S&P Dow Jones Indices

A Division of S&P Global

Research

# Approaches to Benchmarking Listed Infrastructure


**Contributors**

**Izzy Wang**
Senior Analyst
Strategy Indices
izzy.wang@spglobal.com

**Claire Yi**
Analyst
Strategy Indices
claire.yi@spglobal.com

**Tianyin Cheng**
spdji-growthstrategy@spglobal.com

**Vinit Srivastava**
spdji-growthstrategy@spglobal.com


Investing in infrastructure has become popular among institutional and private investors in recent years. Investors could be attracted to the potentially long-term, low-risk and inflation-linked profile that can come with infrastructure assets, and they may find that it is an alternative asset class that could provide new sources of return and diversification of risk.

## Why Consider Investing in Infrastructure?

Infrastructure assets provide essential services that are necessary for populations and economies to function, prosper and grow. They include a variety of assets divided into five general sectors: transportation (e.g., toll roads, airports, seaports and rail); energy (e.g., gas and electricity transmission, distribution and generation); water (e.g., pipelines and treatment plants); communications (e.g., broadcast, satellite and cable); and social (e.g., hospitals, schools and prisons). Infrastructure assets operate in an environment of limited competition as a result of natural monopolies, government regulations or concessions. The stylized economic characteristics of this asset class include the following.

- **Relatively steady cash flows with a strong yield component:** Infrastructure assets are generally long lived. Most companies have long-term regulatory contracts or concessions to operate the assets, which can provide predictable performance over time. As a result, infrastructure assets have the potential to generate consistent, stable cash flow streams, usually with lower volatility than other traditional asset classes.

- **High barriers to entry:** Due to significant economies of scale, infrastructure assets are often regulated in such a way that discourages competition. The high barriers to entry often result in a monopoly for existing owners and operators.

- **Inflation protection:** Revenues from infrastructure assets are typically linked to inflation and are often supported by regulation. In certain instances, revenue increases linked to inflation are embedded in concession agreements, licenses and regulatory frameworks. In other cases, owners of infrastructure assets are able to pass inflation on to consumers via price increases, due to the essential nature of the assets and their inelastic demand.

Consequently, the infrastructure asset class may provide investors with a degree of protection from the business and economic cycles, as well as attractive income yields and an inflation hedge. It could be expected to offer long-term, low-risk, non-correlated, inflation-protected and acyclical performance.

It is also generally believed that infrastructure is, as an asset class, poised for strong growth. As the global population continues to expand and standards of living around the world become higher, there is a vast demand for improved infrastructure. This demand includes the refurbishment and replacement of existing infrastructure worldwide and new infrastructure development in emerging markets.

Financing public infrastructure has traditionally been the responsibility of the state. However, fiscally constrained governments are increasingly turning to the private sector to provide funding for new projects. As a result, the investment opportunities in this sector continue to grow.

# Direct and Indirect Exposure to Infrastructure

Exposure to infrastructure can be achieved either directly or indirectly.

**Direct exposure** is gained through private markets in which investors own the companies that build or operate the infrastructure assets, like toll roads, airports, etc. The most important benefit of investing through these vehicles is that market participants obtain the direct exposure they are looking for and all of the benefits that come with owning the infrastructure itself.

On the other hand, infrastructure assets are often highly regulated, so this type of investment can have more concentrated regulatory risk. It also often involves significant leverage, along with the risks that are bundled with it. The other potential downside is that these assets are illiquid, so there is no price transparency on an ongoing basis. Market participants would typically have to invest in the asset class for the long term, as there are no liquid secondary markets in which their investments could be quickly traded.

**Indirect investment** can be achieved through publicly listed companies whose business is directly related to infrastructure assets.

The primary advantage of listed infrastructure vehicles is that they are traded on an exchange. The size of the listed market is large—the total market capitalization of the universe of "pure-play" infrastructure companies, from which the Dow Jones Brookfield Global Infrastructure Index is constructed, was USD 2.23 trillion as of Dec. 31, 2021. Listed companies also provide access to unique assets that might only be available in public markets. Daily price transparency and relative liquidity, which are characteristics of listed companies, are important to many market participants. Listed firms also have extensive financial reporting requirements that are regulated by the various stock exchanges.

The primary disadvantage of this type of investment is that publicly traded stocks that make up the listed infrastructure vehicle may already be part of the investor's equity portfolio. Another negative aspect of this type of infrastructure investment is that infrastructure assets are sometimes just one piece of a larger conglomerate's operations, particularly on a global basis.

# Benchmarking Publicly Listed Infrastructure Securities

A number of new infrastructure indices (capturing only publicly listed infrastructure securities) have emerged since the mid-2000s. Most indices take one of two construction approaches: either applying a market-cap weighting methodology to infrastructure sectors (in which case, utilities will always dominate the index) or imposing hard caps on these sectors. In order to identify effectively companies with the pure-play characteristics previously outlined, it is necessary to dig into financials and identify what percentage of earnings comes from competitively exposed versus regulated lines of business.

Managers in infrastructure investment may consider different benchmarks, depending on their own definition of the investment universe. Some managers favor pure-play infrastructure sectors, considering only stocks with stable cash flow patterns and low correlations to broader equities for portfolio inclusion. Other managers operate under a less-constrained definition of the space, with a thematic view of what constitutes infrastructure. Such portfolios may include infrastructure-related companies such as shipping, diversified communications, power generation, etc.

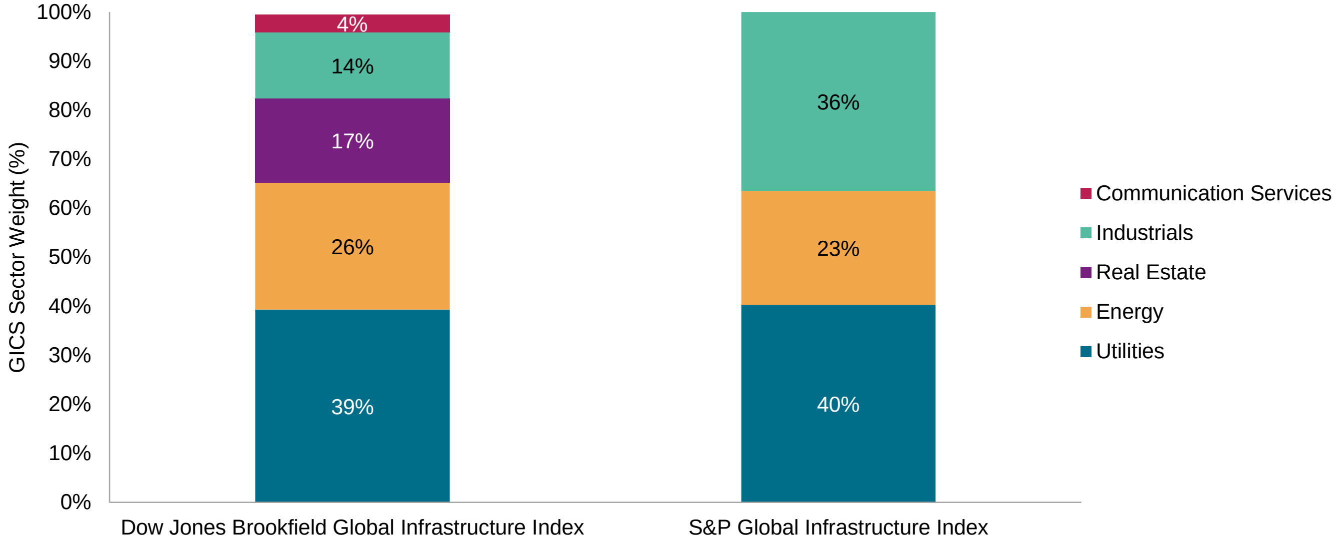
S&P Dow Jones Indices has been a leader in benchmarking the publicly listed infrastructure market. Two distinct approaches are provided to the different types of managers for benchmarking. The Dow Jones Brookfield Global Infrastructure Indices use a pure-play approach. Companies that obtain a majority (70% or higher) of their cash flows from owning and operating infrastructure assets are selected for the indices. On the other hand, the S&P Global Infrastructure Index Series uses a broad-based approach. Companies from infrastructure-related sectors, industries and subindustries, as defined by the Global Industry Classification Standard® (GICS®), are selected for the indices. Both series of indices could be appropriate for market participants seeking diversified, globally listed infrastructure exposure. Exhibit 1 shows a detailed comparison of the methodologies of two examples from the index series mentioned above. Exhibit 2 shows the sector weights of the two indices—the Dow Jones Brookfield Global Infrastructure Index and the S&P Global Infrastructure Index—as of March 31, 2022.

## Exhibit 1: Methodology Comparison

<table>
<tr><th>Category</th><th>Dow Jones Brookfield Global Infrastructure Index</th><th colspan="2">S&P Global Infrastructure Index</th></tr>
<tr><td>Summary</td><td>Developed through a partnership with Brookfield, a leader in the infrastructure space, this index relies on a pure-play approach. Cash flows of companies are evaluated to make sure that the primary driver of revenues for those companies comes from owning and operating infrastructure assets.</td><td colspan="2">Relying on a transparent, rules-based methodology that relies on the GICS classification system, this index seeks to provide a more broad-based exposure to infrastructure that includes access to pure-play infrastructure and infrastructure service companies.</td></tr>
<tr><td>Index Universe</td><td>Maintained by S&P Dow Jones Indices</td><td colspan="2">Three infrastructure clusters (combination of GICS industries) from the S&P Global BMI</td></tr>
<tr><td rowspan="10">Sectors</td><td>Airports</td><td>Energy</td><td>Oil & Gas Storage & Transportation</td></tr>
<tr><td>Toll roads</td><td rowspan="3">Transportation</td><td>Airport Services</td></tr>
<tr><td>Ports</td><td>Highways & Railtracks</td></tr>
<tr><td>Communications</td><td>Marine Ports & Services</td></tr>
<tr><td>Electrical Transmission and Distribution</td><td rowspan="6">Utilities</td><td>Electric Utilities</td></tr>
<tr><td>Oil & Gas Storage & Transportation</td><td>Gas Utilities</td></tr>
<tr><td>Water</td><td>Multi-Utilities</td></tr>
<tr><td rowspan="3">Diversified<br>(multiple sectors)</td><td>Water Utilities</td></tr>
<tr><td>Independent Power Producers & Energy Traders</td></tr>
<tr><td>Renewable Electricity</td></tr>
<tr><td>Size</td><td>Minimum float-adjusted market cap:<br>USD 500 million with a buffer*</td><td colspan="2">Minimum total market cap: USD 250 million<br>Minimum float-adjusted market cap: USD 100 million</td></tr>
<tr><td>Liquidity</td><td>Thresholds of three-month average daily value traded: USD 1 million with a buffer*</td><td colspan="2">Thresholds of three-month average daily value traded:<br>USD 1 million for developed markets<br>USD 500,000 for emerging markets</td></tr>
<tr><td>Listing</td><td>Have a developed market listing</td><td colspan="2">Have a developed market listing</td></tr>
<tr><td>Diversification</td><td>Individual stock weights are capped at 10%<br>Country weights are capped at 50%<br>Industry weights are capped at 50%</td><td colspan="2">Individual stock weights are capped at 5%<br>15 stocks from emerging markets and 60 from developed markets<br>The target number of stocks from the Energy cluster is 15, with the total weight capped at 20%; 30 stocks each from the Transportation and Utilities clusters, with the total weight capped at 40% each</td></tr>
<tr><td>Number of Constituents</td><td>Variable; 102 stocks as of March 31, 2022</td><td colspan="2">Fixed; 75 stocks</td></tr>
<tr><td>Rebalanced</td><td>Semiannual reconstitution in June and December; Quarterly reweight in March and September</td><td colspan="2">Semiannually in March and September</td></tr>
<tr><td>Launch Date</td><td>July 14, 2008</td><td colspan="2">Feb. 22, 2007</td></tr>
</table>

Source: S&P Dow Jones Indices LLC. Data as of March 31, 2022. Table is provided for illustrative purposes. *For details, refer to Dow Jones Brookfield Global Infrastructure Index Methodology.

**Exhibit 2: GICS Sector Weights of the Dow Jones Brookfield Global Infrastructure Index and the S&P Global Infrastructure Index**




Source: S&P Dow Jones Indices LLC. Data as of March 31, 2022. Chart is provided for illustrative purposes.

Several other indices have been offered by competitors (UBS, MSCI, Macquarie and FTSE) in this space—the UBS Global 50/50 Infrastructure & Utilities Net of Tax Index (which has been retired), the MSCI ACWI Infrastructure Index, the Macquarie Global Infrastructure 100 Index (which was retired in November 2016) and the FTSE Global Core Infrastructure 50/50 Index. All of them have relied on a broad-based approach that is similar to the S&P Global Infrastructure Index (see Exhibit 3).

**Exhibit 3: Comparison of Methodologies (High Level)**

| Category | Dow Jones Brookfield Global Infrastructure Index | S&P Global Infrastructure Index | FTSE Global Core Infrastructure 50/50 Index | MSCI ACWI Infrastructure Index |
|---|---|---|---|---|
| Components | 102, Variable | 75, Fixed | 238, Variable | 229, Variable |
| Selection Process | Driven by cash flow from infrastructure-related operations (has to be in excess of 70%[1]) | Based on GICS (combination of GICS sectors and industries). Clusters include Energy (20%), Transportation (40%) and Utilities (40%) | Based on ICB (combination of ICB subsectors). Clusters include utilities (50%), transportation (30%), and others (20%). Revenue must be greater than 65% from the three clusters. | Based on GICS (combination of GICS sectors and industries). Clusters include Telecommunications, Utilities, Energy, Transportation and Social Infrastructure.[2] |
| Review | Semiannually | Semiannually | Semiannually | Quarterly |

Source: S&P Dow Jones Indices LLC, MSCI, FTSE. Components as of March 31, 2022. Table is provided for illustrative purposes.

[1] Current index constituents meeting all other eligibility requirements will remain eligible for index inclusion if at least 60% of estimated cash flows are derived from pure-play infrastructure assets.

[2] The Social Infrastructure cluster includes two GICS sub-industries: Education Services and Health Care Facilities.

The risk/return profile of the Dow Jones Brookfield Global Infrastructure Index, which takes a pure-play approach, is differentiated from that of an index taking a broad-based approach (as seen in Exhibit 4). The Dow Jones Brookfield Global Infrastructure Index has shown the highest return and risk-adjusted return over the past 15 years. The index has an annualized return of 7.26% over the past 15 years, outperforming the S&P Global BMI by 0.77% and all other infrastructure indices studied here by more than 3.07% per year.

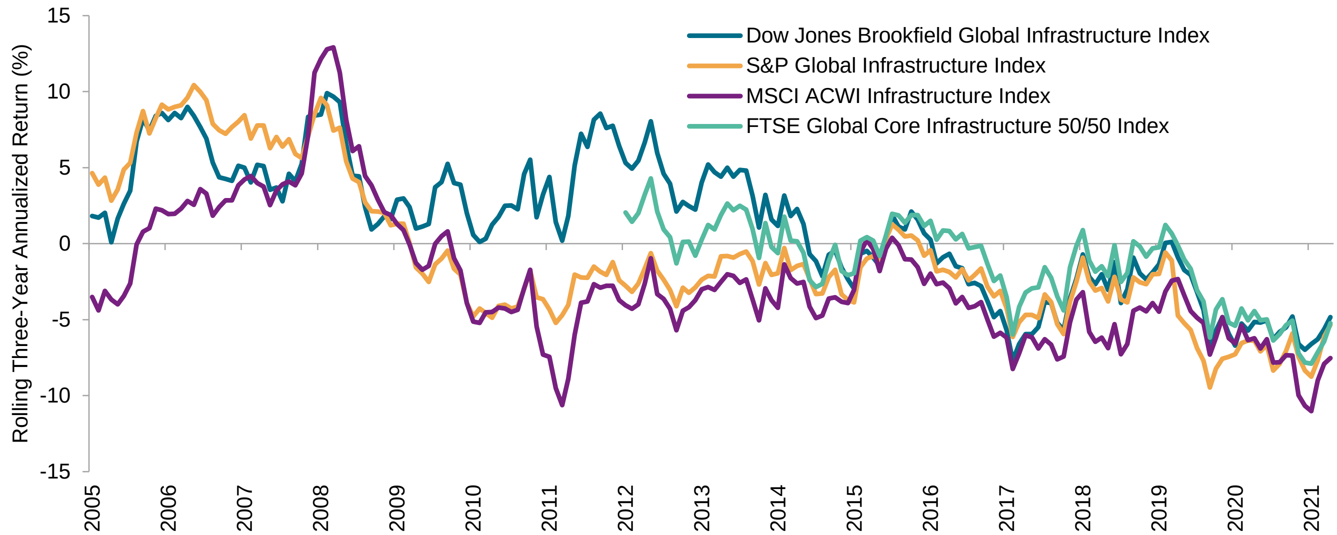
**Exhibit 4: Historical Risk/Return Profile of Listed Infrastructure Equity Indices**

| Time Period | S&P Global BMI | Dow Jones Brookfield Global Infrastructure Index | S&P Global Infrastructure Index | MSCI ACWI Infrastructure Index | FTSE Global Core Infrastructure 50/50 Index |
|---|---|---|---|---|---|
| **Annualized Returns (%)** | | | | | |
| 1-Year | 5.64 | 17.45 | 15.86 | 5.85 | 14.48 |
| 3-Year | 13.21 | 8.57 | 7.16 | 5.84 | 8.15 |
| 5-Year | 11.17 | 8.00 | 6.76 | 5.17 | 8.51 |
| 10-Year | 9.85 | 8.55 | 6.87 | 5.55 | 8.83 |
| 15-Year | 6.49 | 7.26 | 4.19 | 3.58 | - |
| **Annualized Volatility (%)** | | | | | |
| 3-Year | 17.60 | 16.19 | 19.86 | 13.66 | 15.90 |
| 5-Year | 15.45 | 14.11 | 16.69 | 11.99 | 13.54 |
| 10-Year | 13.39 | 12.57 | 14.12 | 11.26 | 11.96 |
| 15-Year | 16.69 | 14.03 | 16.42 | 13.17 | - |
| **Return/Volatility** | | | | | |
| 3-Year | 0.75 | 0.53 | 0.36 | 0.43 | 0.51 |
| 5-Year | 0.72 | 0.57 | 0.41 | 0.43 | 0.63 |
| 10-Year | 0.74 | 0.68 | 0.49 | 0.49 | 0.74 |
| 15-Year | 0.39 | 0.52 | 0.25 | 0.27 | - |
| **Maximum Drawdown (%)** | | | | | |
| 15-Year | -55.44 | -45.23 | -53.21 | -44.30 | - |
| **Return/Maximum Drawdown** | | | | | |
| 15-Year | 0.12 | 0.16 | 0.08 | 0.08 | - |
| **Correlation with the S&P Global BMI** | | | | | |
| 3-Year | - | 0.82 | 0.87 | 0.85 | 0.83 |
| 5-Year | - | 0.80 | 0.84 | 0.82 | 0.80 |
| 10-Year | - | 0.77 | 0.83 | 0.80 | 0.77 |
| 15-Year | - | 0.84 | 0.90 | 0.86 | - |
| **Beta to the S&P Global BMI** | | | | | |
| 3-Year | - | 0.76 | 0.98 | 0.66 | 0.75 |
| 5-Year | - | 0.73 | 0.91 | 0.64 | 0.70 |
| 10-Year | - | 0.73 | 0.87 | 0.67 | 0.69 |
| 15-Year | - | 0.71 | 0.88 | 0.68 | - |

Source: S&P Dow Jones Indices LLC, MSCI, FTSE. Data from March 31, 2007, to March 31, 2022. Index performance is based on net total return in USD. Past performance is no guarantee of future results. The S&P Global Infrastructure Index was launched Feb. 22, 2007. The Dow Jones Brookfield Global Infrastructure Index was launched July 14, 2008. All data prior to the index launch date is back-tested hypothetical data. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

In terms of downside protection and diversification benefits, the MSCI ACWI Infrastructure Index and the Dow Jones Brookfield Global Infrastructure Index showed the best statistics over the 15-year period. For these two indices, the maximum drawdowns were cut from 55.44% for the S&P Global BMI to 44.30% and 45.23%, respectively; betas against the S&P Global BMI were about 0.7 over the past 15 years. On a rolling three-year basis, the Dow Jones Brookfield Global Infrastructure Index has shown continuous significant positive returns in excess of the S&P Global BMI; while the other infrastructure indices have experienced diminished outperformance since the Global Financial Crisis in 2008 and 2009 (see Exhibit 5). On a rolling three-year basis, the Dow Jones Brookfield Global Infrastructure Index underperformed the S&P Global BMI from May 2015 to April 2016 and from January 2017 to March 2022, with the prolonged period of low oil prices in the background.

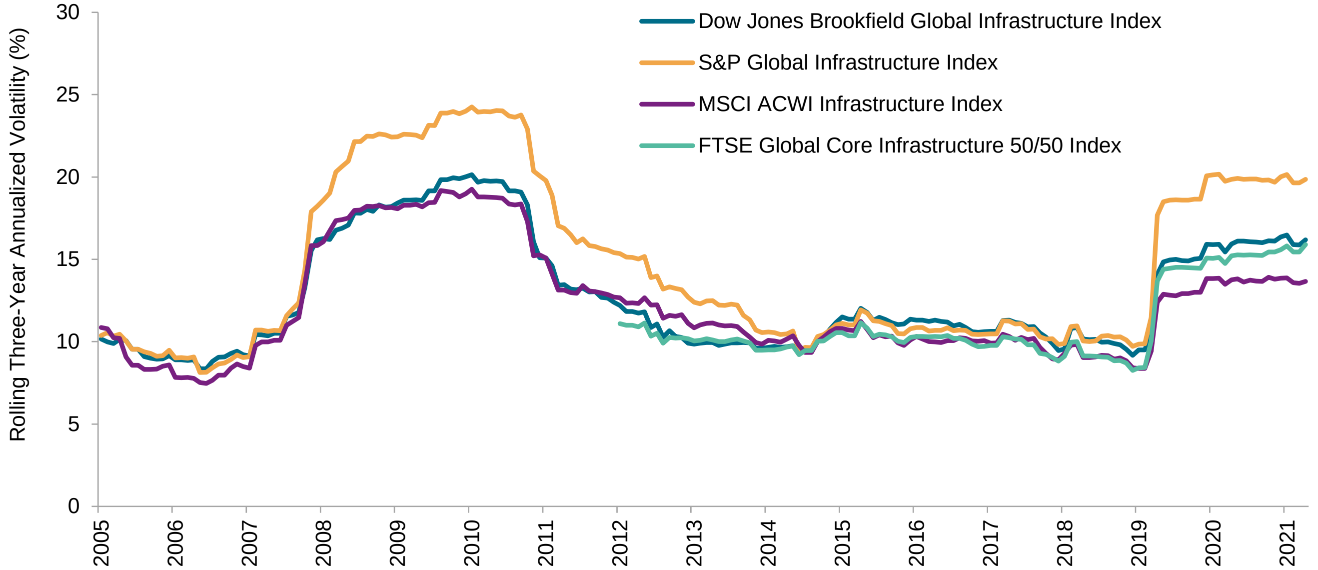
**Exhibit 5: Listed Infrastructure Equity Indices – Rolling Three-Year Annualized Return in Excess of the S&P Global BMI**




Source: S&P Dow Jones Indices LLC, MSCI, FTSE. Data from Dec. 29, 2006, to March 31, 2022. Index performance based on net total return in USD. Past performance is no guarantee of future results. The S&P Global Infrastructure Index was launched Feb. 22, 2007. The Dow Jones Brookfield Global Infrastructure Index was launched July 14, 2008. All data prior to the index launch date is back-tested hypothetical data. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

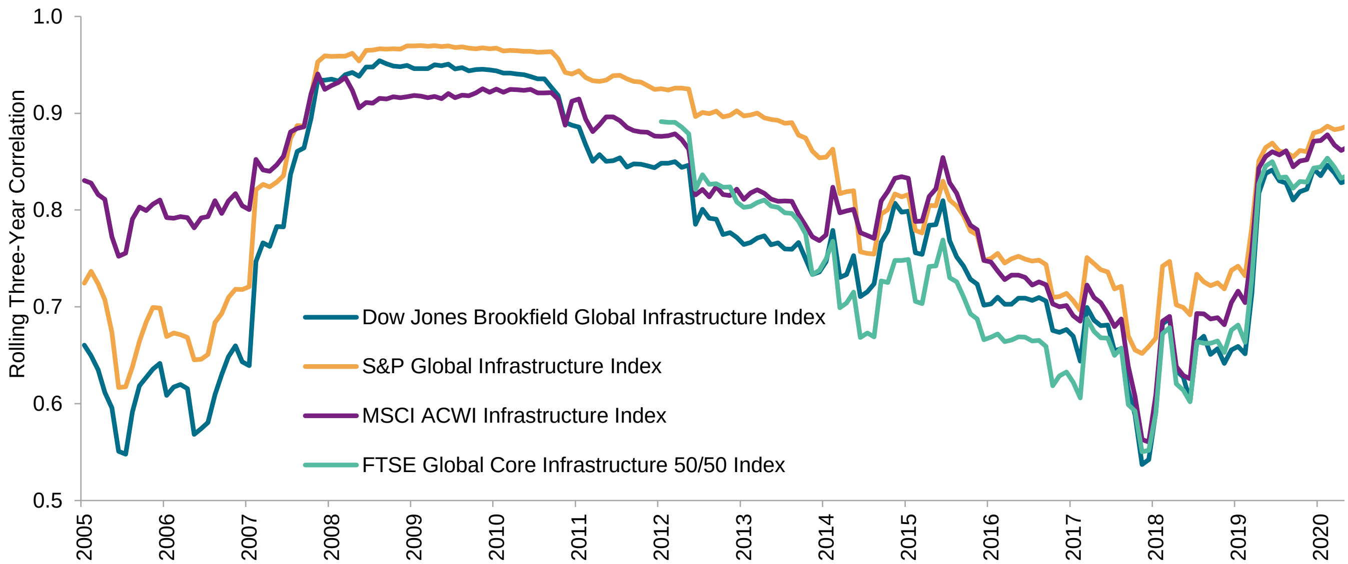
In terms of volatility and correlation, the S&P Global Infrastructure Index is on the high side of the spectrum (see Exhibits 6 and 7). This is consistent with the index's construction idea. Of note, volatility and correlation have increased significantly during and after the 2008 Global Financial Crisis and the 2020 COVID-19 sell-off. This phenomenon has been observed among all asset classes, making it challenging for market participants to construct a diversified portfolio during crisis periods.

## Exhibit 6: Listed Infrastructure Equity Indices – Rolling Three-Year Annualized Volatility




Source: S&P Dow Jones Indices LLC, MSCI, FTSE. Data from Dec. 29, 2006, to March 31, 2022. Index performance based on net total return in USD. Past performance is no guarantee of future results. The S&P Global Infrastructure Index was launched Feb. 22, 2007. The Dow Jones Brookfield Global Infrastructure Index was launched July 14, 2008. All data prior to the index launch date is back-tested hypothetical data. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

## Exhibit 7: Listed Infrastructure Equity Indices – Rolling Three-Year Correlation with the S&P Global BMI

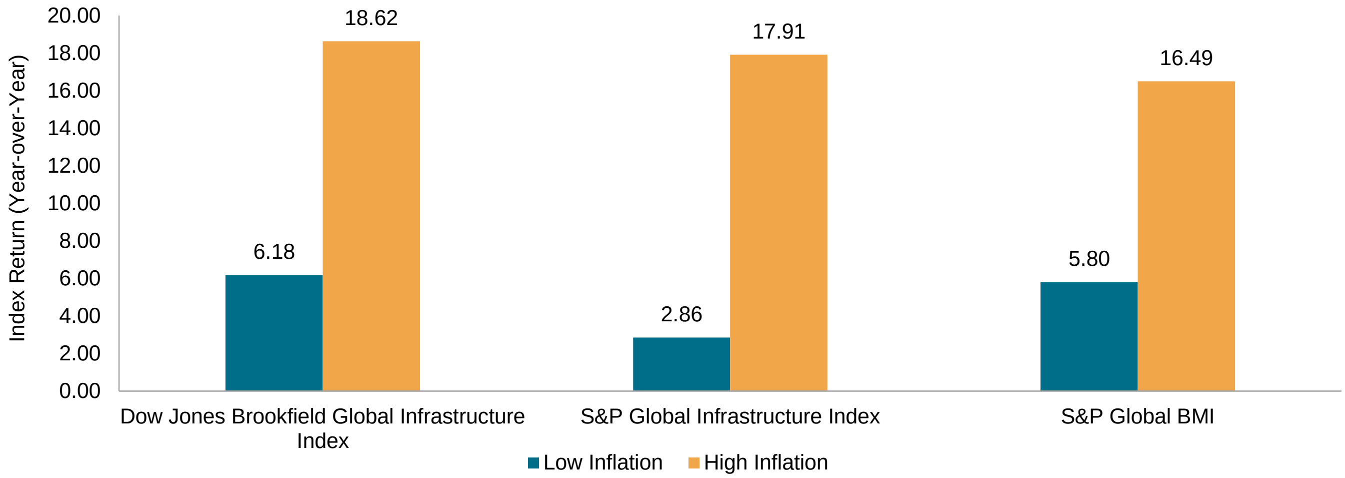



Source: S&P Dow Jones Indices LLC, MSCI, FTSE. Data from Dec. 29, 2006, to March 31, 2022. Index performance based on net total return in USD. Past performance is no guarantee of future results. The S&P Global Infrastructure Index was launched Feb. 22, 2007. The Dow Jones Brookfield Global Infrastructure Index was launched July 14, 2008. All data prior to the index launch date is back-tested hypothetical data. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

# Inflation Hedge

One of the potential benefits of investing in infrastructure is the historical inflation hedge that it has provided. To illustrate this, we studied the relationship between the indices' rolling 12-month returns and inflation rates[3] compared with the broad market benchmark. Exhibit 8 shows that over the past 19 years (from Dec. 31, 2002, to March 31, 2022), the Dow Jones Brookfield Global Infrastructure Index and the S&P Global Infrastructure Index outperformed the S&P Global BMI by an average year-over-year return of 2.13% and 1.41%, respectively, in high-inflation months. In low-inflation months, the Dow Jones Brookfield Global Infrastructure Index slightly outperformed the S&P Global BMI, while the S&P Global Infrastructure Index underperformed.

**Exhibit 8: Average Year-over-Year Return of the Dow Jones Brookfield Global Infrastructure Index and the S&P Global Infrastructure Index versus the S&P Global BMI during Different Inflation Periods**




Source: S&P Dow Jones Indices LLC, FRED. Data from Dec. 31, 2002, to March 31, 2022. Index performance based on net total return. Past performance is no guarantee of future results. The S&P Global Infrastructure Index was launched Feb. 22, 2007. The Dow Jones Brookfield Global Infrastructure Index was launched July 14, 2008. All data prior to the index launch date is back-tested hypothetical data. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

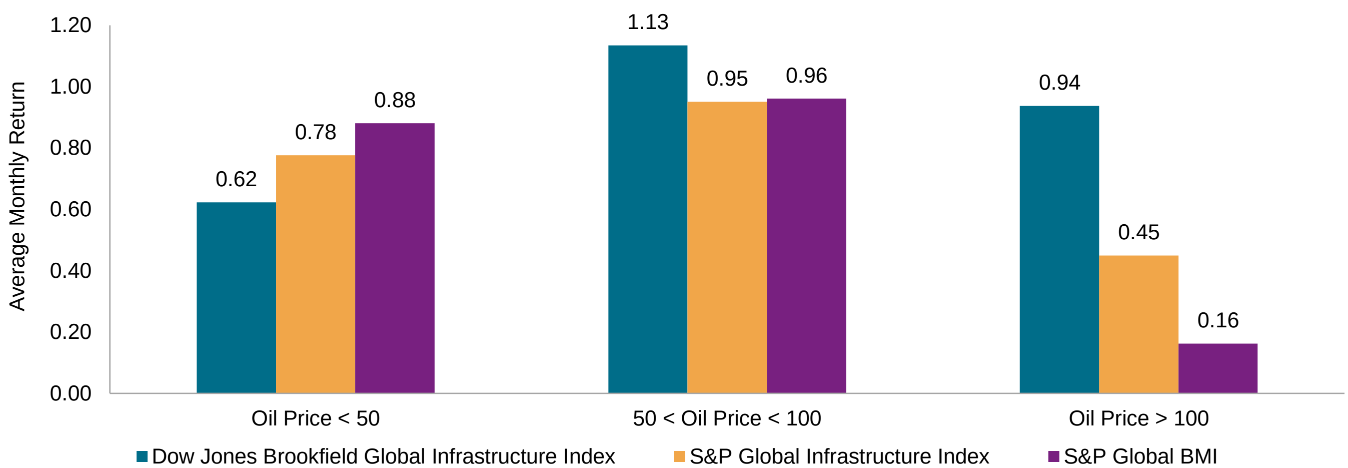
[3] Inflation was measured by year-over-year changes in the U.S. Consumer Price Index (Consumer Price Index for All Urban Consumers, Source: FRED). The median of inflation was calculated from January 2003 to March 2022. Months when inflation was greater than median inflation were considered to be high inflation, and vice versa. This analysis was performed from the hypothetical point of view of investors based in the U.S. or having exposure to U.S. inflation in their portfolios.

# Listed Infrastructure and Oil Prices

The impact of oil prices on companies owning or operating infrastructure assets is not trivial. First, there is generally low exposure to oil prices, as companies that typically own or operate these assets tend to have stable cash flows backed by long-term contracts that are sometimes regulation enabled. It also helps that most of these assets are monopolistic in nature.

Second, there is no exact linear relationship between oil prices and performance of listed infrastructure. Exhibit 9 shows that from Dec. 31, 2002, to March 31, 2022, the Dow Jones Brookfield Global Infrastructure Index and the S&P Global Infrastructure Index almost always outperformed the S&P Global BMI when oil prices were high or moderate. When oil prices were high (above USD 100 per barrel), the average monthly outperformance was 78 bps and 29 bps, respectively. When oil prices were moderate (between USD 50 and USD 100 per barrel), the monthly outperformance was 17 bps for the Dow Jones Brookfield Global Infrastructure Index and the S&P Global Infrastructure Index slightly underperformed. When oil prices were low (below USD 50 per barrel), the average monthly underperformance was 26 bps and 10 bps, respectively.

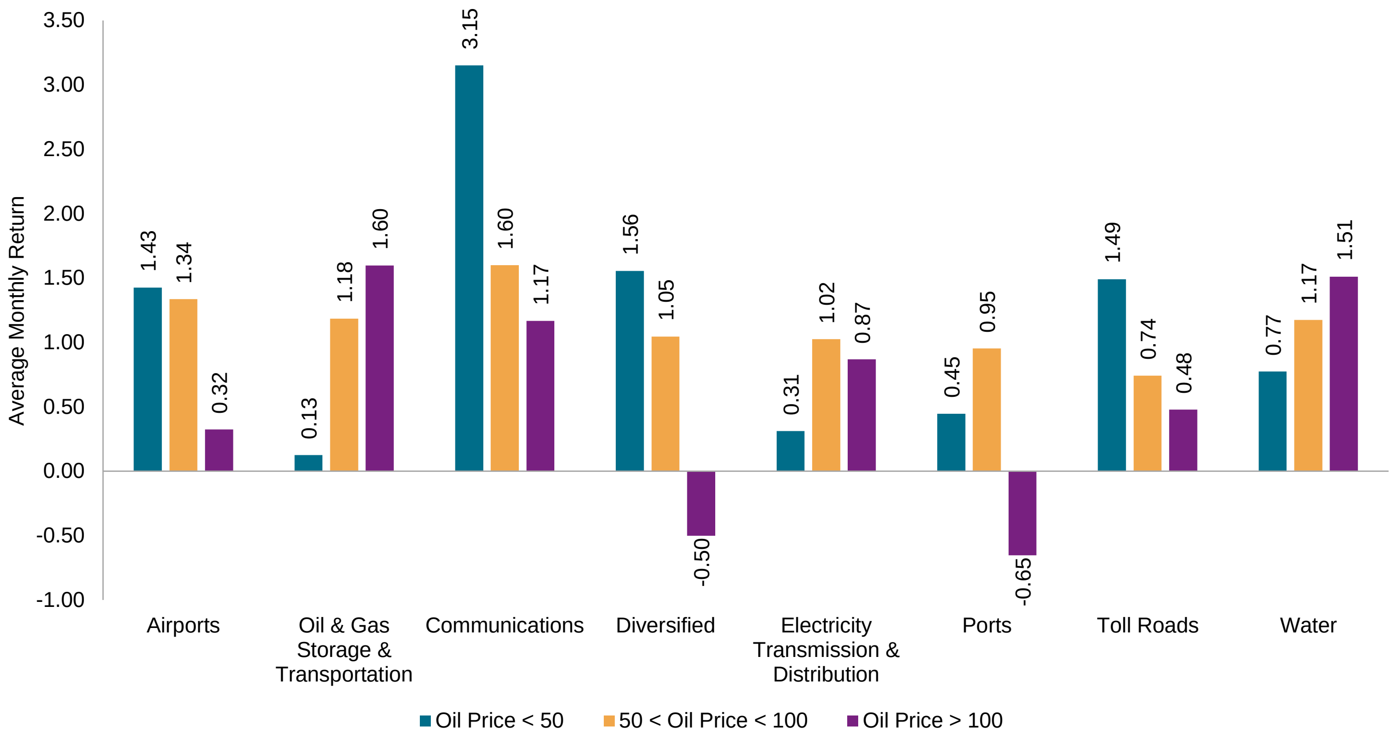
**Exhibit 9: Average Monthly Return of the Dow Jones Brookfield Global Infrastructure Index and the S&P Global Infrastructure Index versus the S&P Global BMI at Different Oil Prices**




Source: S&P Dow Jones Indices LLC, FactSet. Oil price is represented by WTI crude oil prices (the generic 1st 'CL' future). Data from Dec. 31, 2002, to March 31, 2022. Index performance based on net total return. Past performance is no guarantee of future results. The S&P Global Infrastructure Index was launched Feb. 22, 2007. The Dow Jones Brookfield Global Infrastructure Index was launched July 14, 2008. All data prior to the index launch date is back-tested hypothetical data. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Third, the sensitivity to oil prices varies from company to company, depending on whether they are net consumers or producers of oil. Exhibit 10 shows the average monthly return of the Dow Jones Brookfield Global Infrastructure Sector Indices at different oil prices from Dec. 31, 2002, to March 31, 2022. Oil & Gas Storage & Transportation seemed to be the pure-play infrastructure sector most negatively affected by low oil prices. Other pure-play sectors, especially Airports, Communications and Toll Roads, seemed to benefit from low oil prices.

**Exhibit 10: Average Monthly Return of the Dow Jones Brookfield Global Infrastructure Sector Indices at Different Oil Prices**

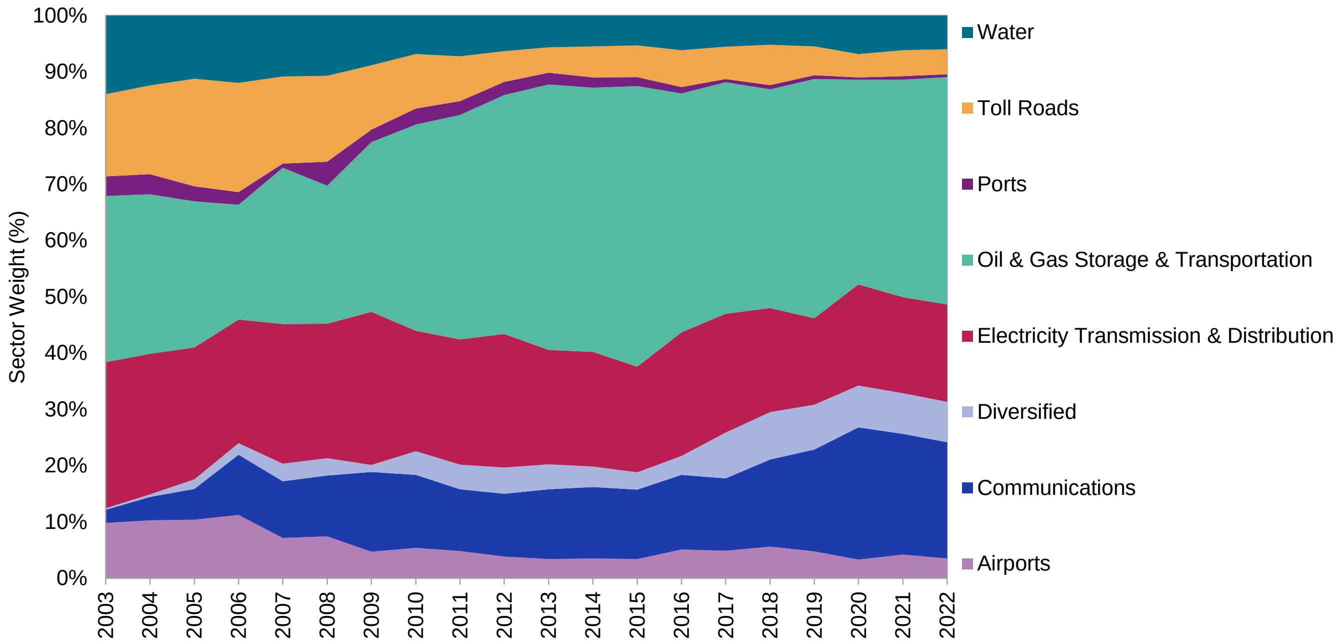



Source: S&P Dow Jones Indices LLC, FactSet. Oil price is represented by WTI crude oil prices (the generic 1st 'CL' future). Data from Dec. 31, 2002, to March 31, 2022. Index performance based on net total return. Past performance is no guarantee of future results. The Dow Jones Brookfield Global Infrastructure Sector Indices were launched July 14, 2008. All data prior to the index launch date is back-tested hypothetical data. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

# Impact of Oil & Gas Storage & Transportation

Among all eight Dow Jones Brookfield pure-play sectors, the Dow Jones Brookfield Global Infrastructure Index is most heavily exposed to Oil & Gas Storage & Transportation. As of March 31, 2022, it made up 40.44% of the index and averaged 36.51% over the past 19 years (see Exhibit 11).

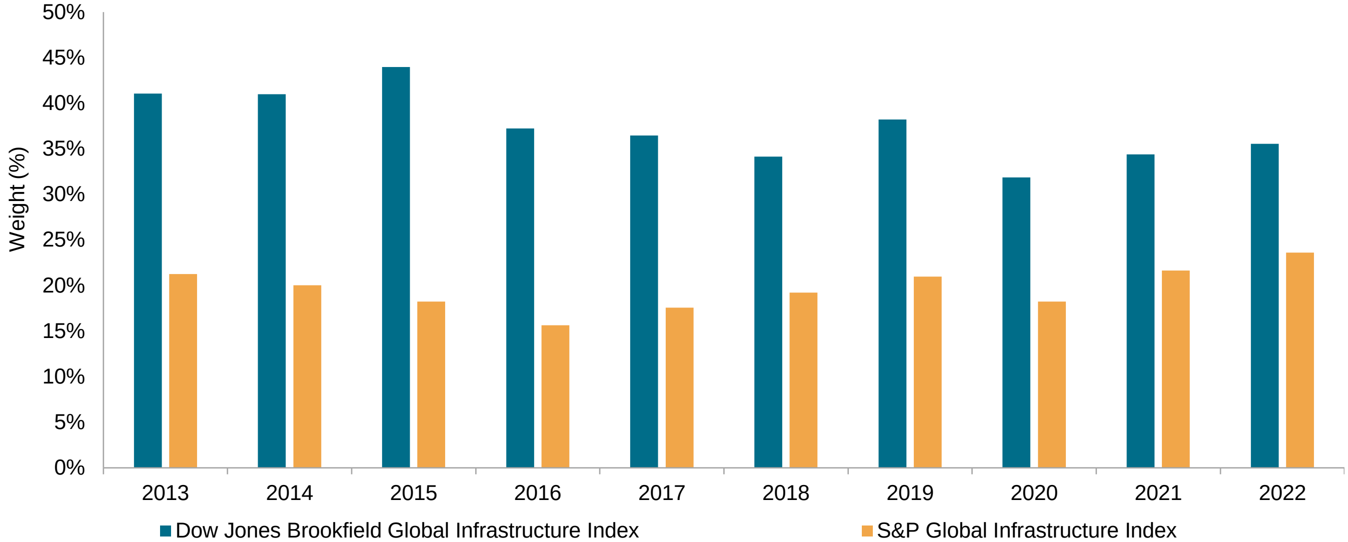
**Exhibit 11: Sector Breakdown of Dow Jones Brookfield Global Infrastructure Index by Dow Jones Brookfield Pure-Play Sectors**




Source: S&P Dow Jones Indices LLC. Data from March 31, 2003, to March 31, 2022. The Dow Jones Brookfield Global Infrastructure Sector Indices were launched July 14, 2008. All data prior to the index launch date is back-tested hypothetical data. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Companies in the Oil & Gas Storage & Transportation sector are defined as being engaged in the development, ownership, lease, concession or management of oil and gas (and other bulk liquid products), fixed transportation or storage assets, and related midstream energy services. This pure-play infrastructure sector corresponds to a combination of two GICS sub-industries: Oil & Gas Storage & Transportation and Gas Utilities. Exhibit 12 shows that over the past 10 years (GICS was not available for the Dow Jones Brookfield Indices before 2012), the Dow Jones Brookfield Global Infrastructure Index had allocated 17.75% more on average to the Oil & Gas Storage & Transportation sector than the S&P Global Infrastructure Index. The difference is a natural result of unconstrained versus constrained index design. The Dow Jones Brookfield Global Infrastructure Index applies an unconstrained approach, while the S&P Global Infrastructure Index is capped at 20% for the Energy sector (Oil & Gas Storage & Transportation) and 40% for the Utilities sector (Gas Utilities; see Exhibit 1).

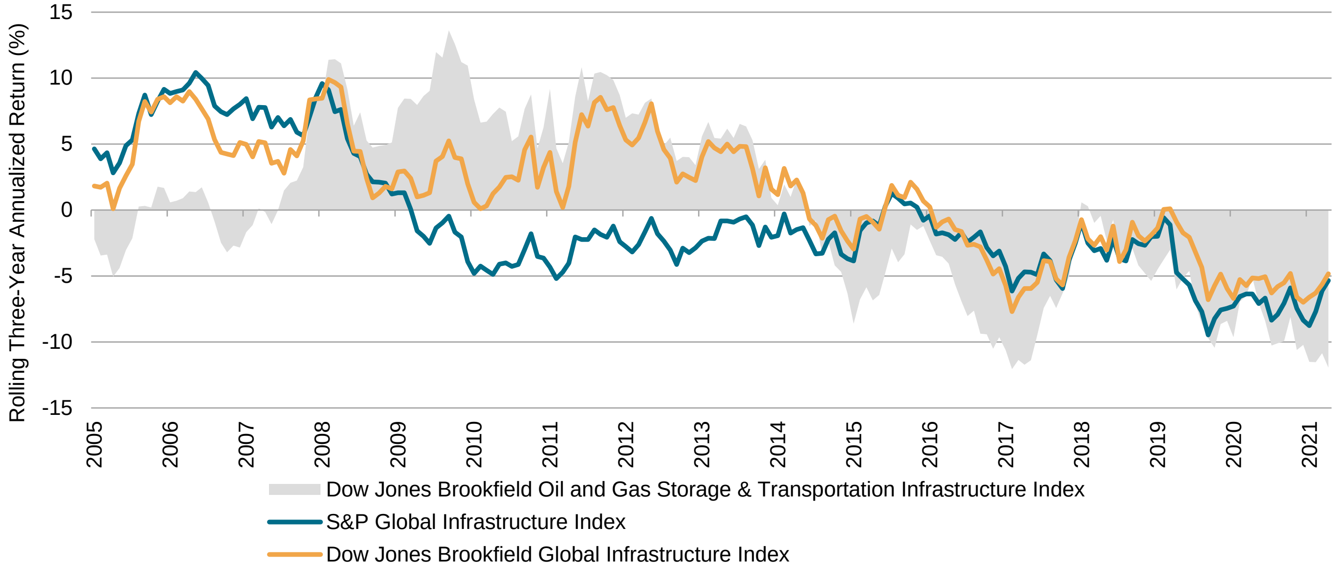
**Exhibit 12: Weight of the Oil & Gas Storage & Transportation Sector in the Dow Jones Brookfield Infrastructure Index and S&P Global Infrastructure Index**




Source: S&P Dow Jones Indices LLC. Data from March 31, 2013, to March 31, 2022. Chart is provided for illustrative purposes.

Given its substantial weight, Oil & Gas Storage & Transportation plays an important role in understanding the performance of the Dow Jones Brookfield Global Infrastructure Index. Exhibit 13 demonstrates the impact of Oil & Gas Storage & Transportation on the Dow Jones Brookfield Global Infrastructure Index in comparison with the S&P Global Infrastructure Index on a rolling three-year basis. There are two clear-cut intervals since the 2008 Global Financial Crisis. First, from January 2009 to mid-2015, the Dow Jones Brookfield Global Infrastructure Index presented a long-lasting outperformance over the S&P Global Infrastructure Index, which can be largely attributed to the rapid growth in Oil & Gas Storage & Transportation during this period. On the other hand, the Oil & Gas Storage & Transportation sector could also drag down the Dow Jones Brookfield Global Infrastructure Index when its performance was heavily suppressed. For example, during the period from mid-2015 to late-2018, and from February 2020 to the end of that year, the Dow Jones Brookfield Global Infrastructure Index had a similar return to the S&P Global Infrastructure Index, as the Oil & Gas Storage & Transportation sector fell due to depressed oil prices or supply uncertainties.

**Exhibit 13: Dow Jones Brookfield Infrastructure Index versus S&P Global Infrastructure Index – Rolling Three-Year Annualized Return in Excess of the S&P Global BMI**




Source: S&P Dow Jones Indices LLC. Data from Dec. 30, 2005, to March 31, 2022. Index performance based on net total return in USD. Past performance is no guarantee of future results. The S&P Global Infrastructure Index was launched Feb. 22, 2007. The Dow Jones Brookfield Global Infrastructure Index and Dow Jones Brookfield Oil and Gas Storage & Transportation Infrastructure Index were launched July 14, 2008. All data prior to the index launch date is back-tested hypothetical data. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

# Listed Infrastructure in Asset Allocation

Infrastructure could offer return, risk and diversification characteristics that are different from those of other asset classes; thus, it may merit consideration for diversification purposes.

Exhibit 14 provides a detailed comparative overview of two infrastructure indices from S&P Dow Jones Indices versus a few major asset classes, including U.S. medium-term Treasury Bonds (as measured by the S&P U.S. Treasury Bond 7-10 Year Index[4]), U.S. investment grade corporate bonds (as measured by the S&P U.S. Investment Grade Corporate Bond Index), U.S. high yield corporate bonds (as measured by the S&P U.S. High Yield Corporate Bond Index), global leveraged loans (as measured by the S&P/LSTA U.S. Leveraged Loan 100 Index), and global equities (as measured by the S&P Global BMI). Exhibit 14 demonstrates that, from December 2002 to March 2022, the Dow Jones Brookfield Global Infrastructure Index outperformed all other asset classes in terms of absolute return. It also outperformed the S&P Global BMI in terms of the Sharpe, Sortino and MAR ratios. The latter two of these ratios could be of interest to market participants who are more concerned about downside risk.

[4] The S&P U.S. Treasury Bond 7-10 Year Index was formerly known as the S&P/BG Cantor 7-10 Year U.S. Treasury Bond Index.

**Exhibit 14: Return Profile of S&P DJI Infrastructure Indices versus Alternatives**

| Metric | S&P U.S. Treasury Bond 7-10 Year Index | S&P U.S. Investment Grade Corporate Bond Index | S&P U.S. High Yield Corporate Bond Index | S&P/LSTA U.S. Leveraged Loan 100 Index | S&P Global BMI | Dow Jones Brookfield Global Infrastructure Index | S&P Global Infrastructure Index |
|---|---|---|---|---|---|---|---|
| Annual Return (%) | 4.03 | 4.54 | 7.54 | 4.69 | 9.48 | 11.31 | 9.38 |
| Maximum Drawdown (%) | -11.15 | -13.45 | -30.64 | -29.23 | -55.44 | -45.23 | -53.21 |
| Annual Volatility (%) | 6.25 | 5.19 | 8.27 | 6.99 | 15.44 | 13.28 | 15.37 |
| Annual Skewness | 0.06 | -0.23 | -0.52 | -0.38 | -0.23 | -0.24 | -0.36 |
| Monthly Alpha to the S&P Global BMI (%) | 0.43 | 0.27 | 0.29 | 0.14 | 0.00 | 0.36 | 0.10 |
| T-Statistics of Alpha | 3.66 | 2.93 | 2.75 | 1.41 | - | 2.48 | 0.70 |
| Beta to the S&P Global BMI | -0.10 | 0.13 | 0.41 | 0.31 | 1.00 | 0.71 | 0.88 |
| Correlation with the S&P Global BMI | -0.24 | 0.38 | 0.76 | 0.68 | 1.00 | 0.82 | 0.88 |
| Sharpe Ratio[5] | 0.46 | 0.65 | 0.77 | 0.51 | 0.54 | 0.76 | 0.53 |
| Sortino Ratio | 0.75 | 0.78 | 0.72 | 0.42 | 0.66 | 0.97 | 0.61 |
| MAR Ratio | 0.36 | 0.34 | 0.25 | 0.16 | 0.17 | 0.25 | 0.18 |
| Omega Ratio | 1.68 | 2.05 | 2.23 | 2.10 | 1.68 | 1.94 | 1.68 |

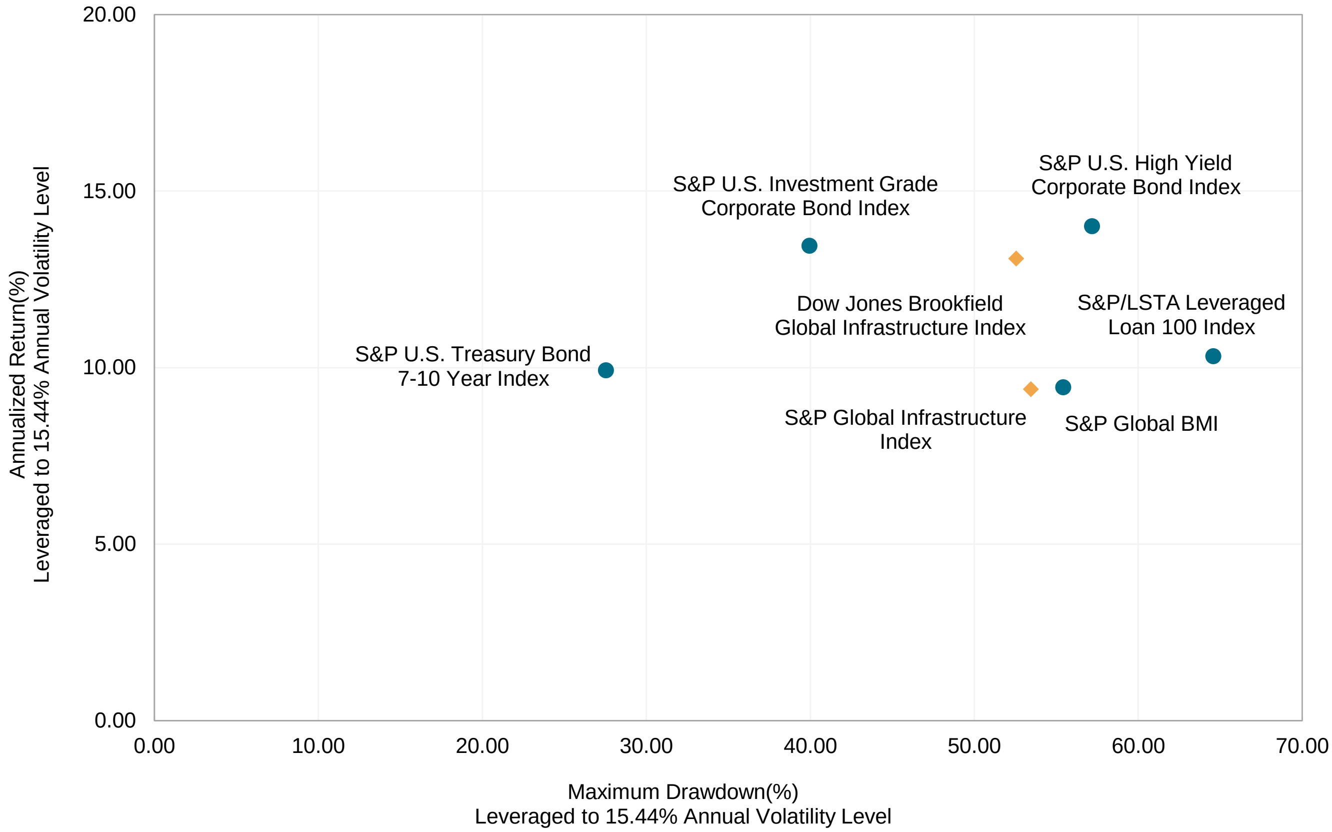
Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 2002, to March 31, 2022. Index performance based on net total return in USD. Past performance is no guarantee of future results. The S&P Global Infrastructure Index was launched Feb. 22, 2007. The Dow Jones Brookfield Global Infrastructure Index was launched July 14, 2008. The S&P U.S. Treasury Bond 7-10 Year Index was launched March 24, 2010. The S&P U.S. Investment Grade Corporate Bond Index was launched July 31, 2017. The S&P U.S. High Yield Corporate Bond Index was launched Dec. 15, 2016. The S&P/LSTA U.S. Leverage Loan 100 Index was launched Oct. 20, 2008. All data prior to index launch date is back-tested hypothetical data. Table is provided for illustrative purposes reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Exhibit 15 provides a visual illustration of the return versus the drawdown of the Dow Jones Brookfield Global Infrastructure Index, the S&P Global Infrastructure Index and other asset classes. All index returns and drawdowns are leveraged to a 15.44% annual volatility level, which was the annual volatility of the S&P Global BMI's net total returns from December 2002 to March 2022. For market participants who focus on return per unit of risk, it is worth noting that with the same downside risk, the Dow Jones Brookfield Global Infrastructure Index generated higher return than global equities during this period.

5 The Sharpe ratio is the annualized excess return of an index over the S&P U.S. Treasury Bill 0-3 Month Index divided by the annualized standard deviation of monthly returns. The Sortino ratio is the annualized excess return of an index over the S&P U.S. Treasury Bill 0-3 Month Index divided by the standard deviation of negative asset returns. The MAR ratio is the annualized return divided by the maximum drawdown for the measurement period. The Omega ratio is the absolute value of the sum of positive returns divided by the sum of negative returns, based on monthly returns.

Diversification is the key advantage of infrastructure ownership in a portfolio context. From December 2002 to March 2022, the Dow Jones Brookfield Global Infrastructure Index had a correlation of -0.04 with U.S. Treasury Bonds, 0.48 with U.S. investment grade corporate bonds, 0.72 with U.S. high yield corporate bonds, 0.60 with global leveraged loans, and 0.82 with global equities (see Exhibit 16).

**Exhibit 15: Risk/Return Profile of S&P DJI Infrastructure Indices versus Alternatives**




Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 2002, to March 31, 2022. Past performance is no guarantee of future results. The S&P Global Infrastructure Index was launched Feb. 22, 2007. The Dow Jones Brookfield Global Infrastructure Index was launched July 14, 2008. The S&P U.S. Treasury Bond 7-10 Year Index was launched March 24, 2010. The S&P U.S. Investment Grade Corporate Bond Index was launched July 31, 2017. The S&P U.S. High Yield Corporate Bond Index was launched Dec. 15, 2016. The S&P/LSTA U.S. Leverage Loan 100 Index was launched Oct. 20, 2008. All data prior to index launch date is back-tested hypothetical data. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance. Net total returns displayed are actual performance leveraged to a 15.44% annual volatility level, which is the annual volatility of the S&P Global BMI during the period.

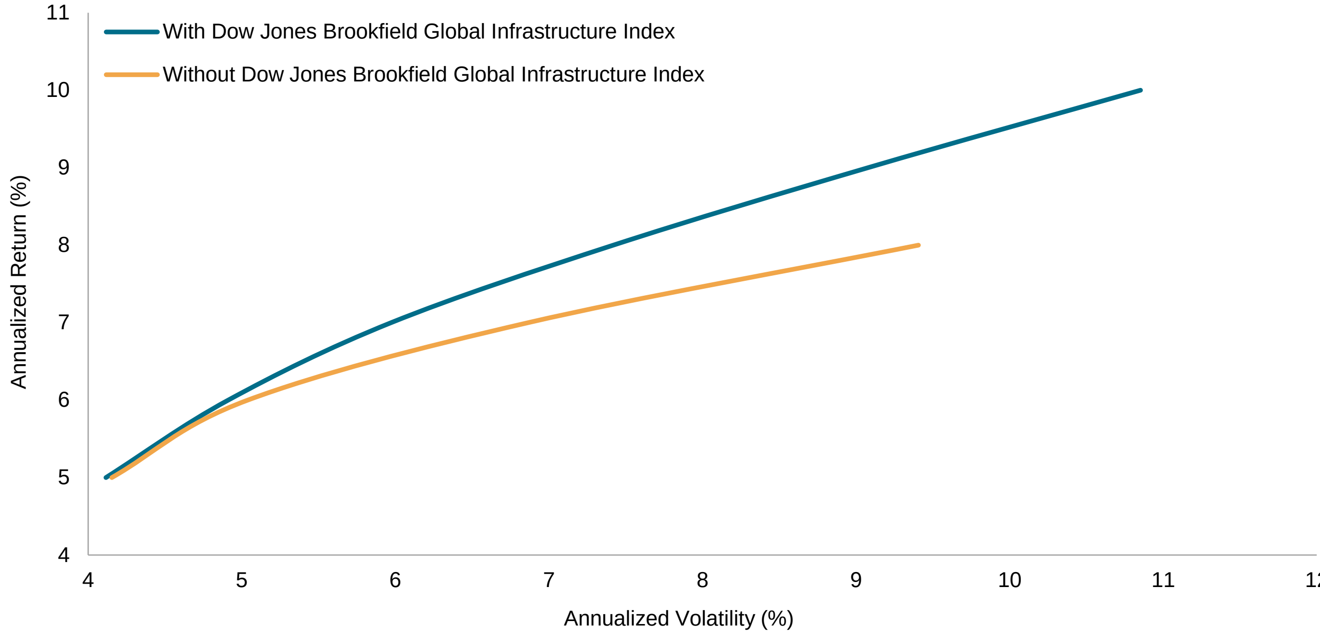
**Exhibit 16: Pairwise Correlation between S&P DJI Infrastructure Indices and Alternatives**

| Index | S&P U.S. Treasury Bond 7-10 Year Index | S&P U.S. Investment Grade Corporate Bond Index | S&P U.S. High Yield Corporate Bond Index | S&P/LSTA U.S. Leveraged Loan 100 | S&P Global BMI | Dow Jones Brookfield Global Infrastructure | S&P Global Infrastructure Index |
|---|---|---|---|---|---|---|---|
| S&P U.S. Treasury Bond 7-10 Year Index | - | 0.59 | -0.14 | -0.36 | -0.24 | -0.04 | -0.08 |
| S&P U.S. Investment Grade Corporate Bond Index | 0.59 | - | 0.60 | 0.37 | 0.38 | 0.48 | 0.49 |
| S&P U.S. High Yield Corporate Bond Index | -0.14 | 0.60 | - | 0.89 | 0.76 | 0.72 | 0.74 |
| S&P/LSTA U.S. Leveraged Loan 100 | -0.36 | 0.37 | 0.89 | - | 0.68 | 0.60 | 0.62 |
| S&P Global BMI | -0.24 | 0.38 | 0.76 | 0.68 | - | 0.82 | 0.88 |
| Dow Jones Brookfield Global Infrastructure | -0.04 | 0.48 | 0.72 | 0.60 | 0.82 | - | 0.95 |
| S&P Global Infrastructure Index | -0.08 | 0.49 | 0.74 | 0.62 | 0.88 | 0.95 | - |

Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 2002, to March 31, 2022. Index performance based on net total return. Past performance is no guarantee of future results. The S&P Global Infrastructure Index was launched Feb. 22, 2007. The Dow Jones Brookfield Global Infrastructure Index was launched July 14, 2008. The S&P U.S. Treasury Bond 7-10 Year Index was launched March 24, 2010. The S&P U.S. Investment Grade Corporate Bond Index was launched July 31, 2017. The S&P U.S. High Yield Corporate Bond Index was launched Dec. 15, 2016. The S&P/LSTA U.S. Leverage Loan 100 Index was launched Oct. 20, 2008. All data prior to index launch date is back-tested hypothetical data. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Finally, we performed two traditional Markowitz mean-variance optimizations, with and without the Dow Jones Brookfield Global Infrastructure Index included in the opportunity set of U.S. medium-term U.S. Treasury bonds, investment grade corporate bonds, high yield corporate bonds, leveraged loans and global equities. The resulting historical efficient frontiers are presented in Exhibit 17. There was a clear improvement in the efficiency of the resulting asset allocations after adding infrastructure into the opportunity set.

**Exhibit 17: Historical Efficient Frontier**




Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 2002, to March 31, 2022. Index performance based on net total return in USD. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance. The following indices were used in preparation of the exhibit: S&P U.S. Treasury Bond 7-10 Year Index, S&P U.S. Investment Grade Corporate Bond Index, S&P U.S. High Yield Corporate Bond Index, S&P/LSTA U.S. Leverage Loan 100 Index, S&P Global BMI and Dow Jones Brookfield Global Infrastructure Index. The S&P Global Infrastructure Index was launched Feb. 22, 2007. The Dow Jones Brookfield Global Infrastructure Index was launched July 14, 2008. The S&P U.S. Treasury Bond 7-10 Year Index was launched March 24, 2010. The S&P U.S. Investment Grade Corporate Bond Index was launched July 31, 2017. The S&P U.S. High Yield Corporate Bond Index was launched Dec. 15, 2016. The S&P/LSTA U.S. Leverage Loan 100 Index was launched Oct. 20, 2008. All data prior to index launch date is back-tested hypothetical data.

# Conclusion

Infrastructure is an asset class that has historically been a strong source of diversification, yield and attractive net total returns. Given the essential role of infrastructure assets as a backbone for economic growth, and in light of the growing trend of privatization of these assets, this sector is an emerging asset class in its own right. Unlike other listed infrastructure indices, the Dow Jones Brookfield Global Infrastructure Index and the S&P Global Infrastructure Index use a broad-based approach that identifies companies that fall into the pure-play infrastructure category. Listed infrastructure, in particular, may offer a sound anchor and immediate entry point into the asset class.

# Performance Disclosure/Back-Tested Data

The S&P Global Infrastructure Index was launched February 22, 2007. The Dow Jones Brookfield Global Infrastructure Index was launched July 14, 2008. The S&P U.S. Treasury Bond 7-10 Year Index was launched March 24, 2010. The S&P U.S. Investment Grade Corporate Bond Index was launched July 31, 2017. The S&P U.S. High Yield Corporate Bond Index was launched December 15, 2016. The S&P/LSTA U.S. Leverage Loan 100 Index was launched October 20, 2008. The Dow Jones Brookfield Airports Infrastructure Index, Dow Jones Brookfield Communications Infrastructure Index, Dow Jones Brookfield Diversified Infrastructure Index, Dow Jones Brookfield Oil and Gas Storage & Transportation Infrastructure Index, Dow Jones Brookfield Electricity Transmission & Distribution Infrastructure Index, Dow Jones Brookfield Ports Infrastructure Index, Dow Jones Brookfield Toll Roads Infrastructure Index and Dow Jones Brookfield Water Infrastructure Index were launched July 14, 2008. All information presented prior to an index's Launch Date is hypothetical (back-tested), not actual performance, and is based on the index methodology in effect on the index launch date. However, when creating back-tested history for periods of market anomalies or other periods that do not reflect the general current market environment, index methodology rules may be relaxed to capture a large enough universe of securities to simulate the target market the index is designed to measure or strategy the index is designed to capture. For example, market capitalization and liquidity thresholds may be reduced. In addition, forks have not been factored into the back-test data with respect to the S&P Cryptocurrency Indices. For the S&P Cryptocurrency Top 5 & 10 Equal Weight Indices, the custody element of the methodology was not considered; the back-test history is based on the index constituents that meet the custody element as of the Launch Date. Complete index methodology details are available at www.spglobal.com/spdji. Back-tested performance reflects application of an index methodology and selection of index constituents with the benefit of hindsight and knowledge of factors that may have positively affected its performance, cannot account for all financial risk that may affect results and may be considered to reflect survivor/look ahead bias. Actual returns may differ significantly from, and be lower than, back-tested returns. Past performance is not an indication or guarantee of future results.

Please refer to the methodology for the Index for more details about the index, including the manner in which it is rebalanced, the timing of such rebalancing, criteria for additions and deletions, as well as all index calculations. Back-tested performance is for use with institutions only; not for use with retail investors.

S&P Dow Jones Indices defines various dates to assist our clients in providing transparency. The First Value Date is the first day for which there is a calculated value (either live or back-tested) for a given index. The Base Date is the date at which the index is set to a fixed value for calculation purposes. The Launch Date designates the date when the values of an index are first considered live: index values provided for any date or time period prior to the index's Launch Date are considered back-tested. S&P Dow Jones Indices defines the Launch Date as the date by which the values of an index are known to have been released to the public, for example via the company's public website or its data feed to external parties. For Dow Jones-branded indices introduced prior to May 31, 2013, the Launch Date (which prior to May 31, 2013, was termed "Date of introduction") is set at a date upon which no further changes were permitted to be made to the index methodology, but that may have been prior to the Index's public release date.

Typically, when S&P DJI creates back-tested index data, S&P DJI uses actual historical constituent-level data (e.g., historical price, market capitalization, and corporate action data) in its calculations. As ESG investing is still in early stages of development, certain datapoints used to calculate S&P DJI's ESG indices may not be available for the entire desired period of back-tested history. The same data availability issue could be true for other indices as well. In cases when actual data is not available for all relevant historical periods, S&P DJI may employ a process of using "Backward Data Assumption" (or pulling back) of ESG data for the calculation of back-tested historical performance. "Backward Data Assumption" is a process that applies the earliest actual live data point available for an index constituent company to all prior historical instances in the index performance. For example, Backward Data Assumption inherently assumes that companies currently not involved in a specific business activity (also known as "product involvement") were never involved historically and similarly also assumes that companies currently involved in a specific business activity were involved historically too. The Backward Data Assumption allows the hypothetical back-test to be extended over more historical years than would be feasible using only actual data. For more information on "Backward Data Assumption" please refer to the FAQ. The methodology and factsheets of any index that employs backward assumption in the back-tested history will explicitly state so. The methodology will include an Appendix with a table setting forth the specific data points and relevant time period for which backward projected data was used.

Index returns shown do not represent the results of actual trading of investable assets/securities. S&P Dow Jones Indices maintains the index and calculates the index levels and performance shown or discussed 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 investment funds that are intended to track the performance of the Index. The imposition of these fees and charges would cause actual and back-tested performance of the securities/fund to be lower than the Index performance shown. As a simple example, if an index returned 10% on a US $100,000 investment for a 12-month period (or US $10,000) and an actual asset-based fee of 1.5% was imposed at the end of the period on the investment plus accrued interest (or US $1,650), the net return would be 8.35% (or US $8,350) for the year. Over a three-year period, an annual 1.5% fee taken at year end with an assumed 10% return per year would result in a cumulative gross return of 33.10%, a total fee of US $5,375, and a cumulative net return of 27.2% (or US $27,200).

# General Disclaimer



It is not possible to invest directly in an index. Exposure to an asset class represented by an index may be available through investable instruments based on that index. S&P Dow Jones Indices does not sponsor, endorse, sell, promote or manage any investment fund or other investment vehicle that is offered by third parties and that seeks to provide an investment return based on the performance of any index. S&P Dow Jones Indices makes no assurance that investment products based on the index will accurately track index performance or provide positive investment returns. S&P Dow Jones Indices LLC is not an investment advisor, and S&P Dow Jones Indices makes no representation regarding the advisability of investing in any such investment fund or other investment vehicle. A decision to invest in any such investment fund or other investment vehicle should not be made in reliance on any of the statements set forth in this document. S&P Dow Jones Indices is not an investment adviser, commodity trading advisor, commodity pool operator, broker dealer, fiduciary, promoter" (as defined in the Investment Company Act of 1940, as amended), "expert" as enumerated within 15 U.S.C. § 77k(a) or tax advisor. Inclusion of a security, commodity, crypto currency or other asset within an index is not a recommendation by S&P Dow Jones Indices to buy, sell, or hold such security, commodity, crypto currency or other asset, nor is it considered to be investment advice or commodity trading advice.

These materials have been prepared solely for informational purposes based upon information generally available to the public and from sources believed to be reliable. No content contained in these materials (including index data, ratings, credit-related analyses and data, research, valuations, model, software or other application or output therefrom) or any part thereof ("Content") may be modified, reverse-engineered, reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written permission of S&P Dow Jones Indices. The Content shall not be used for any unlawful or unauthorized purposes. S&P Dow Jones Indices and its third-party data providers and licensors (collectively "S&P Dow Jones Indices Parties") do not guarantee the accuracy, completeness, timeliness or availability of the Content. S&P Dow Jones Indices Parties are not responsible for any errors or omissions, regardless of the cause, for the results obtained from the use of the Content. THE CONTENT IS PROVIDED ON AN "AS IS" BASIS. S&P DOW JONES INDICES PARTIES DISCLAIM ANY AND ALL EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, FREEDOM FROM BUGS, SOFTWARE ERRORS OR DEFECTS, THAT THE CONTENT'S FUNCTIONING WILL BE UNINTERRUPTED OR THAT THE CONTENT WILL OPERATE WITH ANY SOFTWARE OR HARDWARE CONFIGURATION. In no event shall S&P Dow Jones Indices Parties be liable to any party for any direct, indirect, incidental, exemplary, compensatory, punitive, special or consequential damages, costs, expenses, legal fees, or losses (including, without limitation, lost income or lost profits and opportunity costs) in connection with any use of the Content even if advised of the possibility of such damages.

S&P Global keeps certain activities of its various divisions and business units separate from each other in order to preserve the independence and objectivity of their respective activities. As a result, certain divisions and business units of S&P Global may have information that is not available to other business units. S&P Global has established policies and procedures to maintain the confidentiality of certain non-public information received in connection with each analytical process.

In addition, S&P Dow Jones Indices provides a wide range of services to, or relating to, many organizations, including issuers of securities, investment advisers, broker-dealers, investment banks, other financial institutions and financial intermediaries, and accordingly may receive fees or other economic benefits from those organizations, including organizations whose securities or services they may recommend, rate, include in model portfolios, evaluate or otherwise address.

The Global Industry Classification Standard (GICS®) was developed by and is the exclusive property and a trademark of S&P and MSCI. Neither MSCI, S&P nor any other party involved in making or compiling any GICS classifications makes any express or implied warranties or representations with respect to such standard or classification (or the results to be obtained by the use thereof), and all such parties hereby expressly disclaim all warranties of originality, accuracy, completeness, merchantability or fitness for a particular purpose with respect to any of such standard or classification. Without limiting any of the foregoing, in no event shall MSCI, S&P, any of their affiliates or any third party involved in making or compiling any GICS classifications have any liability for any direct, indirect, special, punitive, consequential or any other damages (including lost profits) even if notified of the possibility of such damages.