



2026 MSCI – Low Carbon Transition Risk Assessment

Contents

Introduction.....	4
Low Carbon Transition Risk assessment.....	4
Methodology	6
Step 1: Measure Low Carbon Transition Risk Exposure	6
Risk transmission channel: operations	6
Risk transmission channel: products.....	7
Adjustment for companies with operations in the fossil fuel value chain	7
Step 2: Assess Low Carbon Transition Risk Management	8
Step 3: Calculate Low Carbon Transition Category and Score	9
Process and governance	9
Entity Selection & Data Mapping	10
Data Entities.....	10
Evaluation Boundary	10
Data Mapping	10
Ongoing monitoring and update cycle	11
Minimum data requirements to calculate a Low Carbon Transition Score	11
Ongoing updates of data and estimates	11
Data quality assurance:	12
Corporate actions and related changes	12
New additions to the issuer coverage universe:.....	12
Spin-offs:.....	13
Acquisitions:	13
Mergers:	13
Global Industry Classification Standard (GICS®) sub-industry classification change:	13
Deletions to indexes in the coverage universe:	13
Methodology update processes	13
Additional disclosures.....	14
Data sourced from NFRD or SFDR	14

NFRD-aligned data disclosure 14

No industry classification used 15

Limitations in data sources and methodologies..... 15

International agreements 15

Not based on scientific evidence 15

AI disclosure 16

Engagement process with rated entities..... 16

Consistent application of methodology..... 16

Methodology governance and update process **Error! Bookmark not defined.**

Appendix 1: Products and services covered under Alternative Energy and Energy Efficiency 19

Alternative Energy 19

Energy Efficiency..... 19

Appendix 2: Avoided Emissions Estimation Methodology 21

Appendix 3: Carbon intensity metrics for risk transmission channels 22

Appendix 4: Low Carbon Transition Category and Score: calculation steps..... 24

Step 1: Measure Low Carbon Transition Risk Exposure 24

Step 2: Assess Low Carbon Transition Risk Management28

Step 3: Calculate Low Carbon Transition Category and Score 30

Computation of Low Carbon Transition Score..... 30

Computation of Low Carbon Transition Category..... 31

Contact us 32

Introduction

To reduce the negative impacts of climate change, in the December 2015 UN Paris Agreement (“the Paris Agreement”), world leaders set a goal to limit global warming to below 2°C above pre-industrial (1861-1880) levels, and to pursue efforts to limit warming to 1.5°C above pre-industrial levels.¹ The Paris Agreement requires all member countries to reduce their greenhouse gas emissions (or carbon emissions)² and strengthen these efforts in the years ahead.

In 2022, the “Emissions Gap Report” from the UN Environment Programme (UNEP) highlighted that since the 26th UN Climate Change Conference of the Parties (COP 26, 2021) insufficient progress has been made towards the emission reductions needed to limit global warming to 1.5°C. According to the report, “broad-based economy-wide transformations are required” to expedite the pace of low carbon transition and achieve a warming-level target of well below 2°C.^{3,4}

In the event that the low carbon transition (the transition) takes place, demand for carbon-intensive products would decline in favor of low- and zero-carbon products, which would put carbon-intensive companies and industries (for example, coal-based power generation and coal mining) at risk of having stranded assets over the long term (5+ years). MSCI Sustainability & Climate (MSCI S&C)⁵ considers a company exposed to low carbon transition risks and opportunities through two main transmission channels: (1) exposure through involvement in carbon-intensive operations, and (2) exposure through involvement in or solutions for carbon-intensive products.

Low Carbon Transition Risk assessment

MSCI S&C’s Low Carbon Transition (LCT) Risk assesses companies’ exposure to risks and opportunities related to the low carbon transition based on the carbon-intensive nature of their business lines. The time horizon for this assessment is considered to be long term (i.e. greater than 5 years). The assessment is derived from company disclosures and estimates.

The final output of this assessment is two company-level factors:

¹ The Paris Agreement. 2015. United Nations. <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>

² Greenhouse gas emissions, GHG emissions and carbon emissions are used interchangeably. In this document, MSCI S&C has primarily used “carbon emissions” to denote greenhouse gas emissions.

³ Emissions Gap Report 2022. October 2022. United Nations Environment Program (UNEP). <https://wedocs.unep.org/bitstream/handle/20.500.11822/40874/EGR2022.pdf?sequence=1&isAllowed=y>

⁴ The “low carbon transition” refers to the necessary transition of the global economy from carbon-intensive operations and energy sources to zero or low-carbon operations and energy sources.

⁵ “MSCI Sustainability & Climate products and services are provided by MSCI Solutions LLC in the United States, MSCI Solutions (UK) Limited in the United Kingdom and certain other related entities.

(1) Low Carbon Transition Category: This factor groups companies in five categories that highlight the predominant risks and opportunities they are most likely to face in the transition (see Exhibit 1).

(2) Low Carbon Transition Score: This score is based on a multidimensional risks and opportunities assessment, and considers both the primary risks (e.g., changes in market dynamics or regulations) and secondary risks (risks affecting the economy as a whole) a company faces from the transition.

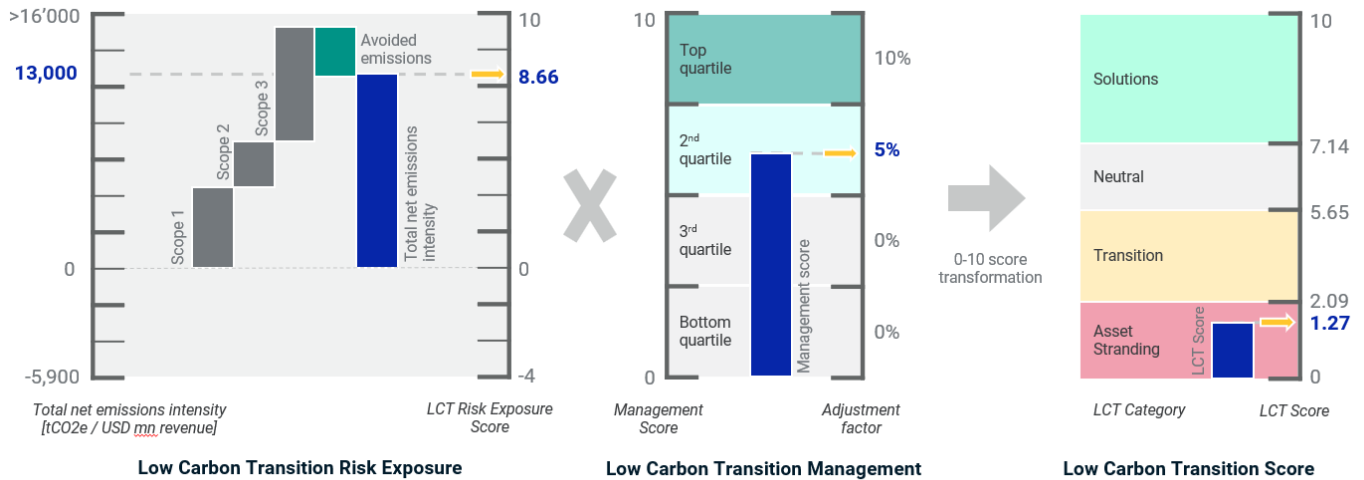
Exhibit 1: Low Carbon Transition Categories and Scores

Low Carbon Transition Score	Low Carbon Transition Category	Low Carbon Transition Risk / Opportunity
0.00 – 2.09	Asset Stranding	Potential to experience "stranding" of physical / natural assets due to regulatory, market, or technological forces arising from low carbon transition.
2.09 – 5.65	Product Transition	Reduced demand for carbon-intensive products and services. Leaders and laggards are defined by the ability to shift product portfolio to low-carbon products.
	Operational Transition	Increased operational and/or capital cost due to carbon taxes and/or investment in carbon emission mitigation measures leading to lower profitability of the companies.
5.65 – 7.14	Neutral	Limited exposure to low carbon transition carbon risk. Though companies in this category could have exposure to physical risk and/or indirect exposure to low carbon transition risk via lending, investment etc.
7.14 – 10	Solutions	Potential to benefit through the growth of low-carbon products and services.

Methodology

MSCI S&C determines the Low Carbon Transition Categories and Scores by a combination of each company’s current risk exposure and its efforts to manage the risks and opportunities presented by the low carbon transition (see Exhibit 2).

Exhibit 2: A three-step process to determine Low Carbon Transition Categories and Scores



Source: MSCI S&C. See Appendix 4 for more detail on above calculation.

Step 1: Measure Low Carbon Transition Risk Exposure

A company may be exposed to low carbon transition risks and opportunities through multiple risk transmission channels, as described below. A company’s aggregate exposure through these channels informs its level of exposure.

Risk transmission channel: operations

- A. Direct operations:** Companies with carbon-intensive operations, such as coal-based power generation and cement production, could be exposed to climate transition costs through regulatory fines, carbon taxes, and required capital investments to reduce emissions.

MSCI S&C uses Scope 1+2 carbon emissions intensity (tCO₂e / USD million revenue) to measure the climate transition risk associated with companies’ direct operations. In the absence of company-reported data, MSCI S&C uses carbon emissions estimates. Estimated emission intensities are derived from two possible approaches: (1) by company-specific emission intensities based on previously disclosed company data, or (2) by industry-specific emission intensities applied to a company’s business activities. For power generating companies, estimates are based on disclosed fuel mix and the emission intensities of each fuel type.

- B. Supply chain:** Companies with carbon-intensive supply chains could be exposed to rising raw material costs or supply disruptions caused by any carbon-related operational risk in the supply chain.

MSCI S&C uses estimated Scope 3 upstream carbon emission intensity to measure risk exposure through this channel. MSCI S&C computes these estimates based on MSCI S&C's proprietary carbon estimation methodology⁶, which estimates emission intensities for each Scope 3 upstream category individually using a top-down (revenue-based) or bottom-up (based on operational data) approach.

Risk transmission channel: products

- C. Carbon-intensive products:** Companies with carbon-intensive products (e.g., petrol/diesel-based automobiles and fossil fuels) and companies in carbon-dependent industries (defined as those with high revenue dependence on companies with carbon-intensive operations or products, e.g., energy equipment and services and steam turbine manufacturers) may face reduced demand for their products and services as a result of a low carbon transition.

MSCI S&C uses estimated Scope 3 downstream carbon emission intensity to measure risk exposure to these types of products. MSCI S&C computes these estimates based on MSCI S&C's proprietary carbon estimation methodology.⁶

- D. Low- or zero-carbon products:** Companies involved in low- or zero-carbon products (e.g., renewable energy production and energy efficient equipment) are likely to benefit from an increase in demand for products and services that provide solutions to address climate change.

MSCI S&C uses estimated avoided carbon emission intensity to measure risk exposure through this channel. MSCI S&C estimates avoided carbon emissions for companies involved in **alternative energy** and **energy efficient** technologies. Please refer to Appendix 1 for detailed information on the products and services covered under these two categories and Appendix 2 for more details on the avoided emissions estimation methodology.

See Appendix 3 for definitions of each of the metrics used to measure exposure through these channels. All carbon emission intensities are measured as tons of CO2 equivalent (tCO2e) per USD million revenue.

A company's Low Carbon Transition Risk Exposure is calculated based on its estimated total net carbon intensity, which considers operational and product carbon emissions.

Once the total net carbon intensity of a company is calculated, its Low Carbon Transition Risk Exposure score is computed.

Adjustment for companies with operations in the fossil fuel value chain

MSCI S&C adjusts the Low Carbon Transition Risk Exposure score for companies that have operations in the fossil fuel value chain. MSCI S&C's Scope 3 estimation methodology is aligned with the Greenhouse

⁶ "Scope 3 Carbon Emissions Estimation Methodology", MSCI S&C LLC.

Gas Protocol (GHGP)⁷, which does not require service providers in the fossil fuel value chain to report emissions associated with the use of fossil fuel products (Scope 3, Category 11). As a result, GHGP-aligned emissions from fossil fuel related service providers (e.g., refining, transportation, distribution, and other services) do not fully reflect the transition risks faced by companies in the fossil fuel value chain.

To reflect the transition risks of companies involved in the fossil fuel value chain, MSCI S&C adjusts the LCT Risk Exposure score to account for revenue⁸ associated with the oil and gas and coal industries. For a company that operates in the oil and gas value chain, the portion of revenue that is associated with this industry is adjusted using the average LCT Risk Exposure score of the Oil & Gas Exploration and Production Global Industry Classification Standard (GICS®)⁹ sub-industry. The same is done for companies with operations in the thermal coal value chain. The LCT Risk Exposure score formula is shown below:

$$\begin{aligned} \text{LCT Risk Exposure score}_{\text{final}} = & \text{[O\&G revenue \%]} \cdot \text{[O\&G Producer LCT Risk Exposure score]} \\ & + \text{[Coal revenue \%]} \cdot \text{[Coal Miner LCT Risk Exposure score]} \\ & + ([1 - \text{[O\&G revenue \%]} - \text{[Coal revenue \%]}) \\ & \quad \cdot \text{LCT Risk Exposure score}_{\text{unadjusted}} \end{aligned}$$

For more details about the fossil fuel adjustment of LCT Risk Exposure scores see Appendix 4.

Step 2: Assess Low Carbon Transition Risk Management

In the second step, MSCI S&C assesses a company’s management of risks and opportunities presented by the low carbon transition. This assessment is based on policies and commitments to mitigate transition risk, governance structures, risk management programs and initiatives, targets and performance, and involvement in any controversies.

MSCI ESG Ratings measures these factors through adopting the assessments of five MSCI ESG Ratings Key Issues¹⁰ (see Exhibit 3). Because low carbon transition risk manifests in different ways for different industries, each industry is assessed on the issues determined to be most economically relevant by the MSCI ESG Ratings assessment. For example, carbon-intensive industries such as electric utilities, steel and cement are analyzed on the management of potential transition risks due to their high direct carbon emissions (Scope 1+2) via the Carbon Emissions Key Issue, but automobile manufacturers are

⁷ GHG Protocol; <https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf>.

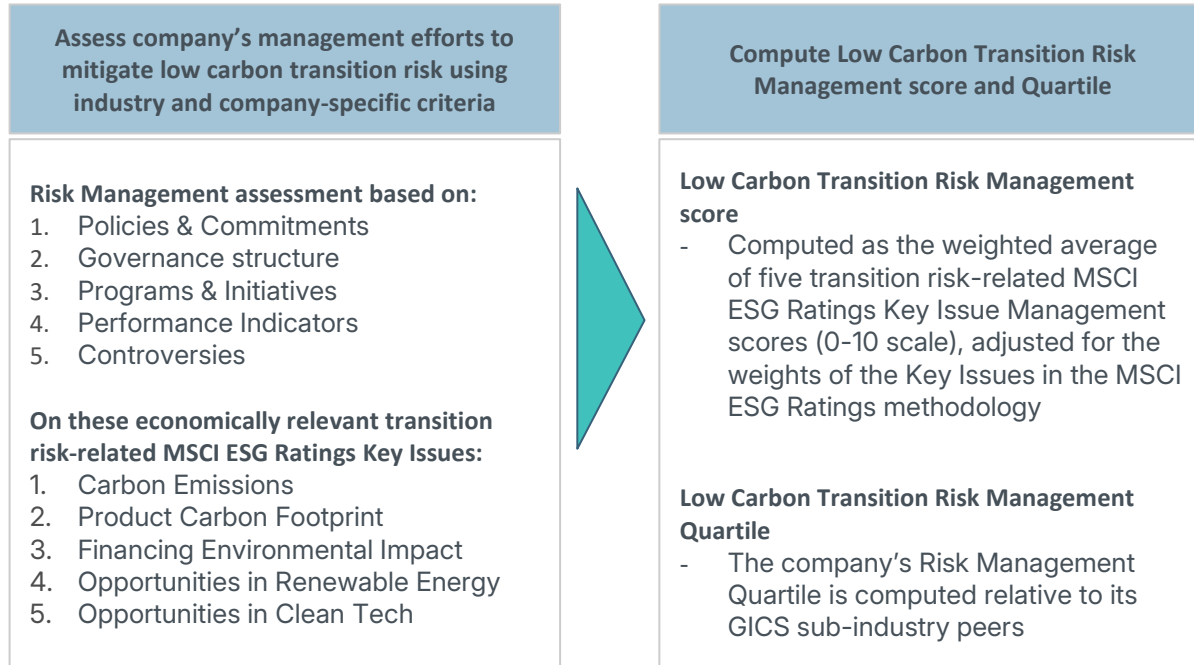
⁸ In oil and gas related revenues, MSCI S&C includes revenues related to the following activities: equipment and services, exploration and production, distribution and retail, pipelines, refining, and trading. In coal related revenues, MSCI S&C includes revenues associated with thermal coal mining and coal mining services.

⁹ GICS is the global industry classification standard jointly developed by MSCI and S&P Global Market Intelligence.

¹⁰ MSCI ESG Ratings provide an opinion of companies’ management of financial relevant ESG risks and opportunities. These ESG risks and opportunities are called Key Issues. Each Key Issue takes into consideration companies’ exposure to the potentially material ESG risks, and the quality of companies’ management systems and governance structures to mitigate such risks (Management scores). Please refer to “ESG Ratings Methodology” for more details on how Key Issues are selected and weighted in the ESG Ratings methodology > <https://www.msci.com/esg-and-climate-methodologies>.

assessed on the carbon efficiency of their products (Scope 3 downstream) rather than their own emissions (Scope 1+2) via the Product Carbon Footprint Key Issue.

Exhibit 3: Compute Low Carbon Transition Risk Management score and Quartile



Computation of the Low Carbon Transition Risk Management score and Quartile for a company is explained in Exhibit 3. Please refer to Appendix 4 for more details on the underlying calculation steps.

Step 3: Calculate Low Carbon Transition Category and Score

In the final step, the Low Carbon Transition Risk Exposure score that was calculated in Step 1 is adjusted by the company’s Low Carbon Transition Management score. The Low Carbon Transition Risk Exposure scores of companies with first or second quartile risk management are adjusted downwards by 10% and 5%, respectively (see Exhibit 2). Following this adjustment, some first and second quartile companies may move up one category. The final output is a Low Carbon Transition Score on a 0-10 scale that corresponds to Low Carbon Transition Category. Please refer to Appendix 4 for more details on the underlying calculation steps.

Process and governance

The Low Carbon Transition Assessment is a derived assessment that aggregates collected data and outputs from several primary MSCI S&C methodologies. The Low Carbon Transition Categories and Scores are generally updated quarterly.

Entity Selection & Data Mapping

ESG Evaluations, including LCT assessments may be attributed to related companies. Companies are selected for ESG Evaluations through MSCI S&C’s Entity Selection process – these are known as Data Entities. Assessments are attributed to related companies through a MSCI S&C’s Data Mapping process.

Data Entities

MSCI S&C defines a Data Entity as an entity subject to an ESG Evaluation. To determine which entity or entities within a group of related companies should be evaluated for a given assessment, MSCI S&C conducts a review of the companies’ financing structures.

Evaluation Boundary

Where there are multiple LCT assessments within a group of companies, the LCT Evaluation Boundary may overlap, or a set of LCT evaluations may be nested inside another, particularly where one of the companies is an equity issuer.

For LCT:

- The Evaluation Boundary for an equity issuer is the whole group of companies.
- The Evaluation Boundary for a bond issuer that sits within a group but is financing only a discrete part of the group (e.g. a single business line or division, specific operating company, the captive finance activities, etc.) extends only to that part of the group. Any activity involvement identified for this discrete part of the group will also be reflected in the group’s evaluation.

Data Mapping

Data Mapping is the process whereby ESG Evaluations for a company (a Data Entity) are attributed to related companies. ESG Evaluations are mapped based on observed parent-subsidary relationships, subject to certain company and data point requirements.

- Certain companies (such as those classified as financing companies) included in the coverage universe may be covered by data mapping from the relevant Data Entity.
- Bond issuers outside the LCT coverage universe may also have their evaluations mapped from parent entities that are included in the LCT coverage universe.

Note that LCT assessments are not to be mapped to:

- Equity issuers; or
- Companies that have already been assessed by MSCI S&C.

MSCI S&C does not recommend the use of Data Mapping for the following assessment types:

- Ownership Of; and
- Ownership By.

Ongoing monitoring and update cycle

Minimum data requirements to calculate a Low Carbon Transition Score

The following data points are required to calculate and maintain a Low Carbon Transition Score:

- Reported or estimated Scope 1 and 2 emission intensity,¹¹
- Estimated Scope 3 upstream and downstream emission intensity,¹²
- Alternative energy and energy efficiency revenue percentage,¹³
- At least one of the relevant Key Issue Management scores.¹⁴

Ongoing updates of data and estimates

Company disclosures:

Generally, underlying data (i.e., carbon emissions, alternative energy revenue, energy efficiency revenue) is updated according to the disclosure cycles of companies on an annual basis.

Estimated input data sets:

Low Carbon Transition Scores and Categories use multiple calculated data sets as inputs that follow different update cycles. The timing and frequency of these data sets is shown in Exhibit 4.

Exhibit 4: Timing and frequency of calculated data sets used in the Low Carbon Transition Risk Assessment model

Data set	Publication cycle ¹⁵
Estimated Scope 1+2 carbon emission intensity	Estimates for companies that do not report Scope 1+2 emissions are typically published up to semi-annually depending on the estimation approach. ¹¹
Estimated Scope 3 carbon emission intensity	Typically, updated estimates based on changes in revenue data are published bi-weekly. Other data and model updates are typically published monthly. ¹²
Key Issue Management scores for five Key Issues	The Carbon Emissions Management score is generally updated annually to account for new disclosures. The timing

¹¹ For details, please refer to “MSCI Greenhouse Gas Emissions Methodologies.”

¹² For details, please refer to “MSCI Greenhouse Gas Emissions Methodologies.”

¹³ For details, please refer to “MSCI Sustainable Impact Metrics Methodology.”

¹⁴ See a list of the relevant Key Issues in Exhibit 3. For details about the underlying methodology, please refer to “ESG Ratings Methodology.”

¹⁵ Not considering ad-hoc publications.

Data set	Publication cycle ¹⁵
	<p>of this update is independent of the ESG Rating review and rating action.¹¹</p> <p>Other Key Issue Management scores are generally updated annually at the time of the ESG Rating review and rating action.¹⁴</p>

Data quality assurance:

Input data is subject to quality assurance processes. This includes automated checks and review by ESG Data Experts and ESG Analytical Personnel when required.

Criteria for an *ad-hoc* update to Low Carbon Transition Scores

MSCI S&C follows specific criteria to determine whether an event such as a corporate action or significant change in data warrants a mid-cycle re-assessment of a company’s Low Carbon Transition Score, including the following:

- Low Carbon Transition Risk Management Quartile change of at least two quartiles
- New information provided by a company that results in one of the following:
 - More than 25% increase/decrease in carbon emissions intensity.
 - Change of at least 2 points on the Low Carbon Transition Risk Management score (on a 0-10 scale).
 - More than 10 percentage points increase/decrease in alternative energy and energy efficiency revenue.
 - Change in business segment data that results in a change of the company’s Low Carbon Transition Category.
- A significant corporate action that results in a change to the historical carbon emissions data and intensity or a change of at least 2 points on the Low Carbon Transition Risk Management score (on a 0-10 scale).

Corporate actions and related changes

The coverage universe may change due to changes in coverage initiated by MSCI S&C and due to changes in index constituents, which are periodically rebalanced by the index administrator.

New additions to the issuer coverage universe:

MSCI S&C aims to assess additions to the MSCI World Index, MSCI Emerging Markets Index, MSCI China A Index and MSCI US IMI within one quarter of their inclusion in the relevant index. MSCI S&C aims to assess additions to any other indexes in the ESG Ratings coverage universe within two quarters of index inclusion.

Spin-offs:

If a new entity is a constituent of the MSCI World Index, MSCI Emerging Markets Index, MSCI China A Index or MSCI US Investible Market Index (IMI), MSCI S&C aims to assess it as a standalone entity within one quarter.

If the spun-off entity is in the targeted issuer universe, but is not a constituent of the MSCI World Index, MSCI Emerging Markets Index, MSCI China A Index or MSCI US IMI, MSCI S&C aims to assess it as a standalone entity within two quarters.

Acquisitions:

If an acquiring company does not have an existing assessment, even if the acquired entity has an existing assessment, the acquiring company is considered a “new” entity and will be assessed according to the index addition approach stated above.

If an acquiring company has an existing assessment, the acquiring company’s assessment will consider the newly acquired entity at the time of the next annual update for the acquiring company. The assessment of both companies will remain available until the reassessment.

Mergers:

If a merger creates a new entity, it will be researched according to the issuer universe addition approach stated above.

Global Industry Classification Standard (GICS®)¹⁶ sub-industry classification change:

If a company’s GICS sub-industry classification changes, the effects of the change on the Low Carbon Transition model will be reviewed within one quarter of the GICS sub-industry classification change following the regular timing of the Low Carbon Transition model releases.

Deletions to indexes in the coverage universe:

When a company is removed from the coverage universe — for example, due to turnover in index constituents or due to corporate actions — the company’s Low Carbon Transition Risk Assessment will no longer be updated, and its Low Carbon Transition Category and Score and other data points will be removed from the MSCI One platform typically the following month, and from data feeds at the next scheduled data feed delivery.

Methodology governance and update process

MSCI S&C has established an internal methodology committee that presides over the development, review and approval of all MSCI S&C methodologies, including the Low Carbon Transition Risk

¹⁶ GICS is the global industry classification standard jointly developed by MSCI and S&P Global Market Intelligence. “Global Industry Classification Standard (GICS®) is a service mark of MSCI and S&P Dow Jones Indices. GICS is reviewed on an ongoing basis; latest consultation date: March 16, 2026.

Assessment. All material methodology and/or model update proposals are subject to market consultation prior to approval for implementation by this committee.

Additional disclosures

Data sourced from NFRD or SFDR

Some data used in the Low Carbon Transition Risk Assessment methodology may be disclosed by companies as part of sustainability statements required by Directive 2013/34/EU and Regulation (EU) 2019/2088. However, this data may also be collected independently of these disclosures.

NFRD-aligned data disclosure

Exhibit 5: Topics covered by this rating that correspond to the topics covered in the NFRD

Topics Covered by the NFRD	Also Covered by this Rating (Y/N)
Environmental matters	
Impacts on the environment (e.g., pollution, emissions, waste)	Y
Use of renewable and non-renewable energy	Y
Greenhouse gas emissions	Y
Water use	N
Impacts on biodiversity	N
Climate-related risks (where relevant)	Y
Social and employee-related matters	
Working conditions	N
Health and safety	N
Social/community dialogue	N
Respect for workers' rights	N
Gender equality and diversity	N
Training and development	N
Respect for human rights	
Due diligence processes	N
Prevention of human rights abuses	N

Remedial actions where violations occur	N
Human rights in supply chains	N
High risk areas for civil and political rights	N
Impacts on indigenous and local communities	N
Conflict resources (e.g., conflict diamonds)	N
Data protection	N
Anti-corruption and bribery matters	
Policies and controls to prevent corruption and bribery	N
Measures taken to detect and address misconduct	N

Industry classification used

GICS is used in the Low Carbon Transition Risk Assessment methodology. For more information, refer to the official GICS documentation available at <https://www.msci.com/our-solutions/indexes/gics>. GICS is reviewed on an ongoing basis; latest consultation date: March 16, 2026.

Limitations in data sources and methodologies

The Low Carbon Transition Risk Assessment primarily relies on carbon emissions intensity metrics and revenue-based classifications to evaluate transition exposure. As a result, the methodology focuses on current emissions profiles and does not explicitly incorporate forward-looking policy developments, carbon pricing dynamics, or technology viability considerations. Scope 3 emissions and avoided emissions metrics are partially based on modelled estimates and standardized intensity factors, which may not fully reflect company-specific circumstances or real-world displacement effects.

International agreements

The foundational premise of the Low Carbon Transition Risk Assessment methodology is consistent with the objective of the Paris Agreement to limit global warming to well below 2°C above pre-industrial levels. The methodology assesses companies' exposure to risks and opportunities arising from the low carbon transition, which is driven in part by policy commitments made under the Paris Agreement. However, the methodology does not explicitly incorporate the specific targets of the Paris Agreement or assess alignment of companies' commitments against the objectives of the Paris Agreement or any other specific international agreement.

Not based on scientific evidence

The overall Low Carbon Transition Risk Assessment methodology is not based on specific scientific evidence.

AI disclosure

Large language models (LLMs) are used for data collection. The use of this technology is subject to risks and limitations because of their probabilistic nature — these include inaccuracy, inconsistency and bias. LLMs are not relied upon as an authoritative source for data collection but are part of a system of data collection and data quality control.

Engagement process with rated entities

MSCI S&C is committed to transparent communication with rated items and issuers of rated items in our coverage universe. For more details, please refer to the “Procedures of Engagement with Rated Entities” document on [msci.com](https://www.msci.com).

Consistent application of methodology

As a quantitative model, the Low Carbon Transition Score is determined in a consistent manner for all assessed companies in Low Carbon Transition Risk Assessment model.

Methodology governance and update process

MSCI S&C has established an internal methodology committee that presides over the development, review and approval of all MSCI S&C methodologies, including the Low Carbon Transition Risk Assessment methodology. All material methodology and/or model update proposals are subject to market consultation prior to approval for implementation by this committee.

Coverage Universe

The Low Carbon Transition Risk Assessment model's coverage universe includes constituents of the MSCI World Index, MSCI Emerging Markets Index, MSCI China A Index, and MSCI US Investable Market Index (IMI), as well as additional companies in targeted issuer universes covered by MSCI S&C. Coverage may change due to periodic index rebalancing or changes initiated by MSCI S&C.

Data sources

MSCI S&C uses the following data sources to determine the Low Carbon Transition Risk Assessment:

Company disclosures (annual reports, sustainability reports, regulatory filings); MSCI S&C's proprietary carbon emissions data and estimates, including reported or estimated Scope 1+2 carbon emissions intensity, estimated Scope 3 upstream and downstream carbon emissions intensity, and estimated avoided carbon emissions intensity; revenue and business segment data; and MSCI ESG Ratings Key Issue management assessments for the five climate-related Key Issues listed in Exhibit 3 (for details, see the relevant MSCI ESG Ratings Key Issue Methodology documents). For details on carbon emissions data and estimation methods, refer to the “MSCI Greenhouse Gas Emissions Methodologies” document.

Estimation methods and treatment of insufficient data

Where company-reported Scope 1+2 carbon emissions data is unavailable or does not align with the GHG Protocol framework,⁷ MSCI S&C applies proprietary Scope 1+2 Carbon Emissions Estimation models to estimate emissions. For details on these estimation models, refer to the “MSCI Greenhouse Gas Emissions Methodologies” document.

MSCI S&C estimates Scope 3 upstream and downstream carbon emissions intensity for all companies based on MSCI S&C’s proprietary carbon estimation methodology. MSCI S&C estimates avoided carbon emissions for companies involved in alternative energy and energy efficiency technologies using standardized avoided emission intensity factors.

The following data points are required to calculate and maintain a Low Carbon Transition Score: reported or estimated Scope 1 and 2 emission intensity, estimated Scope 3 upstream and downstream emission intensity, alternative energy and energy efficiency revenue percentage, and at least one of the relevant Key Issue management assessments. If the minimum data requirements are not met, MSCI S&C does not produce a Low Carbon Transition Score for that company.

Data quality assurance

Data quality checks are conducted on all input data prior to publication to address accuracy, completeness and validity. Automated data quality checks are conducted first and data that is flagged through these checks is subject to further review by S&C data experts and S&C analytical personnel. Input data sourced from other MSCI S&C methodologies, including carbon emissions data and MSCI ESG Ratings Key Issue assessments, is subject to the quality assurance processes described in the respective methodology documents.

Model update history

Exhibit 6: Low Carbon Transition Risk Assessment Methodology Model update history

Version	Changes	Date
V2.0	<p>This update included the following changes:</p> <ul style="list-style-type: none"> Replaced legacy scope 3 emission estimates with GHGP-aligned¹⁷ scope 3 estimation model providing category-level estimates Increased Neutral-to-Transition category threshold from 500 to 700 tCO₂e/million USD revenue Introduced fossil fuel value chain LCT Score adjustment using weighted average of O&G 	February 2024

¹⁷ GHG Protocol; <https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf>.

	<p>producer and coal miner average LCT Risk Exposure scores</p> <ul style="list-style-type: none"> • Added requirement that companies must be associated with the fossil fuel value chain to be categorized as Asset Stranding • Updated LCT Score-to-Category equivalence thresholds 	
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Appendix 1: Products and services covered under Alternative Energy and Energy Efficiency

MSCI S&C estimates avoided carbon emissions for companies involved in alternative energy and energy efficient technologies. Below, MSCI S&C lists the products and services covered under the respective categories.

Alternative Energy

This category includes products, services or infrastructure projects supporting the development or delivery of renewable energy and alternative fuels, including:

- Generation, transmission and distribution of electricity from renewable sources including wind, solar, geothermal, biomass, small scale hydro (<25 MW), waste-to-energy, and wave tidal.
- Fuels, technology and infrastructure for the production and distribution of cleaner hybrid fuels, fuel cells and alternative fuels, including biodiesel, biogas and cellulosic ethanol.
- Natural gas-powered combined heat and power.
- Batteries and energy storage technologies that support alternative energy.

MSCI S&C's alternative energy category does not include:

- Large scale hydroelectric plants (>25 MW installed capacity).

Energy Efficiency

This category includes products, services, infrastructure or technologies that proactively address the growing global demand for energy while minimizing effects on the environment, including:

- Technologies and systems that promote the energy efficiency of industrial operations (e.g., turbines, motors and engines), business operations (e.g., telepresence services) and IT systems (e.g., cloud computing infrastructure and platform services, virtualization and data center optimization).
- Infrastructure, technology and systems that increase the efficiency of power management, power distribution and demand-side management (e.g., wireless sensors, advanced meters, smart grid).
- Technologies and systems focused on reducing fuel consumption of transport vehicles and industrial operations (e.g., hybrid/electric vehicles).
- Sustainable transportation infrastructure including urban mass transit, efficiency improvements of public transportation fleets, electric vehicle charging and improved traffic systems.

- Architectural glass, energy efficient lighting, insulation, building automation and controls, and devices and systems designed to be utilized in the design and construction of environmentally sustainable buildings.

MSCI S&C's Energy Efficiency category does not include:

- Corporate operational energy efficiency efforts, such as efficiency gains in manufacturing, transporting or distributing standard products or services.
- Energy-efficient components of finished goods.
- Energy-efficient consumer devices (e.g., electronics) and appliances (e.g., refrigerators).
- Cloud computing services or technologies that do not have notable energy efficiency benefits.
- Building and industrial automation technologies that do not have notable energy efficiency benefits.

Appendix 2: Avoided Emissions Estimation Methodology

Low-emission products, technologies and services can lead to reduced emissions outside of their life cycle or value chain due to the decreased use of more carbon-intensive alternatives. Such reduced emissions are called avoided emissions. Examples of products and services that avoid emissions include low-temperature detergents, renewable electricity, energy-efficient ball bearings, and teleconferencing services.

The avoided carbon emission intensity for a company involved in cleaner products, technology or services is estimated as follows:

$$\begin{aligned} &\textbf{Avoided carbon emission intensity [tCO}_2\text{e / USD million]} \\ &= \text{production volume of cleaner technology [production volume]} \\ &\cdot \text{carbon emission intensity of avoided technology [tCO}_2\text{e / production volume]} \\ &/ \text{revenue [USD million]} \end{aligned}$$

Please note that this estimation approach implicitly assumes that the avoided technology is replaced by an equal production volume of the cleaner technology and that the clean technology is carbon neutral.

Based on the approach outlined above, MSCI S&C derived the following avoided emission intensities for all alternative energy and energy efficiency technologies:

Type of technology	Avoided emission intensity [tCO ₂ e / USD million revenue]
Alternative energy	5,915
Energy efficiency	1,193 ¹⁸

¹⁸ Within the category of energy efficiency products and services, hybrid electric vehicles are a major emerging technology (See Appendix 1). Hybrid electric vehicles avoid the use of conventional fossil fuels. Thus, MSCI S&C approximated avoided emissions intensity for hybrid vehicle manufacturers as the Scope 3 downstream emissions intensity for automobile manufacturers, which is estimated at 1,193 tCO₂ per USD million. Currently, as an approximation, MSCI S&C applied the same intensity factor (1,193 tCO₂ per USD million) to all energy efficiency technologies (see Appendix 1).

Appendix 3: Carbon intensity metrics for risk transmission channels

Risk Transmission Channel	Carbon Intensity Metric (tCO ₂ e/USD million revenue)	Metric Definition
Operations: Own Operations	Scope 1+2 Carbon Emissions Intensity (reported or estimated) ¹⁹	Scope 1 carbon (or carbon equivalent) emissions are direct carbon emissions that occur from sources that are owned or controlled by the company, for example, emissions from combustion in owned or controlled boilers, furnaces, vehicles, etc. Scope 2 emissions are carbon emissions from the generation of purchased electricity consumed by the company. (Source: GHG Protocol) ²⁰
Operations: Upstream Supply Chain	Scope 3 Upstream Carbon Emissions Intensity (estimated) ⁶	Scope 3 emissions are a consequence of the activities of the company but occur from sources not owned or controlled by the company. Scope 3 emissions occurring upstream of a company's operations are called Scope 3 upstream emissions. Some examples of Scope 3 upstream emissions are extraction and production of purchased materials, and transportation of purchased fuels. (Source: GHG Protocol)
Products: Carbon-intensive Products	Scope 3 Downstream Carbon Emissions Intensity (estimated) ⁶	Scope 3 emissions are a consequence of the activities of the company but occur from sources not owned or controlled by the company. Scope 3 emissions occurring downstream of a company's operations are called Scope 3 downstream emissions. Some examples of Scope 3 downstream emissions are: use of sold products and services and end-of-life treatment of sold products. (Source: GHG Protocol)
Products: Low/zero Carbon Products	Avoided Carbon Emissions	Avoided emissions are emission reductions that occur outside of a product's life cycle or value chain, but as a result of the use of that product. Examples of products (goods and services) that avoid emissions include low-temperature detergents, renewable electricity, energy-efficient ball

¹⁹ Where companies do not report this information, MSCI S&C provides estimates based on our proprietary carbon estimation methodology.

²⁰ GHG Protocol; <https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf>.

Risk Transmission Channel	Carbon Intensity Metric (tCO ₂ e/USD million revenue)	Metric Definition
	Intensity (estimated) ²¹	bearings and teleconferencing services. (Source: World Resource Institute) ²²

²¹ Please refer to Appendix 2 for more details on Avoided emissions estimation methodology.

²² World Resource Institute; <https://www.wri.org/blog/2013/11/do-we-need-standard-calculate-avoided-emissions>.

Appendix 4: Low Carbon Transition Category and Score: calculation steps

MSCI S&C follows a three-step process to compute the Low Carbon Transition Category and Score.

Step 1: Measure Low Carbon Transition Risk Exposure

In this step, MSCI S&C computes two factors:

1. Low Carbon Transition Risk Exposure Category.
2. Low Carbon Transition Risk Exposure score.

In order to compute the Low Carbon Transition Risk Exposure score from total net carbon intensity, MSCI S&C uses following calculation steps:

1. Compute the standard deviation of the total net carbon intensity values distribution in the MSCI ACWI Investable Market Index (IMI).
2. Use the standard deviation to compute a scaling factor that ensures that the correspondence between any emission intensity and a Low Carbon Transition Risk Exposure score is constant and does not depend on the standard deviation (0 and 16'000 tCO₂e / USD million revenue correspond to scores of 0 and 10, respectively).
3. For all companies in the universe, MSCI S&C computes an emission intensity Raw score given the total net carbon emission intensity x_i as follows:

$$\text{Raw score}_i = \frac{|x_i|}{x_i} \cdot \sqrt{\frac{|x_i|}{\sigma_{ACWI IMI}}}$$

Where:

- x_i is the total net carbon intensity of company i
 - $\sigma_{ACWI IMI}$ is the standard deviation of net carbon intensities of companies in the MSCI ACWI IMI.
4. Compute the LCT Risk Exposure score (unconstrained scale) from the Raw score using linear interpolation between adjusted Z scores of 0 and the scaling factor calculated in step 2, which are assigned LCT Risk Exposure scores of 0 and 10, respectively.

5. For companies with fossil fuel exposure,²³ adjust the LCT Risk Exposure score using average LCT Risk Exposure scores²⁴ of oil and gas as well as coal producers as follows:

$$\begin{aligned} \text{LCT Risk Exposure score}_{\text{adj.}} = & [\text{O\&G revenue \%}] \cdot [\text{O\&G Producer LCT Risk Exposure score}] \\ & + [\text{Coal revenue \%}] \cdot [\text{Coal Miner LCT Risk Exposure score}] \\ & + ([1 - [\text{O\&G revenue \%}] - [\text{Coal revenue \%}]] \\ & \quad \cdot \text{LCT Risk Exposure score}_{\text{unadjusted}} \end{aligned}$$

6. In the final step, truncate any LCT Risk Exposure score value above 10 to 10 and below -4 to -4.

The rules for computing Low Carbon Transition Risk Exposure Categories from total carbon intensity, operational carbon intensity, and product carbon intensity are described in Exhibit A4.1. Companies can have a total net emission intensity that is larger than 8,000 tCO₂e / USD million revenue and not be at risk of asset stranding. For example, companies involved in cement and steel production have high emission intensities but face a lower risk of asset stranding than companies involved in fossil fuel production because their products do not have a currently viable, low emissions alternative. To account for this, a company can only be classified as Asset Stranding if its emission intensity exceeds 8,000 tCO₂e / USD million revenue and if it operates in the fossil fuel value chain.²⁵

²³ For companies with fossil fuel exposure, MSCI S&C considers companies that have revenues related to the following activities: O&G equipment and services, O&G exploration and production, O&G distribution and retail, O&G pipelines, O&G refining, O&G trading, thermal coal mining, and coal mining services.

²⁴ To calculate the average LCT Risk Exposure score of oil and gas producers and coal miners, respectively, MSCI S&C first identify the companies to consider in the average. For oil and gas production, MSCI S&C select the companies assigned to the Oil and Gas Exploration and Production GICS sub-industry[®]. For coal mining, MSCI S&C select companies with at least 60% of revenues from thermal coal mining. Next, MSCI S&C calculates the average of the LCT Risk Exposure score of these oil and gas producers and coal miners, respectively. Companies contributing to the averages (producers) are excluded from the fossil fuel adjustment. To reduce volatility in the Low Carbon Transition Scores and Categories the average LCT Risk Exposure scores are reviewed every three years. Current LCT Risk Exposure score averages for fossil fuel production are calibrated based on data published as of July 2022.1

²⁵ MSCI S&C consider a company to operate in the fossil fuel value chain if one or both of the following conditions apply:

- The company has fossil fuel related revenues: This includes revenues related to the following activities: O&G equipment and services, O&G exploration and production, O&G distribution and retail, O&G pipelines, O&G refining, O&G trading, thermal coal mining, and coal mining services.
- If the company is classified under the Utilities or Energy GICS sector or the Heavy Electrical Equipment sub-industry.

Exhibit A4.1: Determination of Low Carbon Transition Risk Exposure Category

Total net carbon intensity ^{26,27}	Comment	Low Carbon Transition Risk Exposure Category
If total carbon emissions intensity <0	Companies involved in low/zero carbon solutions would have negative total carbon intensity. Likely to benefit in a low carbon scenario.	Solutions
If total carbon emissions intensity ≥ 0 , <700	Companies with less carbon-intensive operations and products. Likely to get less affected by a low carbon transition.	Neutral
If total carbon emissions intensity ≥ 700 , <8,000 and If Scope 3 downstream emission intensity >	Companies with moderately to highly carbon-intensive products. Such companies' products could go under transition in a low carbon scenario.	Product Transition

²⁶ As of January 2019. Total carbon emissions intensity thresholds are selected by a team comprised of industry experts and carbon experts and are reviewed and approved by the ESG Methodology Committee, which is comprised of senior ESG research leadership. These thresholds are defined after assessing the distribution of total carbon emissions intensity for companies within an industry and across industries. These thresholds are typically subject to regular annual or more frequent review. As a result of review the process, these thresholds may change.

²⁷ The total carbon emissions intensity thresholds shown in the table (0, 700, and 8,000 tCO₂e per USD million revenue) are reference values. In the model, these thresholds are converted to equivalent values on the exposure score scale using the standardization and scaling steps described in Appendix 4. Category assignment is then performed using the management-adjusted Low Carbon Transition Risk Exposure score, which reflects the fossil fuel revenue adjustment and the management adjustment, rather than the raw total carbon emissions intensity directly. As a result, an issuer whose raw total carbon emissions intensity is below a given threshold may still be assigned to the corresponding category if its adjusted score exceeds the equivalent threshold after these adjustments.

Total net carbon intensity ^{26,27}	Comment	Low Carbon Transition Risk Exposure Category
Scope 1 and 2 emission intensity		
>=700, <8,000 and If Scope 1 and 2 emission intensity >= Scope 3 downstream emission intensity	Companies with moderately to highly carbon-intensive operations. Such companies' operations could go under transition in a low carbon scenario.	Operational Transition
If total carbon emissions intensity >=8,000 and If company operates in the fossil fuel value chain ²⁸	Outlier transition companies with very high exposure to transition risk. May face asset stranding risk in the short- to medium-term.	Asset Stranding

²⁸ MSCI S&C consider a company to operate in the fossil fuel value chain if one or both of the following conditions apply:

- The company has fossil fuel related revenues: This includes revenues related to the following activities: O&G equipment and services, O&G exploration and production, O&G distribution and retail, O&G pipelines, O&G refining, O&G trading, thermal coal mining, and coal mining services.

If the company is classified under the Utilities or Energy GICS sector or the Heavy Electrical Equipment sub-industry.

Exhibit A4.2: Total carbon intensity, Low Carbon Transition Risk Exposure Category and Low Carbon Transition Risk Exposure score equivalence

Total Carbon Emissions Intensity ²⁵	Low Carbon Transition Risk Exposure Category	Low Carbon Transition Risk Exposure score
<0	Solutions	-4 to 0
>=0, <700	Neutral	0 to 2.09
>=700, <8,000	Transition (Operational or Product ²⁹)	2.09 to 7.07
>=8,000	Asset Stranding	7.07 to 10

Step 2: Assess Low Carbon Transition Risk Management

MSCI S&C’s assessment of a company’s low carbon transition risk management efforts is based on its policies and commitments to mitigate transition risk, governance, risk management programs and initiatives, targets and performance, and controversies assessment on five MSCI ESG Ratings Key Issues (“Key Issue”, see Exhibit A4.3).

Computation of the Low Carbon Transition Risk Management score for a company is based on the following data points:

1. Management scores for five Key Issues (see Exhibit A4.3).
2. Key Issue weights for five Key Issues.

The Low Carbon Transition Risk Management Score for a company is computed as the weighted average of the Key Issue management scores (of five Key Issues),³⁰ using the following formula:

$$\text{Low Carbon Transition Risk Management score} = \frac{\sum(\text{Key Issue Management Score}_i \cdot \text{Key Issue Weight}_i)}{\sum \text{Key Issue Weights}_i}$$

²⁹ Within the Transition Category, a company will be classified as Operational Transition if its Scope 1 and 2 emissions intensity is larger than in its Scope 3 downstream emission intensity. If its Scope 3 downstream emission intensity is larger than its Scope 1 and 2 emission intensity, the company is classified as Product Transition.

³⁰ If a company is not assessed on any of these five Key Issues, then its Carbon Emissions Risk Management score is used as the Transition Risk Management score. MSCI S&C conducts the Carbon Emissions Key Issue assessment for all companies in the coverage universe of Climate Change Metrics irrespective of whether it is a Key Issue for the company or not.

This yields scores of 0-10, where 0 represents worst-in-class risk management and 10 represents best-in-class risk management within a given GICS sub-industry. Once MSCI S&C has the Low Carbon Transition Risk Management score, MSCI S&C computes Low Carbon Transition Risk Management Quartile for each company relative to its GICS sub-industry peers.

Exhibit A4.3: Description of low carbon transition-related MSCI ESG Ratings Key Issues

Key Issue	Intent	Management Metrics
Carbon Emissions	This Key Issue evaluates the extent to which companies may face increased costs linked to carbon pricing or regulatory caps due to their high Scope 1+2 carbon emissions.	Efforts to reduce exposure through comprehensive carbon policies and implementation mechanisms, including carbon reduction targets, production process improvements, and installation of depollution or emissions capture equipment, and/or switch to cleaner energy sources.
Product Carbon Footprint	This Key Issue evaluates the extent to which companies (1) may face higher input or production costs for high-embedded carbon emissions products (e.g., steel products, agriculture, and meat products, etc.) and/or (2) may face increased costs and/or decreased demand for their products due to their involvement in manufacturing carbon-intensive products (e.g., automobiles)	<p>(1) Efforts to reduce exposure through measurement and reduction of carbon emissions associated with raw materials production, product manufacturing, distribution, and retail.</p> <p>(2) Efforts to reduce carbon intensity of their products.</p>

Key Issue	Intent	Management Metrics
Financing Environmental Impact	This Key Issue evaluates the extent to which companies may face potential credit or reputational risks resulting from indirect exposure to the environmental concerns (including low carbon transition) facing borrowers.	Efforts to mitigate credit risk through integration of ESG risk management policies into the company's overall financing and risk management structures
Opportunities in Clean Tech	This Key Issue evaluates the extent to which companies take advantage of opportunities in the market for environmental technologies.	Efforts to take advantage of opportunities through development of clean tech business segments that are related to the company's core business.
Opportunities in Renewable Energy	This Key Issue evaluates the extent to which companies take advantages of opportunities linked to the development of renewable power production.	Efforts to develop renewable power generation capacity and/or proactively complement the development of renewable power through electrical network expansion, equipment commercialization, and "green power" offerings to its customers.

Step 3: Calculate Low Carbon Transition Category and Score

Computation of Low Carbon Transition Score

In the next step, MSCI S&C calculated the Low Carbon Transition Score by applying an adjustment factor to the Low Carbon Transition Risk Exposure score based on the Low Carbon Transition Risk Management Quartile. This has the effect of increasing the final score, reflecting a better position for companies with stronger management. The largest adjustment applies to first quartile companies, a smaller adjustment to second quartile companies, and no adjustment to those in the third or fourth quartiles.

Exhibit A4.4: Adjustment Factor and Low Carbon Transition Risk Management Quartile

Low Carbon Transition Risk Management Quartile	Adjustment Factor
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First quartile	10%
Second quartile	5%
Third and fourth quartile	0%

In the final step, the management-adjusted Low Carbon Transition Risk Exposure score (scale 10 to -4) is translated to a 0-10 scale to compute the Low Carbon Transition Score using the linear interpolation method. Management-adjusted Low Carbon Transition Risk Exposure scores of 10 and -4 are assigned the values of 0 and 10 respectively on the Low Carbon Transition Score scale (0-10) and other values are derived using linear interpolation using those two values.

Computation of Low Carbon Transition Category

First and second quartile Asset Stranding and Transition companies breaching the category thresholds after adjusting for their LCT Management score (see Exhibit 2 and Exhibit A4.4) are recategorized into the Transition and Neutral categories, respectively.

Similar to the Low Carbon Risk Exposure Category, a company can only be classified as Asset Stranding in the final Low Carbon Transition Category if it is associated with the fossil fuel value chain.³¹

³¹ MSCI S&C consider a company to operate in the fossil fuel value chain if one or both of the following conditions apply:

- The company has fossil fuel related revenues: This includes revenues related to the following activities: O&G equipment and services, O&G exploration and production, O&G distribution and retail, O&G pipelines, O&G refining, O&G trading, thermal coal mining, and coal mining services.
- If the company is classified under the Utilities or Energy GICS sector or the Heavy Electrical Equipment sub-industry.

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