MSCI Global Low Carbon Target Indexes Methodology

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1 Introduction

The MSCI Global Low Carbon Target Indexes (the “Index”) are designed to address two dimensions of carbon exposure – carbon emissions and fossil fuel reserves. The Index is constructed by selecting constituents of a market capitalization weighted index (the “Parent Index”) through an optimization process that aims to:

- Maximize the reduction of carbon exposure compared to the Parent Index – in terms of carbon emissions and fossil fuel reserves.
- Control tracking error by applying an ex-ante tracking error constraint of 50 bps while minimizing carbon exposure.
- Have low active sector, country, and regional biases relative to the Parent Index.

2 MSCI ESG Research

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

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

2.1 MSCI Climate Change Metrics

MSCI Climate Change Metrics provide climate data & tools to support institutional investors seeking to integrate climate risk & opportunities into their investment strategy and processes. This includes investors seeking to achieve a range of objectives, including measuring and reporting on climate risk exposure, implementing low carbon and fossil fuel-free strategies, alignment 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-solutions.

2.2 MSCI ESG Controversies

MSCI ESG Controversies provide assessments of controversies concerning the potential 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 at: 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.

3 Constructing the MSCI Global Low Carbon Target Indexes

Constructing the Index involves the following steps:

- Defining the Eligible Universe
- Defining the Carbon Exposure of each security in the Eligible Universe
- Defining the optimization parameters
- Determining the optimized index

3.1 Defining the Eligible Universe

The Eligible Universe for the Indexes is defined by applying the following exclusions on the constituents of the Parent Index.

- **Controversial Weapons:** All companies involved in Controversial Weapons as defined by the methodology of the MSCI Ex-Controversial Weapons Indexes.
- **ESG Controversies:** All companies involved in very severe ESG controversies, which is defined as companies with an ESG Controversy Score of 0.
- **Thermal Coal Mining:** All companies deriving 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. It excludes revenue from metallurgical coal, coal mined for internal power generation (e.g., in the case of vertically integrated power producers), intracompany sales of mined thermal coal, and revenue from coal trading (either reported or estimated).
- **Oil Sands:** All companies deriving 5% or more revenue from oil sands extraction, which own 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 with no associated revenue are also not excluded.

3.2 Defining the Carbon Exposure of Each Security in the Eligible Universe

The Carbon Exposure of a security is measured in terms of its greenhouse gas (GHG) emissions and its potential emissions from fossil fuel reserves.

3.2.1 Greenhouse Gas Emissions

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

MSCI ESG Research estimates company-specific indirect (Scope 3) GHG emissions from the Scope 3 Carbon Emissions Estimation Model.

The data is updated on an annual basis. Carbon emissions of a company are normalized for size by dividing annual carbon emissions by Enterprise Value including Cash (EVIC).

For newly added companies to the Index which do not report emission data and where MSCI ESG Research has not estimated the greenhouse gas emissions yet, 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 emissions for the company.

3.2.2 Potential 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 purposes (e.g., coking coal used for steel production). For the construction of the MSCI Global Low Carbon Target Core Indexes, only fossil fuel reserves used for energy purposes are taken into account. The data is updated on an annual basis 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. MSCI normalizes for the company's size by dividing the potential carbon emissions of the company by its EVIC.

To convert reserves data to potential carbon emissions, MSCI ESG Research applies a formula from the Potsdam Institute for Climate Impact Research.[2]

[1] For more information on MSCI Climate Change Metrics, please refer to https://www.msci.com/climate-change-solutions

[2] 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.

3.3 Defining the Optimization Parameters

The Indexes are constructed using an optimization process that applies the following objective and constraints:

- Minimize the carbon exposure subject to a tracking error constraint of 50 basis points relative to the Parent Index
- The maximum weight of an Index constituent will be restricted to 20 times its weight in the Parent Index
- The country weights in the Index will not deviate more than +/-2% from the country weights 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 in the MSCI Global Low Carbon Target Core Indexes will not deviate more than +/-2% from the sector weights in the Parent Index with the exception of the Energy Sector where no sector weight constraint is applied
- The one-way turnover of the Indexes is constrained to a maximum of 10% at each index review.

In the event that there is no optimal solution that satisfies all the optimization constraints, the turnover constraint will be relaxed up to a maximum turnover of 20% in steps of 1% until an optimal solution is found. If a feasible solution is still not found, the predicted tracking error is instead relaxed in steps of 10 basis points.

3.4 Determining the Optimized Index

The Indexes are constructed using the Barra Open Optimizer in combination with the relevant Barra Equity Model. The optimization uses the universe of eligible securities and the specified optimization objective and constraints to determine the constituents of the Index. After the optimization process, any securities with extremely low weights (less than 1/10th of the minimum weight in the Parent Index) are eliminated, and their weight is proportionately distributed over the remaining securities in order to determine the final Index constituents.

4 Maintaining the MSCI Low Carbon Target Indexes

4.1 Semi-Annual Index Reviews

The Index is reviewed on a semi-annual basis in May and November to coincide with the May and November Index Reviews of the MSCI Global Investable Market Indexes, and the changes are implemented as of the close of the last business day of May and November. In general, the pro forma Index is announced nine business days before the effective date.

At each Index Review, the optimization process outlined in Section 3 is implemented. In general, MSCI uses MSCI ESG Research data (i.e., MSCI Climate Change Metrics, MSCI ESG Controversies Scores and MSCI Business Involvement Screening Research) as of the end of the month preceding the Index Reviews. 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.

4.2 Ongoing Event-Related Maintenance

The general treatment of corporate events in the Index 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.

Additionally, if the frequency of Index Reviews in the Parent Index is greater than the frequency of Index Reviews in the Index, the changes made to the Parent Index during intermediate Index Reviews will be neutralized in the Index.

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

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

EVENT TYPE	EVENT DETAILS
New additions to the Parent Index	A new security added to the Parent Index (such as IPO and other early inclusions) 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.

Appendix 1: Calculation of Carbon Exposure Metrics

Index Carbon Emissions

Security Level GHG Intensity =

$$\frac{Scope\ 1+2+3\ \ Carbon\ Emissions}{Enterprise\ Value + Cash\ (in\ M\$)}$$

Weighted Average GHG Intensity of Index =

$$\sum_i (Index\ Weight\ \ * Security\ Level\ GHG\ Intensity)$$

Index Potential Emissions from Fossil Fuels

Security Level Potential Emissions =

$$\frac{Potential\ Emissions}{Enterprise\ Value + Cash\ (in\ M\$)}$$

Potential Emissions of Index =

$$\sum_i (Index\ Weight\ \ * Security\ Level\ Potential\ Emissions)$$

Appendix 2: Companies Involved in Controversial Weapons Business

Companies which meet the following Controversial Weapons criteria are excluded from the Index

- Cluster Bombs

  MSCI ESG Research's cluster bomb research identifies public companies that are involved in the production of cluster bombs and munitions, or the essential components of these products.

- Landmines

  MSCI ESG Research's landmines research identifies public companies that are involved in the production of anti - personnel landmines, anti - vehicle landmines, or the essential components of these products.

- Depleted Uranium Weapons

  MSCI ESG Research's depleted uranium weapons research identifies public companies involved in the production of depleted uranium weapons and armor.

- Chemical and Biological Weapons

  MSCI ESG Research's chemical and biological weapons research identifies public companies that are involved in the production of chemical and biological weapons, or the essential components of these products.

- Blinding Laser Weapons

  MSCI ESG Research's blinding laser weapons research identifies public companies that are involved in the production of weapons utilizing laser technology to cause permanent blindness.

- Non-Detectable Fragments

  MSCI ESG Research's non-detectable fragments research identifies public companies that are involved in the production of weapons that use non-detectable fragments to inflict injury.

- Incendiary Weapons (White Phosphorus)

  MSCI ESG Research's incendiary weapons research identifies companies that are involved in the production of weapons using white phosphorus.

Involvement criteria:

- Producers of the weapons

- Producers of key components of the weapons (only applies to cluster bombs, landmines, depleted uranium weapons as well as chemical and biological weapons)
- Ownership of 20% or more of a weapons or components producer
- The minimum limit is raised to 50% for financial companies having an ownership in a company that manufactures controversial weapons or key components of controversial weapons
- Owned 50% or more by a company involved in weapons or components production

Revenue limits:

Any identifiable revenues, i.e., zero tolerance

The exclusion criteria above are reflective of the MSCI Global ex Controversial Weapons Index Methodology[3]. For details, please refer to MSCI Global ex Controversial Weapons Indexes Methodology at https://www.msci.com/index-methodology.

[3] For more information, please refer to the MSCI Global ex Controversial Weapons Index Methodology at www.msci.com/index- methodology

Appendix 3: Barra Equity Model Used in The Optimization

Since inception till the November 2017 Semi-Annual Index Review, the Index had an optimization setup which used the Barra Global Equity Model (GEM3L).

Starting at the May 2018 Semi-Annual Index Review, the Index has an optimization setup which uses the MSCI Barra Global Equity Model for Long-Term Investors (GEMLTL). The change of optimization setup was completed without any change in the prevailing index methodology.

Appendix 4: New release of Barra® Equity Model or Barra® Optimizer

A major new release of the relevant Barra Equity Model or Barra Optimizer may replace the former version within a suitable timeframe.

Appendix 5: Methodology Transition

The Index transitioned to the enhanced methodology as part of the November 2022 Semi-Annual Index Review (SAIR).

History of Indexes Created After the Transition

For Indexes created after the transition, the enhancements will be implemented in the Index history as per the following schedule.

Methodology Enhancement	Reference to Methodology Book Section	Historical Implementation Date
(1) Relaxation mechanism in case of infeasible optimization	Section 3.3	November 2013 SAIR
(2) ESG BISR and Controversies Screens	Section 3.1	November 2013 SAIR
(3) Tracking Error constraint of 50 bps instead of 30 bps	Section 3.3	November 2013 SAIR
(4) Use of EVIC and Weighted Average method to calculate Carbon Exposure Metrics	Appendix I	November 2013 SAIR
(5) Use of “Fossil Fuel Reserves Energy Application” factor to calculate Potential Emissions	Section 3.2.2	May 2020 SAIR
(6) Use of Scope 3 Emissions in defining Carbon Exposure	Section 3.2.1	May 2020 SAIR

Treatment of Certain Custom Indexes

As announced by MSCI on September 15, 2022 to subscribers of relevant custom indexes, the enhancements were not implemented as part of the November 2022 SAIR in certain custom indexes that have been referencing the MSCI Global Low Carbon Target Indexes methodology in their specification forms. Therefore, for such custom indexes, the MSCI Global Low Carbon Target Indexes methodology will no longer be used as a basis for the weighting and rebalancing of such indexes starting

December 1, 2022 and until further notice or otherwise agreed. Subscribers should instead refer to MSCI Global Low Carbon Target Core Indexes methodology available at https://www.msci.com/index-methodology as a basis for the weighting and rebalancing of such indexes.

Appendix 6: Tracked Changes

The following sections have been modified since September 2014:

The details on the corporate events treatment are now included in Section 4.2.

The following sections have been modified since June 2017:

Section 3.2

- Updated link to the description of MSCI ESG CarbonMetrics

Section 4.1

- Clarification on use of ESG data for securities whose data would be available after the end of the month preceding Index Review.

The following sections have been modified since September 2017:

Section 3.4

- Clarification on the turnover constraint applied at each index review.

The following sections have been modified since October 2017:

Appendix II: Barra Equity Model Used In the Optimization

- Added Appendix II to update the information on transition of MSCI Global Low Carbon Leaders Indexes to GEMLTL

The following sections have been modified since November 2017:

Section 3.4

- Updated to reflect the additional constraint on China A Stock Connect listings

The following sections have been modified to reflect the methodology enhancements implemented since the November 2022 Semi-Annual Index Review:

Section 2

- Added the information on ESG Products used in the Index methodology

Section 3.1

- Added the list of ESG exclusions

Section 3.2.1

- Added a reference to Scope 3 emissions
- Changed the metric used to normalize carbon emissions

Section 3.2.2

- Changed the metric used to normalize Potential Emissions

Section 3.3

- Changed the tracking error constraint

Appendix 2 Companies Involved in Controversial Weapons Business

- Added detailing Controversial Weapons criteria

Appendix 4 New release of Barra® Equity Model or Barra® Optimizer

- Added to clarify treatment of new releases of the relevant Barra Equity Model or Barra Optimizer

The following sections have been modified since February 2023:

- Methodology book was updated to reflect the transition of the MSCI Global Investable Market Indexes (GIMI) to Quarterly Comprehensive Index Reviews.
- • All references to “Semi-Annual Index Reviews” and “Quarterly Index Reviews” of the MSCI GIMI were replaced with “Index Reviews”.

Appendix 5 Methodology Transition

- Added an appendix on the transition to the new methodology

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