

MSCI GLOBAL LOW CARBON TARGET INDEXES METHODOLOGY

November 2017

CONTENTS

- 1 Introduction 3
- 2 Characteristics of MSCI Global Low Carbon Target Indexes..... 4
- 3 Constructing the MSCI Global Low Carbon Target Indexes..... 5
 - 3.1 Defining the Parent Index 5
 - 3.2 Defining the Carbon Exposure of each Parent Index constituent 5
 - 3.2.1 Greenhouse Gas Emissions5
 - 3.2.2 Potential Carbon Emissions from Fossil Fuels.....6
 - 3.3 Defining the Optimization Parameters 6
 - 3.4 Determining the Pro Forma Index..... 7
- 4 Maintaining the MSCI Global Low Carbon Target Indexes..... 8
 - 4.1 Semi-Annual Index Reviews 8
 - 4.2 Ongoing Event Related Changes 8
- Appendix I: Calculation of Carbon Exposure metrics..... 10
 - Index Carbon Emissions – 10
 - Index Potential Carbon Emissions from Fossil Fuels–..... 10
- Appendix II: Barra Equity Model Used In the Optimization 11

1 INTRODUCTION

The MSCI Global Low Carbon Target Indexes are designed to address two dimensions of carbon exposure – carbon emissions and fossil fuel reserves. By overweighting companies with low carbon emissions relative to sales and those with low potential carbon emissions per dollar of market capitalization, the indexes aim to reflect a lower carbon exposure than that of the broad market. The indexes are designed to achieve a target level of tracking error while minimizing the carbon exposure.

This methodology may be applied to create MSCI Low Carbon Target Indexes from any of the existing MSCI equity indexes (herein, “Parent Indexes”). Some of the parameters applied to determine the MSCI Low Carbon Target Index may vary based on the Parent Index from which the Low Carbon Target Index is constructed.

2 CHARACTERISTICS OF MSCI GLOBAL LOW CARBON TARGET INDEXES

The MSCI Global Low Carbon Target Indexes aim to demonstrate the following characteristics across markets by re-weighting constituents relative to the underlying free float-adjusted market capitalization weighted Parent Index:

- Lower carbon exposure – in terms of carbon emissions and fossil fuel reserves¹
- Low tracking error relative to the Parent Index
- Low active sector, country and regional biases relative to the Parent Index

¹ Defined in Appendix I

3 CONSTRUCTING THE MSCI GLOBAL LOW CARBON TARGET INDEXES

The MSCI Global Low Carbon Target Indexes are constructed using the following steps:

- Defining the Parent Index
- Defining the Carbon Exposure of each Parent Index constituent
- Defining the optimization parameters
- Determining the optimized pro forma index

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

3.1 DEFINING THE PARENT INDEX

The Parent Index serves as the universe of eligible securities for the Index. The MSCI Global Low Carbon Target Indexes can be constructed on any market capitalization weighted MSCI Index.

3.2 DEFINING THE CARBON EXPOSURE OF EACH PARENT INDEX CONSTITUENT

The Carbon exposure of a security is measured in terms of its greenhouse gas (GHG) emissions and its potential carbon emissions from fossil fuel reserves. The MSCI Global Low Carbon Target Indexes use MSCI ESG CarbonMetrics data provided by MSCI ESG Research Inc.

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. The data is updated on an annual basis. Since the current carbon emissions of a company are directly influenced by its current business activity, MSCI normalizes for size by dividing the annual carbon emissions of the company by the annual sales of the company.

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 emission for the company.

3.2.2 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 industries². Fossil fuel reserves can be used for several applications including energy or industrial (e.g. coking coal used for steel production). For the development of the MSCI Global Low Carbon Target Indexes, 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 Research.³

3.3 DEFINING THE OPTIMIZATION PARAMETERS

At each semi-annual index review, the MSCI Global Low Carbon Target Indexes are constructed using an optimization process that aims to achieve replicability and investability, subject to the following optimization objective and constraints:

- Minimize the carbon exposure subject to a tracking error constraint of 30 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 MSCI Global Low Carbon Target Index will not deviate more than +/-2% from the country weights in the Parent Index
- The sector weights in the MSCI Global Low Carbon Target Index 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

² For more information on MSCI ESG CarbonMetrics, please refer to <https://www.msci.com/index-carbon-footprint-metrics>

³ 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 one-way turnover of the MSCI Low Carbon Target Index is constrained to a maximum of 10% at each index review.

3.4 DETERMINING THE PRO FORMA INDEX

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

4 MAINTAINING THE MSCI GLOBAL LOW CARBON TARGET INDEXES

4.1 SEMI-ANNUAL INDEX REVIEWS

The changes resulting from the Semi-Annual Index Reviews of the MSCI Global Low Carbon Target Indexes will be made as of the close of the last business day of May and November, coinciding with the May and November Semi-Annual Index Reviews of the Parent Indexes. The pro forma indexes are announced nine business days before the effective date.

For the May and the November Semi-Annual Index Reviews, the Barra model data as of the end of April and the end of October is used respectively.

At each rebalancing, a constraint factor is calculated for each constituent in the MSCI Global Low Carbon Target Index. The constraint factor is defined as the weight in the MSCI Global Low Carbon Target Index at the time of the rebalancing divided by the weight in the Parent Index. The constraint factors as well as the constituents in the index remain constant between index reviews except in case of corporate events as described below.

In general, MSCI uses MSCI ESG Research data (including MSCI ESG Ratings, 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 CHANGES

The general treatment of corporate events in the MSCI Global Low Carbon Target 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.

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

The following section briefly describes the treatment of common corporate events within the MSCI Global Low Carbon Target Indexes.

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 I: CALCULATION OF CARBON EXPOSURE METRICS

INDEX CARBON EMISSIONS –

- Parent Index Carbon Emissions –

$$\sum_i \left(\frac{(\text{Float Market Capitalization} * \text{Absolute Emissions})}{\text{Issuer Market Capitalization}} \right)$$

- Derived Index Carbon Emissions –

$$\sum_i \left(\frac{(\text{Derived Index Market Capitalization} * \text{Absolute Emissions})}{\text{Issuer Market Capitalization}} \right)$$

- Parent Index Carbon Emission Intensity is defined as Parent Index Carbon Emissions, as defined above, divided by Parent Index Sales –

$$\sum_i \left(\frac{(\text{Float Market Capitalization} * \text{Absolute Emissions})}{\text{Issuer Market Capitalization}} \right) / \sum_i \left(\frac{(\text{Float Market Capitalization} * \text{Sales})}{\text{Issuer Market Capitalization}} \right)$$

- Derived Index Carbon Emissions Intensity is defined as Derived Index Carbon Emissions, as defined above, divided by Derived Index Sales –

$$\sum_i \left(\frac{(\text{Derived Index Market Capitalization} * \text{Absolute Emissions})}{\text{Issuer Market Capitalization}} \right) / \sum_i \left(\frac{(\text{Derived Index Market Capitalization} * \text{Sales})}{\text{Issuer Market Capitalization}} \right)$$

INDEX POTENTIAL CARBON EMISSIONS FROM FOSSIL FUELS–

- Parent Index Potential Carbon Emissions from Fossil Fuels–

$$\sum_i \left(\frac{(\text{Float Market Capitalization} * \text{Absolute Potential Emissions})}{\text{Issuer Market Capitalization}} \right)$$

- Derived Index Potential Carbon Emissions from Fossil Fuels–

$$\sum_i \left(\frac{(\text{Derived Index Market Capitalization} * \text{Absolute Potential Emissions})}{\text{Issuer Market Capitalization}} \right)$$

APPENDIX II: BARRA EQUITY MODEL USED IN THE OPTIMIZATION

In order to meet its objective, the MSCI Global Low Carbon Target Index construction, since inception, made use of the Barra Global Equity Model (GEM3L) within the optimization setup. However, starting from the November 2017 Semi-Annual Index Review, the index construction used an optimization setup that used the Barra Global Equity Model for Long-Term Investors (GEMTL). The change of optimization setup was completed without any change in the prevailing index methodology.

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 3.3

- 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 Target Indexes to GEMTL

CONTACT US

clientservice@msci.com

AMERICAS

Americas	1 888 588 4567 *
Atlanta	+ 1 404 551 3212
Boston	+ 1 617 532 0920
Chicago	+ 1 312 675 0545
Monterrey	+ 52 81 1253 4020
New York	+ 1 212 804 3901
San Francisco	+ 1 415 836 8800
Sao Paulo	+ 55 11 3706 1360
Toronto	+ 1 416 628 1007

EUROPE, MIDDLE EAST & AFRICA

Cape Town	+ 27 21 673 0100
Frankfurt	+ 49 69 133 859 00
Geneva	+ 41 22 817 9777
London	+ 44 20 7618 2222
Milan	+ 39 02 5849 0415
Paris	0800 91 59 17 *

ASIA PACIFIC

China North	10800 852 1032 *
China South	10800 152 1032 *
Hong Kong	+ 852 2844 9333
Mumbai	+ 91 22 6784 9160
Seoul	00798 8521 3392 *
Singapore	800 852 3749 *
Sydney	+ 61 2 9033 9333
Taipei	008 0112 7513 *
Tokyo	+ 81 3 5290 1555

* = toll free

ABOUT MSCI

For more than 40 years, MSCI's research-based indexes and analytics have helped the world's leading investors build and manage better portfolios. Clients rely on our offerings for deeper insights into the drivers of performance and risk in their portfolios, broad asset class coverage and innovative research.

Our line of products and services includes indexes, analytical models, data, real estate benchmarks and ESG research.

MSCI serves 98 of the top 100 largest money managers, according to the most recent P&I ranking.

For more information, visit us at www.msci.com.

NOTICE AND DISCLAIMER

- This document and all of the information contained in it, including without limitation all text, data, graphs, charts (collectively, the “Information”) is the property of MSCI Inc. or its subsidiaries (collectively, “MSCI”), or MSCI’s licensors, direct or indirect suppliers or any third party involved in making or compiling any Information (collectively, with MSCI, the “Information Providers”) and is provided for informational purposes only. The Information may not be modified, reverse-engineered, reproduced or disseminated in whole or in part without prior written permission from MSCI.
- The Information may not be used to create derivative works or to verify or correct other data or information. For example (but without limitation), the Information may not be used to create indexes, databases, risk models, analytics, software, or in connection with the issuing, offering, sponsoring, managing or marketing of any securities, portfolios, financial products or other investment vehicles utilizing or based on, linked to, tracking or otherwise derived from the Information or any other MSCI data, information, products or services.
- The user of the Information assumes the entire risk of any use it may make or permit to be made of the Information. NONE OF THE INFORMATION PROVIDERS MAKES ANY EXPRESS OR IMPLIED WARRANTIES OR REPRESENTATIONS WITH RESPECT TO THE INFORMATION (OR THE RESULTS TO BE OBTAINED BY THE USE THEREOF), AND TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, EACH INFORMATION PROVIDER EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES (INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF ORIGINALITY, ACCURACY, TIMELINESS, NON-INFRINGEMENT, COMPLETENESS, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE) WITH RESPECT TO ANY OF THE INFORMATION.
- Without limiting any of the foregoing and to the maximum extent permitted by applicable law, in no event shall any Information Provider have any liability regarding any of the Information for any direct, indirect, special, punitive, consequential (including lost profits) or any other damages even if notified of the possibility of such damages. The foregoing shall not exclude or limit any liability that may not by applicable law be excluded or limited, including without limitation (as applicable), any liability for death or personal injury to the extent that such injury results from the negligence or willful default of itself, its servants, agents or sub-contractors.
- Information containing any historical information, data or analysis should not be taken as an indication or guarantee of any future performance, analysis, forecast or prediction. Past performance does not guarantee future results.
- The Information should not be relied on and is not a substitute for the skill, judgment and experience of the user, its management, employees, advisors and/or clients when making investment and other business decisions. All Information is impersonal and not tailored to the needs of any person, entity or group of persons.
- None of the Information constitutes an offer to sell (or a solicitation of an offer to buy), any security, financial product or other investment vehicle or any trading strategy.
- It is not possible to invest directly in an index. Exposure to an asset class or trading strategy or other category represented by an index is only available through third party investable instruments (if any) based on that index. MSCI does not issue, sponsor, endorse, market, offer, review or otherwise express any opinion regarding any fund, ETF, derivative or other security, investment, financial product or trading strategy that is based on, linked to or seeks to provide an investment return related to the performance of any MSCI index (collectively, “Index Linked Investments”). MSCI makes no assurance that any Index Linked Investments will accurately track index performance or provide positive investment returns. MSCI Inc. is not an investment adviser or fiduciary and MSCI makes no representation regarding the advisability of investing in any Index Linked Investments.
- Index returns do not represent the results of actual trading of investable assets/securities. MSCI maintains and calculates indexes, but does not manage actual assets. Index returns do not reflect payment of any sales charges or fees an investor may pay to purchase the securities underlying the index or Index Linked Investments. The imposition of these fees and charges would cause the performance of an Index Linked Investment to be different than the MSCI index performance.
- The Information may contain back tested data. Back-tested performance is not actual performance, but is hypothetical. There are frequently material differences between back tested performance results and actual results subsequently achieved by any investment strategy.
- Constituents of MSCI equity indexes are listed companies, which are included in or excluded from the indexes according to the application of the relevant index methodologies. Accordingly, constituents in MSCI equity indexes may include MSCI Inc., clients of MSCI or suppliers to MSCI. Inclusion of a security within an MSCI index is not a recommendation by MSCI to buy, sell, or hold such security, nor is it considered to be investment advice.
- Data and information produced by various affiliates of MSCI Inc., including MSCI ESG Research LLC and Barra LLC, may be used in calculating certain MSCI indexes. More information can be found in the relevant index methodologies on www.msci.com.
- MSCI receives compensation in connection with licensing its indexes to third parties. MSCI Inc.’s revenue includes fees based on assets in Index Linked Investments. Information can be found in MSCI Inc.’s company filings on the Investor Relations section of www.msci.com.
- MSCI ESG Research LLC is a Registered Investment Adviser under the Investment Advisers Act of 1940 and a subsidiary of MSCI Inc. Except with respect to any applicable products or services from MSCI ESG Research, neither MSCI nor any of its products or services recommends, endorses, approves or otherwise expresses any opinion regarding any issuer, securities, financial products or instruments or trading strategies and MSCI’s products or services are not intended to constitute investment advice or a recommendation to make (or refrain from making) any kind of investment decision and may not be relied on as such. Issuers mentioned or included in any MSCI ESG Research materials may include MSCI Inc., clients of MSCI or suppliers to MSCI, and may also purchase research or other products or services from MSCI ESG Research. MSCI ESG Research materials, including materials utilized in any MSCI ESG Indexes or other products, have not been submitted to, nor received approval from, the United States Securities and Exchange Commission or any other regulatory body.
- Any use of or access to products, services or information of MSCI requires a license from MSCI. MSCI, Barra, RiskMetrics, IPD, FEA, InvestorForce, and other MSCI brands and product names are the trademarks, service marks, or registered trademarks of MSCI or its subsidiaries in the United States and other jurisdictions. The Global Industry Classification Standard (GICS) was developed by and is the exclusive property of MSCI and Standard & Poor’s. “Global Industry Classification Standard (GICS)” is a service mark of MSCI and Standard & Poor’s.