

MSCI Minimum Volatility ESG Reduced Carbon Target Indexes Methodology

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1 Introduction

The MSCI Minimum Volatility ESG Reduced Carbon Target Indexes (herein, 'the Indexes') are designed to represent the performance of a strategy that seeks systematic integration of environmental, social and governance (ESG) norms along with the minimum volatility factor.

The Indexes are constructed by selecting constituents of a market capitalization weighted index (the 'Parent Index') and applying an optimization process that aims to minimize volatility risk, meet minimum index-level sustainable exposure percentage ("Index SE%") thresholds, reduce the carbon-equivalent exposure to CO₂ and other GHG as well as the exposure to potential emissions risk of fossil fuel reserves by thirty percent (30%) and improve the weighted-average industry-adjusted ESG score of the Index with respect to their respective Parent Indexes under certain constraints described below.

2 ESG Research Framework

The Indexes use company ratings and research provided by MSCI ESG Research. In particular, the Indexes use the following MSCI ESG Research products: MSCI ESG Ratings, MSCI ESG Controversies, MSCI ESG Business Involvement Screening Research, MSCI Climate Change Metrics and MSCI ESG Impact Solutions.

For details on MSCI ESG Research's full suite of ESG products, please refer to: <https://www.msci.com/esg-investing>

2.1 MSCI ESG RATINGS

MSCI ESG Ratings provides research, data, analysis and ratings of how well companies manage environmental, social and governance risks and opportunities. The product provides an overall company ESG rating based on a seven-point scale from 'AAA' to 'CCC', scores and percentiles indicating how well a company manages each key issue relative to industry peers, as well as underlying data and metrics used to compile the scores and ratings.

The MSCI ESG Ratings methodology can be found in: <https://www.msci.com/esg-and-climate-methodologies>.

2.2 MSCI ESG CONTROVERSIES

MSCI ESG Controversies provides assessments of controversies concerning the negative environmental, social, and/or governance impact of company operations, products and services. The evaluation framework used in MSCI ESG Controversies is designed to be consistent with international norms represented by the UN Declaration of Human Rights, the ILO Declaration on Fundamental Principles and Rights at Work, and the UN Global Compact. MSCI ESG Controversies Score falls on a 0-10 scale, with "0" being the most severe controversy.

The MSCI ESG Controversies methodology can be found in: <https://www.msci.com/esg-and-climate-methodologies>.

2.3 MSCI ESG BUSINESS INVOLVEMENT SCREENING RESEARCH

MSCI ESG Business Involvement Screening Research (BISR) aims to enable institutional investors to manage environmental, social and governance (ESG) standards and restrictions reliably and efficiently.

For more details on MSCI ESG Business Involvement Screening Research, please refer to http://www.msci.com/resources/factsheets/MSCI_ESG_BISR.pdf.

2.4 MSCI CLIMATE CHANGE METRICS

MSCI Climate Change Metrics provides climate data & tools to support investors integrating climate risk & opportunities into their investment strategy and processes. It supports investors seeking to achieve a range of objectives, including measuring and reporting on climate risk exposure, implementing low carbon and fossil fuel-free strategies, align with temperature pathways and factoring climate change research into their risk management processes, in particular through climate scenario analysis for both transition and physical risks.

The dataset spans across the four dimensions of a climate strategy: transition risks, green opportunities, physical risks and 1.5° alignment.

For more details on MSCI Climate Change Metrics, please refer to <https://www.msci.com/climate-change-solutions>.

2.5 MSCI IMPACT SOLUTIONS: SUSTAINABLE IMPACT METRICS

MSCI Impact Solutions' Sustainable Impact Metrics is designed to identify companies that derive revenue from products or services with positive impact on society and the environment. The Sustainable Impact Metrics are comprised of six Environmental Impact categories and seven Social Impact categories arranged by theme.

MSCI Sustainable Impact Taxonomy

Pillar	Themes	Categories
Environmental Impact	Climate Change	1. Alternative energy 2. Energy efficiency 3. Green building
	Natural capital	4. Sustainable water 5. Pollution prevention 6. Sustainable agriculture
Social Impact	Basic needs	7. Nutrition 8. Major Disease Treatment 9. Sanitation 10. Affordable Real Estate
	Empowerment	11. SME Finance 12. Education 13. Connectivity – Digital divide

Under each of the actionable environmental and social impact themes, MSCI ESG Research has identified specific categories of products and services that it has determined companies can offer as potential solutions to environmental and social challenges.



More detailed taxonomy for each category can be found in Section 2.4 of the MSCI ACWI Sustainable Impact Index Methodology available at <https://www.msci.com/index-methodology>.

3 Index Construction Methodology

Constructing the Indexes involves the following steps:

- Defining the Parent Index
- Defining the exclusion criteria
- Defining the security level carbon exposure
- Defining the optimization constraints
- Determining the optimized index

The steps mentioned above are defined in detail in the subsequent sections.

3.1 DEFINING THE PARENT INDEX

Constructing the Indexes begins with selecting the Parent Index and the Eligible Universe to perform total risk minimizing optimization. The Parent Index serves as the universe of eligible securities for optimization.

3.2 ELIGIBLE UNIVERSE

The Eligible Universe is constructed by excluding securities from the Parent Index based on the exclusion criteria described below.

3.3 DEFINING THE EXCLUSION CRITERIA

Securities of companies involved in Very Severe business controversies as defined by the MSCI ESG Controversies Methodology are not eligible for inclusion in the Indexes. This is implemented by excluding constituents of the Parent Index with ESG Controversy Score = 0 ('Red Flag' companies).

3.3.1 BUSINESS EXCLUSION CRITERIA

Companies that are involved in specific businesses which have high potential for negative social and/or environmental impact are ineligible for inclusion in the Indexes.

- Controversial Weapons
- Nuclear Weapons
- Civilian Firearms
- Tobacco
- Thermal Coal
- Oil Sands

In addition to the above, companies that fail to comply with the United Nations Global Compact Principles are also excluded from the Indexes.

Please refer to Appendix II for more details on these criteria.

OTHER EXCLUSION CRITERIA

- Missing Controversy Score – Companies not assessed by MSCI ESG Research's MSCI ESG Controversy Scores are excluded from the Indexes.
- Missing ESG Rating or ESG Score – Companies which are not rated by MSCI ESG Research for an MSCI ESG Rating are excluded from the Indexes.

3.4 DEFINING THE SECURITY LEVEL CARBON EXPOSURE

The carbon exposure of a security is measured in terms of its greenhouse gas emissions and its potential carbon emissions from fossil fuel reserves. The Indexes use MSCI Climate Change Metrics data from MSCI ESG Research.

3.4.1 GREENHOUSE GAS EMISSIONS

MSCI ESG Research collects company-specific direct (Scope 1) and indirect (Scope 2) greenhouse gas (GHG) emissions data from company public documents and/or the Carbon Disclosure Project. If a company does not report GHG emissions, then MSCI ESG Research uses its proprietary methodology to estimate Scope 1 and Scope 2 GHG emissions.

For newly added companies to the Indexes which do not report emission data and where MSCI ESG Research has not yet estimated the greenhouse gas emissions, MSCI uses the average emissions per dollar of issuer market capitalization for the companies in the same industry group, multiplied by the market capitalization of the company as the estimated emission for the company.

3.4.2 POTENTIAL CARBON EMISSIONS FROM FOSSIL FUELS

MSCI ESG Research collects fossil fuel reserves data where relevant for companies which have reserves, typically in the Oil & Gas, Coal Mining and Electric Utilities industries. Fossil fuel reserves can be used for several applications including energy or industrial (e.g. coking coal used for steel production). Only fossil fuel reserves used for energy are taken into account. The data is updated on an annual basis and based on information disclosed by companies. Sources include company publications, other public records and third party data providers. For newly added companies to the index where data is not available yet, MSCI uses zero fossil fuel reserves. The size of reserves of a company typically influences its market valuation, and hence MSCI normalizes for size by dividing the potential carbon emissions of the company by its market capitalization.

To convert reserves data to potential carbon emissions, MSCI ESG Research applies a formula from the Potsdam Institute for Climate Impact Research¹.

3.5 DEFINING THE OPTIMIZATION SETUP

The optimization objective is to perform total risk minimizing optimization. The optimization is performed from a base currency perspective and does not allow short selling of securities. The default currency is the US Dollar.

Please refer to Appendix I for more details.

3.6 DEFINING THE OPTIMIZATION CONSTRAINTS

At each Semi-Annual Index Review (SAIR), the following optimization constraints are employed, which aim to ensure replicability and investability:

- The maximum weight of an index constituent will be restricted to the lower of 1.5% and 20 times the weight of the security in the Parent Index
- The minimum weight of an index constituent will be 0.05%
- For countries with weight greater than 2.5% in the Parent Index, the weight in the MSCI Minimum Volatility ESG Reduced Carbon Target Index will not deviate more than +/-5% from the country weight in the Parent Index
- For countries with weight less than 2.5% in the Parent Index, the weight in the MSCI Minimum Volatility ESG Reduced Carbon Target Index will be capped at 3 times their weight in the Parent Index
- The above country weight constraint will also apply on China A Stock Connect listings as a group separately in addition to the usual country weight constraint on China
- The sector weights of the MSCI Minimum Volatility ESG Reduced Carbon Target Index will not deviate more than +/-5% from the sector weights of the Parent Index
- No constraint will be applied on the exposure of the MSCI Minimum Volatility ESG Reduced Carbon Target Index to the Barra Volatility risk factors (BETA and RESVOL). Exposure to all other Barra risk factors will be restricted to +/- 0.25 standard deviations relative to the Parent Index

¹ Malte Meinshausen, Nicolai Meinshausen, William Hare, Sarah C. B. Raper, Katja Frieler, Reto Knutti, David J. Frame & Myles R. Allen. Greenhouse-gas emission Target for limiting global warming to 2 °C. Nature 458, 1158-1162 (30 April 2009) | doi: 10.1038/nature08017; Received 25 September 2008; Accepted 25 March 2009. Supplementary Information, p. 7.

- The minimum weighted-average industry-adjusted ESG score of the Index at the time of rebalancing will be higher of the following:
 - 120% of the weighted-average industry-adjusted ESG score of the Parent Index and
 - The ESG Score of the Index by removing at least bottom 20% of the Parent Index by lowest ESG score
- The minimum reduction in the Weighted Average Carbon Emission Intensity² relative to the Parent Index will be 30%
- The minimum reduction in the Potential Emissions per dollar of market capitalization relative to the Parent Index will be 30%
- The constraint on minimum Index SE% (which reflects a particular interpretation of the company-level sustainable investment assessment as per Article 2(17) of the Sustainable Finance Disclosure Regulation (SFDR)³ along with an associated aggregation method) for the Index is defined in Appendix VI.
- The one-way turnover of the MSCI Minimum Volatility ESG Reduced Carbon Target Index is constrained to a maximum of 10% at each SAIR

Please refer to Appendix V for the criteria used to determine the company-level sustainable exposure qualification and the calculation of Index SE%.

The Potential Emissions per dollar of market capitalization of the Indexes is calculated using the formulae defined in Appendix I of the MSCI Global Low Carbon Leaders Indexes Methodology⁴.

The Weighted Average Carbon Intensity is calculated using the formulae defined in section 1.2 of MSCI Carbon Footprint Index Ratios Methodology⁵.

3.7 DETERMINING THE OPTIMIZED INDEX

The Indexes are constructed using the Barra Open Optimizer in combination with the relevant Barra Equity Model⁶. The optimization uses the Eligible Universe as the

² Carbon Intensity = Scope 1 & 2 Emission / Sales. For Parent Index constituents where the Emissions Intensity is not available, the average Emissions Intensity of all the constituents of the MSCI ACWI Index in the same GICS Industry Group in which the constituent belongs is used.

³ Regulation (EU) 2019/2088 of the European Parliament and of the Council of 27 November 2019 on sustainability-related disclosures in the financial services sector, available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R2088&from=EN>

⁴ For details about the methodology, please refer to: <https://www.msci.com/index-methodology>.

⁵ For details about the methodology, please refer to: <https://www.msci.com/index-carbon-footprint-metrics>.

⁶ Please refer to Appendix IV for the detailed information on model usage

universe of eligible securities and the specified optimization objective and constraints to determine the Index. Infeasible optimizations are handled as explained in Appendix III.

4 Maintaining the Index

4.1 SEMI-ANNUAL INDEX REVIEWS

The Indexes are rebalanced on a semi-annual basis, usually as of the close of the last business day of May and November, coinciding with the May and November Semi-Annual Index Reviews (SAIRs) of the MSCI Global Investable Market Indexes. Barra Equity Model data as of the end of April and October are used respectively.

Similarly, the MSCI ESG Research data (including MSCI ESG Ratings, MSCI ESG Controversies Scores, MSCI Business Involvement Screening Research, and MSCI Climate Change Metrics) used for the Semi-annual Index Reviews will be taken as of the end of the month preceding the Index Review i.e., April and October. For some securities, such data may not be published by MSCI ESG Research by the end of the month preceding the Index Review. For such securities, MSCI will use ESG data published after the end of month, when available.

The pro forma Indexes are in general announced nine business days before the effective date.

4.2 MONTHLY REVIEW OF CONTROVERSIES

Index constituents are reviewed on a monthly basis for the involvement in ESG controversies and for compliance with the United Nations Global Compact Principles. Existing constituents will be deleted if they face controversies as defined by MSCI ESG Controversies Score of 0 ('Red Flag' companies), or if they fail to comply with the UN Global Compact Principles.

MSCI uses MSCI ESG Controversies data as of the end of the month preceding the review (e.g., end of June data for the end of July monthly review). For some securities, such data may not be published by MSCI ESG Research by the end of the month preceding the review. For such securities, MSCI will use ESG data published after the end of month, when available, for the monthly review of the Index.

The pro forma indexes are generally announced nine business days before the first business day of the month.

4.3 ONGOING EVENT RELATED CHANGES

The general treatment of corporate events in the Indexes aims to minimize turnover outside of Index Reviews. The methodology aims to appropriately represent an investor's participation in an event based on relevant deal terms and pre-event weighting of the index constituents that are involved. Further, changes in index market capitalization that occur as a result of corporate event implementation will be offset by a corresponding change in the Variable Weighting Factor (VWF) of the constituent.

The following section briefly describes the treatment of common corporate events within the Indexes.

No new securities will be added (except where noted below) to the Index between Index Reviews. Parent Index deletions will be reflected simultaneously in the Index.

EVENT TYPE	EVENT DETAILS
New additions to the Parent Index	A new security added to the Parent Index (such as IPO and other early inclusion) will not be added to the Index.
Spin-Offs	All securities created as a result of the spin-off of an existing Index constituent will be added to the Index at the time of event implementation. Reevaluation for continued inclusion in the Index will occur at the subsequent Index Review.
Merger/Acquisition	For Mergers and Acquisitions, the acquirer's post event weight will account for the proportionate amount of shares involved in deal consideration, while cash proceeds will be invested across the Index. If an existing Index constituent is acquired by a non-Index constituent, the existing constituent will be deleted from the Index and the acquiring non-constituent will not be added to the Index.
Changes in Security Characteristics	A security will continue to be an Index constituent if there are changes in characteristics (country, sector, size segment, etc.). Reevaluation for continued inclusion in the Index will occur at the subsequent Index Review.

Further detail and illustration regarding specific treatment of corporate events relevant to this Index can be found in the MSCI Corporate Events Methodology book under the sections detailing the treatment of events in Capped Weighted and Non-Market Capitalization Weighted indexes.

The MSCI Corporate Events methodology book is available at:
<https://www.msci.com/index/methodology/latest/CE>

Appendix I: The Parent Index and the Base Currency for Optimization

Minimum Volatility ESG Reduced Carbon Target Index	Parent Index	Base Currency for Optimization
MSCI World Minimum Volatility ESG Reduced Carbon Target Index	MSCI World Index	USD
MSCI EM Minimum Volatility ESG Reduced Carbon Target Index	MSCI EM (Emerging Markets) Index	USD
MSCI USA Minimum Volatility ESG Reduced Carbon Target Index	MSCI USA Index	USD
MSCI Europe Minimum Volatility ESG Reduced Carbon Target Index	MSCI Europe Index	EUR
MSCI Japan Minimum Volatility ESG Reduced Carbon Target Index	MSCI Japan Index	USD
MSCI EMU Minimum Volatility ESG Reduced Carbon Target Index	MSCI EMU Index	EUR

Appendix II: Business Exclusion Criteria

MSCI ESG Research has developed a framework designed to define significant involvement in controversial activities. According to this framework, there are three tolerance levels: Zero Tolerance, Minimal Tolerance and Low Tolerance.

Each controversial activity screened by the MSCI Minimum Volatility ESG Reduced Carbon Target Indexes (except Thermal Coal, Oil Sands and Global Norms) is assigned to one of these tolerance levels:

Activities classified under “Zero Tolerance”

- **Controversial Weapons**
 - All companies with any tie to Controversial Weapons (cluster munitions, landmines, depleted uranium weapons, biological/chemical weapons, blinding lasers, non-detectable fragments and incendiary weapons), as defined by the methodology of the MSCI Ex-Controversial Weapons Indexes available at <https://www.msci.com/index-methodology>.

Activities classified under “Minimal Tolerance”

- **Nuclear Weapons**
 - All companies that manufacture nuclear warheads and/or whole nuclear missiles.
 - All companies that manufacture components that were developed or are significantly modified for exclusive use in nuclear weapons (warheads and missiles).
 - All companies that manufacture or assemble delivery platforms that were developed or significantly modified for the exclusive delivery of nuclear weapons.
 - All companies that provide auxiliary services related to nuclear weapons.
 - All companies that manufacture components that were not developed or not significantly modified for exclusive use in nuclear weapons (warheads and missiles).
 - All companies that manufacture or assemble delivery platforms that were not developed or not significantly modified for the exclusive delivery of nuclear weapons.
 - All companies that manufacture components for nuclear-exclusive delivery platforms.

- **Civilian Firearms**

- All companies classified as “Producer” of firearms and small arms ammunitions for civilian markets. It does not include companies that cater to the military, government, and law enforcement markets.
- All companies deriving 5% or more revenue from the distribution (wholesale or retail) of firearms or small arms ammunition intended for civilian use.

- **Tobacco**

- All companies classified as a “Producer”
- All companies deriving 5% or more aggregate revenue from the production, distribution, retail and supply of tobacco-related products.

Activities not classified under any specific tolerance level

- **Thermal Coal**

- All companies deriving 5% or more revenue (either reported or estimated) from the mining of thermal coal (including lignite, bituminous, anthracite and steam coal) and its sale to external parties. It excludes: revenue from metallurgical coal; coal mined for internal power generation (e.g. in the case of vertically integrated power producers); intra-company sales of mined thermal coal; and revenue from coal trading.
- All companies deriving 5% or more revenue (either reported or estimated) from the thermal coal based power generation.

- **Oil Sands**

- All companies deriving 5% or more revenue from oil sands extraction, which own oil sands reserves and disclose evidence of deriving revenue from oil sands extraction. Companies that derive revenue from non-extraction activities (e.g. exploration, surveying, processing, refining) or intra-company sales are not excluded. Additionally, companies that own oil sands reserves with no associated revenue are also not excluded.

- **Global Norms – United Nations Global Compact Compliance**

- All companies that fail to comply with the United Nations Global Compact principles.

Appendix III: Handling Infeasible Optimizations

During the Semi-Annual Index Review, in the event that there is no optimal solution that satisfies all the optimization constraints defined in Section 3.4, the following constraints are relaxed, until an optimal solution is found:

- Relax the turnover constraint in steps of 5%, up to a maximum of 30%
- Relax the minimum weight constraint in steps of 0.01% up to a minimum of 0.01%.
- The turnover constraint and the minimum asset weight constraint are alternately relaxed until a feasible solution is achieved. For example, constraints relaxation is executed in the sequence as illustrated below:

Order of Relaxation	Minimum Asset Weight	Turnover Limit
1	0.05%	15%
2	0.04%	15%
3	0.04%	20%
4	0.03%	20%

In the event that no optimal solution is found after the above constraints have been relaxed and if the ESG Score constraint is set at 120% of the Parent Index ESG Score, the ESG score⁷ is relaxed from 120% of the weighted-average industry- adjusted ESG score of the Parent Index down to a minimum value equivalent to the ESG score of the Index by removing at least bottom 20% of the Parent Index by lowest ESG score in 5 equal steps.

In the event that no optimal solution is found after the above constraints have been relaxed, the Index will not be rebalanced for that Semi-Annual Index Review.

⁷ Weighted-average industry-adjusted ESG score of the Index

Appendix IV: New release of Barra[®] Equity Model or Barra[®] Optimizer

The methodology presently uses MSCI Barra Global Equity Model for Long-Term Investors (“GEMTLT”) for the optimization. A new release of the relevant Barra Equity Model or Barra Optimizer may replace the former version within a suitable timeframe.

Appendix V: Company-Level Sustainable Exposure and Calculation of Index SE%

A company qualifies as having company-level sustainable exposure if it meets all the following conditions

1. MSCI ESG Rating of “BB” or above⁸
2. MSCI ESG Controversies Score of 2 or above⁹
3. At least one of the following conditions is met:
 - a. Derives 20% or more aggregate revenue from any of the thirteen social and environmental impact categories of Sustainable Impact Metrics (including nutrition, sanitation, major diseases treatment, SME finance, education, connectivity, affordable real estate, alternative energy, energy efficiency, green building, pollution prevention, sustainable agriculture and sustainable water).
 - b. Has one or more active carbon emissions reduction target(s) approved by the Science Based Targets initiative (SBTi).
4. Not flagged by the following business involvement criteria:
 - a. Has any tie to Controversial Weapons (cluster munitions, landmines, depleted uranium weapons, biological/chemical weapons, blinding lasers, non-detectable fragments and incendiary weapons), in line with the methodology of the MSCI Ex-Controversial Weapons Indexes available at <https://www.msci.com/index-methodology>.
 - b. Derives 1% or more revenue (either reported or estimated) from the mining of thermal coal (including lignite, bituminous, anthracite and steam coal) and its sale to external parties.
 - c. Manufactures tobacco products, such as cigars, blunts, cigarettes, e-cigarettes, inhalers, beedis, kreteks, smokeless tobacco, snuff, snus, dissolvable and chewing tobacco.
 - d. Derives 5% or more aggregate revenue from the production, distribution, retail, supply and licensing of tobacco-related products.

The index-level sustainable exposure is calculated as the sum of the weight of companies in the Index that qualify as having company-level sustainable exposure.

⁸ The condition is not met if the MSCI ESG Rating is missing for the company.

⁹ The condition is not met if the MSCI ESG Controversies Score is missing for the company.

Appendix VI: Minimum Index SE% Constraints

The following optimization constraints on minimum Index SE% are used for each Index.

No.	Index	Index SE% Threshold
1	MSCI World Minimum Volatility ESG Reduced Carbon Target Index	30%
2	MSCI EM Minimum Volatility ESG Reduced Carbon Target Index	10%
3	MSCI USA Minimum Volatility ESG Reduced Carbon Target Index	25%
4	MSCI Europe Minimum Volatility ESG Reduced Carbon Target Index	40%
5	MSCI Japan Minimum Volatility ESG Reduced Carbon Target Index	0%
6	MSCI EMU Minimum Volatility ESG Reduced Carbon Target Index	0%

The following sections have been modified effective May 2022:

- Section 3.4: Optimization Constraints
Update to reflect the change in weighted-average industry-adjusted ESG score and Carbon Emission Intensity constraints
- Appendix III: Handling Infeasible Optimizations
Update to reflect the change in weighted-average industry-adjusted ESG score constraint relaxation

The following sections have been modified effective November 2022:

- Introduction: Updated to reflect the new requirement on index-level sustainable exposure
- Section 3.6.2: Optimization Constraints
Update to reflect the addition of minimum index-level sustainable exposure (Index SE%) constraint
- Section 4.2: Monthly Review of Controversies
Added to reflect the monthly exclusions of 'Red Flag Companies'
- Appendix V: Additional details of the calculation of index-level sustainable exposure
- Appendix VI: Added to reflect the optimization constraints on index-level sustainable exposure

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www.msci.com/index-regulation

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