

# **MSCI Diversified Multiple-Factor EU PAB Indexes Methodology**

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# 1 Introduction

The MSCI Diversified Multiple-Factor EU PAB Indexes (the “Indexes”) are designed to represent the performance of a strategy that meets the minimum standards of the EU Paris Aligned Benchmark (PAB)<sup>1</sup> and seek higher exposure to the four style factors - Value, Momentum, Low Size and Quality - relative to other factors from the relevant Barra Equity Model<sup>2</sup> while maintaining market risk exposure similar to the underlying Parent Index (herein, the “Parent Index”).

This index methodology aims to incorporate climate-based constraints in an optimization-based index construction approach by using risk-target optimization.

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<sup>1</sup> <https://www.msci.com/documents/1296102/15294579/eu-teg-interim-report-on-climate-benchmarks-and-benchmarks-esg-disclosures.pdf>. In case there are changes in the EU delegated acts and an update to the Index methodology is required, MSCI will issue an announcement prior to implementing the changes in the methodology. MSCI will not conduct a formal consultation for such an update.

<sup>2</sup> Please refer to Appendix II

## 2 MSCI ESG Research

The Indexes use company ratings and research provided by MSCI ESG Research LLC. In particular, these Indexes use the following three MSCI ESG Research products: MSCI Climate Change Ratings, MSCI ESG Controversies Score and MSCI ESG 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 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-solutions>.

### 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.

For more details on MSCI ESG Controversies Score, please refer to <https://www.msci.com/documents/10199/acbe7c8a-a4e4-49de-9cf8-5e957245b86b>.

## 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](http://www.msci.com/resources/factsheets/MSCI_ESG_BISR.pdf).

## 3 Index Construction Methodology

The Indexes are constructed based on an optimization process from the underlying Parent Index using a Barra Equity Model to maximize the Index-level exposure to the targeted style factors while maintaining market risk similar to the Parent Index and meeting the minimum standards of the EU Paris Aligned Benchmark (PAB).

The steps for constructing the Indexes are described below.

### 3.1 APPLICABLE UNIVERSE

The Applicable Universe includes all the existing constituents of an underlying MSCI Parent Index. The relevant Parent Index could be any MSCI Global Investable Market Index.

### 3.2 ELIGIBLE UNIVERSE

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

### 3.3 DEFINING THE EXCLUSION CRITERIA

#### 3.3.1 CONTROVERSEY BASED 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 Index. This is implemented by excluding securities from the Applicable Universe with ESG Controversy Score = 0 (‘Red Flag’ companies).

#### 3.3.2 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 Index.

- Controversial Weapons
- Environmental Harm
- Tobacco
- Thermal Coal Mining
- Oil & Gas
- Power Generation

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

### 3.4 CONSTITUENT IDENTIFICATION

The selection of constituents from the Eligible Universe is conducted through the process of optimization.

The optimization relies on the factor exposures for all the securities in the Parent Index and the factor covariance matrix of the relevant Barra Equity Model. The optimization is performed using a base currency. The default currency is the US Dollar.

### 3.5 WEIGHTING SCHEME

The optimization objective is to maximize the Alpha score (representative of the exposures to the set of target factors) under the “target risk” constraint where the risk target is equal to the ex-ante risk of the Parent Index at the time of rebalancing.

#### 3.5.1 CALCULATION OF THE ALPHA SCORE

$$\alpha_i = 0.25 * F_{1,i} + 0.25 * F_{2,i} + 0.25 * F_{3,i} + 0.25 * F_{4,i}$$

Where,

$F_{j,i}$  = Factor exposure of each security i for each of the target factors.

The factor exposures for the target factors are sourced as follows:

- Momentum – The winsorized z-score of factor exposure for each security taken from the Momentum factor exposure in the relevant Barra Equity Model. The factor definition is given in Appendix II.
- Low Size - The winsorized z-score of factor exposure for each security taken from the relevant Barra Equity Model. The factor definition is given in Appendix II.
- Value – Sector-relative score calculated using the security-level exposures to earnings-based, asset-based and whole-firm based valuation metrics from the relevant Barra Equity Model. The factor definition is given in Appendix II.
- Quality – Sector-relative score calculated using the security-level exposures to all Quality factors from the relevant Barra Equity Model. The factor definition is given in Appendix II.

### 3.6 OPTIMIZATION CONSTRAINTS

At each Quarterly Index Review (QIR), the following optimization constraints are employed, which aim to ensure investability while achieving total risk in line with that of the Parent Index:

- If the Parent Index is an MSCI Standard Index or MSCI Investable Market Index (IMI), then the maximum weight of an Index constituents that belong to the Large Cap size segment will be restricted to the lower of (the weight of the security in the Parent Index + 2%) and 10 times the weight of the security in the Parent Index. The minimum weight of an Index constituent will be restricted to the higher of the (weight of the security in the Parent Index - 2%) and 0. The maximum weight of an Index constituents that belong to the Mid Cap or Small Cap size segments will be restricted to the lower of (the weight of the security in the Parent Index + 1%) or 5 times the weight of the security in the Parent Index. The minimum weight of an Index constituent will be restricted to the higher of the (weight of the security in the Parent Index - 1%) or 0.
- If the Parent Index is an MSCI Mid Cap index or an MSCI Small Cap index, the maximum weight of an Index constituent will be restricted to the lower of (the weight of the security in the Parent Index + 1%) and 5 times the weight of the security in the Parent Index. The minimum weight of an Index constituent will be restricted to the higher of (the weight of the security in the Parent Index - 1%) and 0.
- Active exposure of the Index to the target Barra style factors (factors included in the calculation of Alpha score) will be constrained to be greater than 0.1 and less than 0.6. Factors, namely, Earnings Variability, Leverage, Size, Beta and Residual Volatility if included in the calculation of Alpha score, will be constrained to be greater than -0.6 and less than -0.1 relative to the Parent Index.
- The exposure of the Index to the non-target Barra style factors will be restricted to +/-0.1 standard deviations relative to the Parent Index.
- The Global Industry Classification Standard (GICS®)<sup>3</sup> sector weights of the Index will not deviate more than +/- 5% from the sector weights of the Parent Index (the Energy GICS Sector is not constrained).
- For countries with weight greater than 2.5% in the Parent Index, the weight in the 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 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 one-way turnover of the Index is constrained to a maximum of 10% at each QIR.

<sup>3</sup> Please refer to MSCI GICS Methodology for details. The GICS methodology is available at: <https://www.msci.com/gics>



- In addition to the above-mentioned constraints, the climate objective constraints are applied as detailed in Table 1 below:

No.	Climate Objectives	
1.	Minimum reduction in Greenhouse Gas (GHG) Intensity relative to EVIC (Scope 1+2+3 <sup>4</sup> ) relative to the Parent Index	50%
2.	Minimum average reduction (per annum) in GHG Intensity (relative to EVIC) relative to GHG Intensity of the Index at the Base Date <sup>5</sup>	7%
3.	Minimum active weight in High Climate Impact Sector relative to Parent Index as defined in Appendix III	0%

Table 1: Constraints imposed to meet climate objectives

### 3.7 DETERMINING THE OPTIMIZED INDEX

The MSCI Diversified Multiple-Factor EU PAB Indexes are constructed using the Barra Open Optimizer in combination with the relevant Barra Equity Model<sup>6</sup>. The optimization uses the Eligible Universe and the Applicable Universe and the specified optimization objective and constraints to determine the constituents and the weights of the Index. The Eligible Universe is used to determine the securities eligible in the Index and the Applicable Universe is used to define other constraints like “target risk”. Infeasible optimizations are handled as explained in Appendix V.

<sup>4</sup> Prior to the May 2020 Semi-Annual Index Review (SAIR) of the Indexes, the Weighted Average Carbon Emissions Intensity relative to EVIC has been calculated based on Scope 1+2 Emissions.

<sup>5</sup> Prior to the May 2020 Semi-Annual Index Review (SAIR) of the Indexes, the average reduction in Weighted Average Carbon Emissions Intensity relative to EVIC has been calculated using Scope 1+2 Emissions since Inception.

<sup>6</sup> Please refer to Appendix IV for the detailed information on model usage

## 4 Maintaining the Indexes

### 4.1 QUARTERLY INDEX REVIEWS

The MSCI Diversified Multiple-Factor EU PAB Indexes are rebalanced on a quarterly basis, usually as of the close of the last business day of February, May, August and November, coinciding with the regular Index Reviews (Semi-Annual Index Reviews in May and November and Quarterly Index Reviews in February and August) of the MSCI Global Investable Market Indexes. The Barra Equity Model data as of the day before the rebalancing day is used. This approach aims to capture timely updates to the risk characteristics of the companies and coincide with the rebalancing frequency of the relevant Parent Index.

In general, MSCI uses MSCI ESG Research data (including MSCI Climate Change Metrics, MSCI ESG Controversies and MSCI Business Involvement Screening Research) as of the end of the month preceding the Index Reviews for the rebalancing of the Indexes.

The pro forma MSCI Diversified Multiple-Factor EU PAB Indexes are in general announced nine business days before the effective date.

### 4.2 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.

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 I: Business Exclusion Criteria

Companies whose activities meet the following values and climate change-based criteria, as evaluated by MSCI ESG Research, are excluded from the MSCI Diversified Multiple-Factor EU PAB Indexes.

- **ESG Controversy Score (“Red Flags”)**
  - Securities of companies having faced very severe controversies pertaining to ESG issues are not eligible for inclusion in the Index. This is implemented by excluding constituents of Parent Index with MSCI ESG Controversy Score = 0 (“Red Flag” companies). For more details on MSCI ESG Controversies Score, please refer to <https://www.msci.com/esg-integration>.
- **Controversial Weapons Involvement**
  - 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>.
- **Environmental Harm**
  - All companies having faced very severe and severe controversies pertaining to Environmental issues – Defined as companies with an Environment Controversy Score of 0 or 1.
- **Tobacco**
  - All companies that are involved in the manufacturing of Tobacco products.
- **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 & Gas**

- All companies deriving 10% or more revenue from oil and gas related activities, including distribution / retail, equipment and services, extraction and production, pipelines and transportation and refining but excluding biofuel production and sales and trading activities.

- **Power Generation**

- All companies deriving 50% or more revenue from thermal coal-based power generation, liquid fuel-based power generation and natural gas-based power generation<sup>7</sup>.

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<sup>7</sup> As per [https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc\\_wg3\\_ar5\\_chapter7.pdf](https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter7.pdf), thermal coal based power generation, liquid fuel based power generation and natural gas based power generation have median lifecycle emissions exceeding 100gCO<sub>2</sub>/kWh.

## Appendix II: Target Factor Definition Summary

The style factors targeted in the MSCI Diversified Multiple-Factor EU PAB Index are the four style factor families and their combinations: Value, Quality, Momentum and Low Size. These factor families are described using individual factor scores from the current release of the MSCI Barra Equity Model. The choice of factors used within each factor family is governed by the current model used for the optimization, which may change with a new release of the Barra Equity Model (as specified in Appendix IV). The model data will be used from a day prior to the rebalancing date. All factor exposures are re-normalized at the Parent Index level prior to the calculation of the Alpha score. Following are the definitions of factor families currently used in the Index. For more detailed information on individual factors in GEMTL, please refer to <https://www.msci.com/portfolio-management>.

### Value:

The Value score for each security is calculated by combining the security-level exposures to two factors, Book-to-Price and Earnings Yield, from the relevant Barra Equity Model (currently GEMTL). A sector-relative score is derived from the combined score by standardizing (z-score) the latter within each sector and winsorizing at +/- 3.

$$\text{Value}_i = (0.33) * \text{BtoP}_i + (0.67) * \text{EarningsYield}_i$$

### Quality:

The Quality score for each security is calculated by combining in equal proportion the security-level exposures to five factors - Profitability, Investment Quality, Earnings Quality, Leverage and Earnings Variability - from the relevant Barra Equity Model (currently GEMTL). A sector-relative score is derived from the combined score by standardizing (z-score) the latter within each sector and winsorizing at +/- 3.

$$\begin{aligned} \text{Quality}_i = & (0.2) * \text{Profitability}_i + (0.2) * \text{Investment Quality}_i + (0.2) * \text{Earnings Quality}_i \\ & + (-1) * (0.2) * \text{Earnings Variability}_i + (-1) * (0.2) * \text{Leverage}_i \end{aligned}$$

### Momentum:

The Momentum score for each security is the standardized (z-score) Momentum factor score from the relevant Barra Equity Model (currently GEMTL) within the Parent Index and winsorized at +/- 3.

### Low Size:

The Low Size score for each security is the standardized (z-score) Size factor score with sign reversed from the relevant Barra Equity Model (currently GEMTL) within the Parent Index and winsorized at +/- 3.

$$\text{Low Size}_i = -(1)\text{Size}_i$$

## Appendix III: Calculation of Target Metrics

### Calculation of GHG Intensity relative to EVIC

For Parent Index constituents where the Scope 1+2+3 Emissions Intensity is not available, the average Scope 1+2+3 Emissions Intensity of all the constituents of the MSCI ACWI in the same GICS Industry Group in which the constituent belongs is used.

Security Level GHG Intensity =

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

Enterprise Value Inflation Adjustment Factor (EVIAF) =

$$EVIAF = \left( \frac{\text{Average(Enterprise Value + Cash)}}{\text{Previous (Average(Enterprise Value + Cash))}} \right) - 1$$

Weighted Average GHG Intensity of Parent Index =

$$\sum (\text{Weight in Parent Index} * \text{Security Level GHG Intensity})$$

Weighted Average GHG Intensity of Derived Index =

$$\sum (\text{Index Weight} * \text{Security Level GHG Intensity})$$

### Calculation of Average Decarbonization

On average, the Indexes follow a 7% decarbonization trajectory since the Base Date. The Weighted Average GHG Intensity relative to EVIC at the Base Date ( $W_1$ ) is used to compute the target Weighted Average GHG Intensity relative to EVIC at any given Semi-Annual Index Review ( $W_t$ ) as per the below formula.

$$W_t = W_1 * 0.93^{\frac{(t-1)}{2}}$$

Where 't' is the number of Semi-Annual Index Reviews since the Base Date.

Thus, for the 3<sup>rd</sup> Semi-Annual Index Review since the Base Date (t=3), the target Weighted Average GHG Intensity relative to EVIC will be  $W_1 * 0.93$ .

### Calculation of GHG Intensity relative to Sales

For Parent Index constituents where the Scope 1+2+3 Emissions Intensity is not available, the average Scope 1+2+3 Emissions Intensity of all the constituents of the

MSCI ACWI in the same GICS Industry Group in which the constituent belongs is used.

Security Level GHG Intensity =

$$\frac{\text{Scope 1 + 2 + 3 Carbon Emissions} * (1 + EVIAF)}{\text{Sales (in M\$)}}$$

### Climate Impact Sectors

NACE<sup>8</sup> is the European Union's classification of economic activities. As per the draft DA, stocks in the NACE Section codes A, B, C, D, E, F, G, H, L are classified as "High Climate Impact" sector and other stocks are classified 'Low Climate Impact' sector. The GICS<sup>9</sup> Sub-Industry code for each security is mapped to the corresponding "Climate Impact Sector" using a mapping. This mapping is constructed in the following steps:

1. MSCI has published a mapping<sup>10</sup> between the NACE classes and GICS Sub-Industry.
2. For each GICS Sub-Industry, the number of NACE classes which fall under the High Climate Impact Sector (say the number of classes is  $N_H$ ) and Low Climate Impact Sector (say the number of classes is  $N_L$ ) is identified.
3. If all the NACE classes for a given GICS Sub-Industry are identified in the High Climate Impact Sector ( $N_L = 0$ ), then the GICS Sub-Industry is mapped to the High Climate Impact Sector. Conversely, if all the NACE classes for a given GICS Sub-Industry are identified in the Low Climate Impact Sector ( $N_H = 0$ ) then the GICS Sub-Industry is mapped to the Low Climate Impact Sector.
4. In case a GICS Sub-Industry is mapped to some NACE classes in the High Climate Impact Sector and the others in the Low Climate Impact Sector, the GICS Industry is mapped to the Climate Impact Sector in the following manner:
  - a.  $N_H \geq N_L$ : If the number of NACE classes in the High Climate Impact Sector is at least equivalent to the number of NACE classes in the Low Climate Impact Sector, the GICS Sub-Industry is mapped to the High Climate Impact Sector.

<sup>8</sup> For further details regarding NACE, please refer to [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=NACE\\_background](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=NACE_background)

<sup>9</sup> For further information regarding GICS, please refer to <https://www.msci.com/gics>

<sup>10</sup> This mapping is available in the [Handbook of Climate Transition Benchmarks, Paris-Aligned Benchmark and Benchmarks' ESG Disclosures](#)





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

The methodology presently uses MSCI Barra Global Equity Model for Long-Term Investors (“GEMTL”) 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: Handling Infeasible Optimizations

During the Quarterly Index Review, in the event that there is no optimal solution that satisfies all the optimization constraints defined in Section 3.6, the following constraints will be relaxed, until an optimal solution is found:

- Relax the maximum weight multiple in steps of 2 for the Large Cap size segment and in steps of 1 for the Mid Cap and Small Cap size segments, up to a maximum of 5 iterations based upon the following formula:

$$wm_{i+1} = step + wm_i \text{ for } i = 0 - 4$$

Where  $wm_i$  = Maximum Active weight multiple

$wm_0 = 10$  and  $step=2$  for the Large Cap size segment

$wm_0 = 5$  and  $step=1$  for the Mid Cap and Small Cap size segment

- Relax the turnover constraint in steps of 2%, up to a maximum of 20%.
- The maximum weight multiple constraint and the maximum turnover 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	Maximum Asset Weight Multiple	Turnover Limit
1	12 times (for Large Cap)/ 6 times (for Mid Cap and Small Cap) the weight of the security in the Parent Index	10%
2	12 times (for Large Cap)/ 6 times (for Mid Cap and Small Cap) the weight of the security in the Parent Index	12%
3	14 times (for Large Cap)/ 7 times (for Mid Cap and Small Cap) the weight of the security in the Parent Index	12%
4	14 times (for Large Cap)/ 7 times (for Mid Cap and Small Cap) the weight of the security in the Parent Index	14%

In the event that no optimal solution is found after the above constraints have been relaxed over all the iterations, the relevant MSCI Diversified Multiple-Factor EU PAB Index will not be rebalanced for that Quarterly Index Review.

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