S&P Dow Jones Indices

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Trucost by S&P Dow Jones Indices
ESG Analysis

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The Carbon Scorecard

S&P Dow Jones Indices is committed to providing transparency to markets and publishing relevant environmental metrics on indices. A range of metrics reveals the carbon footprint of each index, alongside exposure to fossil fuels, stranded assets, and renewable energy. A new metric has been added this year: carbon price risk exposure. This metric, developed by Trucost, helps investors understand how companies, and ultimately portfolios and indices, are exposed to the risk of governments imposing a price on carbon emissions.

KEY FINDINGS

- Absolute emissions decreased for the S&P Asia 50, S&P Europe 350, S&P Global 1200, S&P Latin America 40, S&P/ASX All Australian 50, and S&P TOPIX 150.
- In 2017, all indices increased their share of renewable power generation and decreased their share of fossil fuel power generation, with the exceptions of the S&P/ASX All Australian 50 and S&P Asia 50.
- The S&P/TOPIX 150 had the smallest coal exposure score and is well positioned in the face of punitive climate legislation.
- The carbon intensity of every index assessed increased in 2017, except for the S&P Asia 50, which decreased its carbon intensity by 26%.
- In 2017, the index with the highest carbon intensity was the S&P/TSX 60 whereas in 2016 it was the S&P Asia 50.
- Within the S&P/IFCI, 26% of earnings of the index's listed companies were at risk from 2030 carbon pricing regimes according to the Trucost carbon pricing model.
- S&P Dow Jones Indices is committed to providing index solutions that provide choices and reflect low-carbon options. When we compare indices with their carbon-focused counterparts, the low-carbon versions actually outperformed the benchmark over a five-year period in most cases.

INTRODUCTION

The S&P Dow Jones Indices Carbon Scorecard stands as a barometer for the carbon intensity of financial markets today and its relation to the direction of the economy.

As regulators strengthen policies that support the growth of "sustainable" economies, the investment community will rely on transparent markets to manage risk and capitalize on sustainable development opportunities. How companies can adapt their products and services to changing consumer demands and how they are exposed to regulations that seek to put a price on carbon are among the key questions to which shareholders, lenders, and insurers now seek answers.

In addition, financial regulators are moving to embed sustainable finance at the core of capital markets. Earlier this year, the EU High Level Expert Group on Sustainable Finance, which S&P Global was proud to be a member of, recommended a wide range of policy interventions. In response, the EU published its Action Plan on Sustainable Finance, which introduced a raft of proposed regulatory measures that will, if implemented, impose greater emphasis on investor duties and transparency in markets. Such moves are mirrored across the world. For example, the U.S. Department of Labor recently updated its guidance on the integration of ESG in the investment process, and the UK is seeking to strengthen pension regulations. As such, we have seen increasing market participant interest in understanding the exposure of their investments to a range of carbon indicators.

It is now considered best practice to report on portfolio exposure to carbon even in markets where guidance is lacking.

Understanding carbon risks and their potential financial impact is crucial if we are to avoid sudden and inconsistent write-downs of assets and redirect capital toward activities that are aligned with global climate commitments. Mandatory and voluntary guidance have acted as a crutch to encourage behavioral change, and it is now considered best practice to report on portfolio exposure to carbon even in markets where guidance is lacking. Investors with over USD 60 trillion in AUM now report their carbon exposure.[1]

S&P Dow Jones Indices published its Carbon Scorecard for the first time in 2015 to show the exposure of major global benchmarks to carbon risks. Subsequent publications show how quickly the market (measured as the largest companies in each region) is transitioning to a lower-carbon economy.

For the first time, we have added two fixed income benchmarks to the 10 equity benchmarks assessed by the Carbon Scorecard to provide a broader perspective on the carbon exposure of global financial markets.

Direction of Travel

The absolute emissions associated with index constituents give us a measure of a benchmark's overall contribution to global greenhouse gas levels and tell us whether carbon exposure is increasing or reducing over

[1] https://www.unpri.org/signatories

time. Exhibit 1 shows the absolute emissions associated with S&P DJI benchmarks in 2016 and 2017. While we saw an increase in emissions in the S&P 500®, S&P United Kingdom, S&P/IFCI, and S&P/TSX 60, the remaining indices showed a decrease, with the largest decrease coming from the S&P Asia 50 (a 45% reduction).

The absolute emissions associated with index constituents give us a measure of a benchmark's overall contribution to global greenhouse gas levels and tell us whether carbon exposure is increasing or reducing over time.

Exhibit 1: Absolute Index Emissions in S&P DJI Benchmarks

INDEX	2016 (tCO2e)	2017 (tCO2e)	CHANGE (%)
S&P 500	2,797,022,831	2,881,064,464	3%
S&P Asia 50	768,308,217	419,149,763	-45%
S&P Europe 350	2,726,038,281	2,713,373,489	-0%
S&P Global 1200	7,909,551,311	7,495,523,590	-5%
S&P Latin America 40	282,213,130	280,035,653	-1%
S&P United Kingdom	549,462,116	575,384,463	5%
S&P/ASX All Australian 50	224,753,469	220,599,614	-2%
S&P/IFCI	6,515,932,309	6,663,948,075	2%
S&P/TOPIX 150	909,132,845	817,225,764	-10%
S&P/TSX 60	216,047,984	231,570,054	7%

Source: Trucost. Data as of Dec. 29, 2017. Table is provided for illustrative purposes.

In order to compare the relative performance of indices of different sizes, absolute index emissions must be normalized. Total assets under management, revenues, production volumes, or floor space are some examples of units that can be used, and there is no right or wrong approach. As turnover is considered to be a good proxy for production volumes, it provides a better indicator of carbon efficiency than many other metrics and is therefore widely adopted by market participants undertaking portfolio footprinting.

There are multiple variables to consider when understanding any performance metric. For example, a carbon to revenue intensity ratio will favor luxury goods companies that can price their products higher than "high street" peers. Revenues are also sensitive to market dynamics with changes in supply and demand creating pricing swings that can distort year-over-year comparisons. There can also be a currency effect when converting non-U.S. revenues into USD. A stronger U.S. dollar will translate into lower dollar-denominated revenues for foreign operations, which can affect the carbon to revenue ratio year-over-year. It is important to bear these factors in mind when considering the results of carbon exposure analysis.

An Update on Carbon Footprint Methodology

There is currently no single standard methodology for measuring the carbon footprint of a portfolio or benchmark. The four approaches that are most widely used (total carbon emissions, carbon to value invested, carbon to revenue intensity, and weighted average carbon intensity) each have

their own advantages and limitations. Metric selection often depends on the question an investor is trying to answer.

In our last publication of the Carbon Scorecard in May 2017,[2] we selected an approach well suited to equities (carbon to value invested), which apportioned emissions based on the percentage of total market capitalization owned. However, this year's scorecard extends our analysis to fixed income benchmarks and therefore a different approach is required.

One methodologically sound approach would be to exchange market capitalization for enterprise value, taking into account total equity and debt financing when apportioning emissions back to an investor. However, in instances where cash deductions make enterprise value low or negative, the overall results can become skewed.

The weighted average carbon intensity metric takes the carbon intensity (direct + first tier indirect emissions/revenue) of each holding and multiplies it by its investment weight in the benchmark. The final footprint is the sum of these weighted intensities. If sales data is unavailable for a particular security, that holding is removed and the benchmark index is reweighted accordingly.

We have therefore chosen to use weighted average carbon intensity for this report, which was the approach advocated by the Taskforce for Climate-related Financial Disclosures (TCFD) in its 2017 Final Recommendations Report.[3] This methodology does not require market capitalization or enterprise value as inputs and can therefore be applied more easily to asset classes beyond equity and listed fixed income.[4]

The Five Measures of Carbon Risks and Opportunities in This Report

We have analyzed index exposure to carbon risks using five indicators.

1. **Carbon Footprint:** The overall weighted average carbon intensity of each benchmark calculated as the sum of the direct and first-tier supply chain greenhouse gas emissions released by each constituent in the index, divided by their revenues,[5] and then multiplied by their index weight.[6]

2. **Fossil Fuel Reserve Emissions:** The greenhouse gas emissions that could be generated if the proven and probable fossil fuel reserves owned by index constituents were burned.

[2] https://spindices.com/indexology/esg/carbon-scorecard

[3] https://www.fsb-tcfd.org/wp-content/uploads/2017/06/FINAL-TCFD-Report-062817.pdf

[4] As noted, there are advantages and limitations with every approach. In the case of the weighted average carbon intensity metric, limitations include:
- Inconsistency with the GHG Protocol accounting standard for measuring and reporting emissions;
- Sensitivity to outliers at a portfolio level; and
- Use of revenues to normalize carbon emissions benefits companies that price their goods and services higher than their peers.

[5] Index constituent revenues were based on the end of financial year 2016.

[6] Index weights were as of Dec. 29, 2017

3. **Coal Revenue Exposure:** The percentage of total index weight coming from companies that derive more than 10% of revenues from coal extraction or coal power generation.

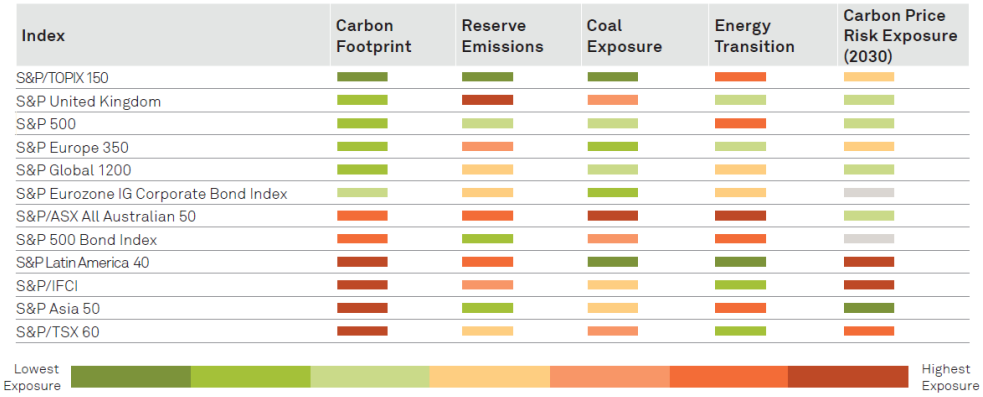
4. **Energy Transition:** The percentage of total energy generated by an index's constituents (over a 12-month period) that is classified as coming from renewable sources. Each index can be compared to the International Energy Agency's 2 degrees Celsius scenario to gauge current alignment with a global transition pathway.

5. **Carbon Price Risk Exposure:** The estimated portion of index company earnings that could be lost if index constituents had to absorb the additional operational emissions and those from purchased electricity.

The colors in Exhibit 2 convey how the benchmark indices have performed in each category relative to each other. As can be seen from the table, each indicator tells a different story, and low exposure in one aspect of carbon risk does not necessarily imply a low exposure in another.

Low exposure in one aspect of carbon risk does not necessarily imply a low exposure in another.

Exhibit 2: Indicators of Carbon Exposure in S&P DJI Benchmarks



Source: Trucost. Data as of Dec. 29, 2017. Table is provided for illustrative purposes.

1. CARBON FOOTPRINT

Portfolio carbon footprinting aims to capture an investor's exposure to carbon-intensive companies, and it is often the first step investors take when assessing carbon risk exposure. As governments raise subsidies for cleaner technologies or increase the scale and reach of carbon pricing mechanisms, companies with a high carbon to revenue-intensity ratio will likely bear the brunt. This metric isolates areas of high risk and provides a useful indicator of index exposure relative to other markets.

Exhibit 3 shows the carbon intensity of each index between 2016 and 2017. In terms of relative intensity, the S&P United Kingdom showed the largest year-over-year increase. Despite reductions in sector weights for utilities and energy, the index showed an overall increase in absolute emissions and an overall reduction in U.S. dollar-denominated revenues, which

contributed to this higher intensity figure. A significant increase in emissions from one energy constituent influenced the rise.

Exhibit 3: Weighted Average Carbon Intensity

INDEX	2016 (tCO2e/USD million)	2017 (tCO2e/USD million)	CHANGE (%)
S&P/TOPIX 150	183	194	5.9
S&P United Kingdom	209	252	20.7
S&P 500	255	259	1.37
S&P Europe 350	242	267	10.2
S&P Global 1200	270	279	3.63
S&P Eurozone Investment Grade Corporate Bond Index	-	310	-
S&P/ASX All Australian 50	370	415	12.19
S&P 500 Bond Index	-	415	-
S&P Latin America 40	439	450	2.49
S&P/IFCI	460	461	0.28
S&P Asia 50	642	472	-26.43
S&P/TSX 60	423	478	13.03

Lowest Exposure — Highest Exposure

Source: Trucost. Data as of Dec. 29, 2017. Table is provided for illustrative purposes.

The S&P Asia 50 was the most carbon-intensive benchmark in 2016, but it demonstrated the greatest year-over-year improvement across all indices in this group in 2017. Reductions in carbon intensity across the energy, utilities and industrials sectors were compounded by reductions in index weight to give an overall reduction of 26% in the weighted average carbon intensity. This was particularly marked in the utilities sector, where the rate moved from 21,000 tCO2e/USD million to 14,000 tCO2e/USD million. The removal of Korea Electric Power from the index between 2016 and 2017 and reductions in carbon intensity from companies such as Formosa Plastics contributed significantly to this improvement. In 2016, Korea Electric Power's total emissions made up 41% of the benchmark's total emissions.

The S&P/TSX 60 was also the only equity benchmark that increased its weight in utilities, as all other benchmarks decreased their weight in the sector.

The S&P/TSX 60 was the most carbon-intensive index in 2017. While the materials sector saw a 29% reduction in absolute emissions, an increase in carbon intensity in this sector contributed to an overall rise.[7] Accounting for 21% of the overall index, the S&P/TSX 60 had the largest energy weight across all indices, well above the 16% and 12% weights of the S&P United Kingdom and S&P Latin America 40, respectively, which had the second- and third-largest weights in energy. The S&P/TSX 60 was also the only equity benchmark that increased its weight in utilities, as all other benchmarks decreased their weight in the sector.

The S&P Global 1200 showed a 5% reduction in absolute emissions, offering a positive global news story. However, we also saw a decline in

[7] This is due to lower reported sales figures over the period in U.S. dollar terms.

overall U.S. dollar-denominated revenues across the benchmark, which led to a higher carbon intensity year-over-year. If revenues are a proxy for output, lower absolute emissions could be the result of lower productivity over the period rather than an indicator of efficiency improvements.

Encouragingly, we saw a swing toward less-carbon-intensive sectors in the S&P Global 1200 in 2017. The information technology sector increased its weight from 15% to 18%, and the utilities and energy sectors decreased their weights.

U.S. dollar-denominated constituent revenues decreased year-over-year for every index except the S&P 500, with the most significant drop (31%) seen in the S&P/IFCI. However, the weighted average footprint shifted by less than 1%. This was again due to sectoral shifts in weight from high carbon to low carbon—information technology grew by 5%, while utilities and energy declined by a combined 1.5%.

In a move that reflected market demand, we saw 81% of constituents in the S&P Global 1200 report emissions data. Standardized, robust disclosure is crucial to the effective management of climate risks and, as such, it is encouraging to see that companies are responding to investor calls for greater transparency. As the Financial Disclosure Board's TCFD states on its website, "increasing transparency makes markets more efficient, and economies more stable."[8]

For the first time in the Carbon Scorecard series, Trucost has applied its carbon metrics to two S&P DJI corporate debt benchmarks. Transition risks (such as carbon pricing mechanisms, changing consumer preferences, or advances that render old technologies obsolete) can affect all asset classes, not just equities. Due to legislative drivers, such as those we have seen in Europe,[9] the publication of best practice risk management guidelines like those from the TCFD, and increased awareness of climate risks, market demand for greater transparency of carbon exposure across different asset classes has been growing.

If a company's debt-to-earnings ratio is high already, the introduction of higher carbon prices could have a material impact on a company's ability to repay its lenders.

The S&P 500 Bond Index and the S&P Eurozone Investment Grade Corporate Bond Index each have a higher weighted average carbon intensity than their equity counterparts. This is driven by a sectoral bias toward the utilities sector. The weight of the utilities sector in the S&P 500 Bond Index in 2017 was 8.19%, compared with 2.93% for the S&P 500. As capital-intensive industries, such as utilities, tend to be the most highly leveraged, it is crucial for debt investors to consider the resilience of those assets in the face of climate risks and a company's ability to diversify. If a company's debt-to-earnings ratio is high already, the introduction of higher

[8] https://www.fsb-tcfd.org/

[9] Article 173 of the French Energy Transition Law requires all market participants to report on the carbon risks and opportunities associated with all asset classes.

carbon prices could have a material impact on a company's ability to repay its lenders.

2. FOSSIL FUEL RESERVE EMISSIONS

As policies supporting a move from a high-to low-carbon economy strengthen, so too does the need to apply forward-looking risk projections to current assets. An article published in 2015 in the scientific journal *Nature* calculated that in order to limit global warming to below 2 degrees Celsius above pre-industrial levels, we would need to leave one-third of oil, half of gas, and 80% of coal reserves in the ground. Some markets will be more exposed to the risk of sudden downward valuations or asset stranding than others.

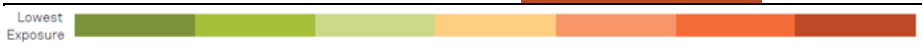
The carbon metric in this section looks at the potential scale of carbon emissions associated with index constituents' proven and probable fossil fuel reserves, if they were to be burned. The magnitude of carbon emissions associated with burning coal is different from that of natural gas, so the level of exposure can vary based on fuel type or the size of reserves.

Trucost has collated time-series data on the proven and probable fossil fuel reserves owned by the constituents of each index. Exhibit 4 shows the weighted average reserve emissions of the companies within the index.

Trucost has collated time-series data on the proven and probable fossil fuel reserves owned by the constituents of each index.

Exhibit 4: Weighted Average Fossil Fuel Reserve Emissions

INDEX	2016 $MtCO_2$	2017 $MtCO_2$	CHANGE (%)
S&P/TOPIX 150	12	11	-10
S&P Asia 50	134	85	-37
S&P 500 Bond	-	87	-
S&P 500	261	179	-31
S&P Global 1200	315	250	-21
S&P Eurozone Investment Grade Corporate Bond Index	-	260	-
S&P/TSX 60	317	295	-7
S&P/IFCI	638	466	-27
S&P Europe 350	535	468	-12
S&P/ASX All Australian 50	1375	651	-53
S&P Latin America 40	650	705	8
S&P United Kingdom	1,485	1,333	-10



Source: Trucost. Data as of Dec. 29, 2017. Table is provided for illustrative purposes.

There are three key observations to make here.

1. The weighted average emissions associated with disclosed fossil fuel reserves have declined between 7% and 53% across all benchmarks with the exception of the S&P Latin America 40, where exposure to emissions has increased by 8%.

2. The S&P United Kingdom is considerably more exposed than other index benchmarks and may be a key focus area for scenario analyses.
3. The majority of risk lies with a small number of companies. In the S&P/IFCI in 2017, only 10 of the 49 companies with owned reserves held 80% of reported reserve emissions.

As this metric is not influenced by revenues, reduced exposure to emissions is due to one of the following factors.

- Constituents with owned reserves dropped out of an index.
- Constituents ran down assets through production without replacing reserve capacity.
- Divestment from exploration sites.
- A reduction in the relative weight of sectors which have disclosed reserves

Energy's weight decreased for every index except for the S&P/ASX All Australian 50.

3. COAL EXPOSURE

Overall, the coal exposure metric appears to tell a positive transition story (see Exhibit 5). While the number of companies operating in coal-based sectors in the S&P Global 1200 remained quite static, total reported power output declined 26% as demand for coal slowed.

Exhibit 5: Coal Exposure

INDEX	2016 WEIGHT IN INDEX (%)	2017 WEIGHT IN INDEX (%)	CHANGE (%)
S&P/TOPIX 150	0.59	0.44	-26
S&P Latin America 40	0	0.64	100
S&P Europe 350	0.99	1.06	8
S&P Eurozone Investment Grade Corporate Bond Index	-	1.27	-
S&P 500	1.79	1.4	-22
S&P Global 1200	1.75	1.55	-12
S&P Asia 50	2.11	1.75	-17
S&P/IFCI	1.98	1.81	-9
S&P/TSX 60	2.54	2.71	7
S&P United Kingdom	3.39	3.49	3
S&P 500 Bond Index	-	4.39	-
S&P/ASX All Australian 50	10.12	11.41	13

Lowest Exposure — Highest Exposure

Source: Trucost. Data as of Dec. 29, 2017. Table is provided for illustrative purposes.

The S&P Latin America 40 had one of the smallest coal exposure scores but reflected a 100% increase year-over-year because one company qualified as a "coal" company for the first time (due to its revenues associated with coal going beyond the 10% threshold).

Aside from the S&P/ASX All Australian 50, which had a coal exposure of 11.41% (a year-over-year increase of 13%), the S&P 500 Bond Index had the largest exposure to coal. This is due to the sector bias within debt portfolios toward capital-intensive industries like utilities. The sector weight for utilities in the S&P 500 Bond Index was 8.19% compared with 2.93% in the S&P 500.

For several decades, fossil fuel power companies have been able to enjoy a high debt-to-equity ratio because demand for their services has been relatively stable and their prices have remained quite constant, even in periods of slow economic growth. However, damage to infrastructure due to the physical effects of climate change, higher levies on emissions, and lower demand for "brown" energy could all affect the level of risk that lenders are prepared to take on.

Five constituents in the S&P/TOPIX 150 generated revenues from coal-based sectors, but only two of those surpassed the 10% revenue threshold for this metric. The S&P/TOPIX 150 had the smallest coal exposure score and is well positioned in the face of punitive climate legislation.

Damage to infrastructure due to the physical effects of climate change, higher levies on emissions, and lower demand for "brown" energy could all affect the level of risk that lenders are prepared to take on.

4. ENERGY TRANSITION

Continued economic growth in developing countries and a global rise in population will have a significant impact on energy demand. In Southeast Asia, for example, it is estimated that electricity demand will more than double by 2040. The ability to meet this demand through fossil fuel technologies may be a challenge, due to aging infrastructure, terminal capacities, and policies to mitigate global warming. However, it is an equally large challenge to rely on renewable technology as a secure source of energy that meets this requirement.

This is perhaps reflected in the S&P Asia 50, where fossil fuels increased their overall share of the total power supply. The percentage of total power from coal rose from 51% to 57% and natural gas rose from 18% to 30%. Nuclear power dropped from 18% to 1% and hydro from 7% to 3%.

The financial sector has an important role to play if we are to meet commitments set out by the Paris Agreement. Market participants would need to reorient investments toward new technologies that will help mitigate climate change. According to the International Energy Agency,[10] over USD 100 trillion in infrastructure investment is required over the next 15 years if we are to meet a 2 degree Celsius scenario, and the utilities sector is a clear target opportunity.

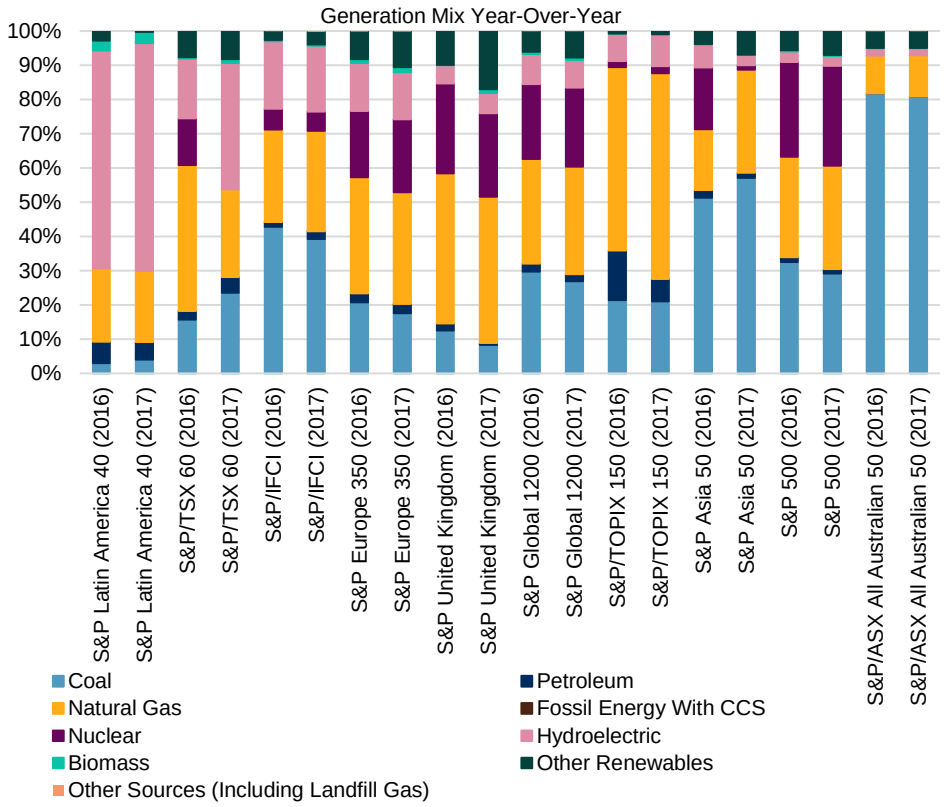
In the S&P 500, there was a shift toward cleaner power sources, which resulted in a decline in carbon emissions from the sector. A surge in the supply of shale gas coupled with lower priced renewables led to a decline in

[10] International Energy Agency, World Energy Outlook Special Briefing for COP21, 2015.

coal demand. In 2016, power generation from natural gas exceeded that from coal for the first time in the U.S. There was a 6% increase in nuclear power generation year-over-year.

All indices increased their share of renewables and decreased their share of fossil fuels, with the exception of the S&P/ASX All Australian 50 and the S&P Asia 50 (see Exhibit 6).

Exhibit 6: Energy Generation Mix (% of Energy Generated From Fuel Type)



Source: Trucost. Data as of Dec. 29, 2017. Chart is provided for illustrative purposes.

5. CARBON PRICE RISK EXPOSURE (2030)

The financial implications of tightening carbon regulations could be material and widespread.

A vital function of the financial markets is to price risk to inform capital allocation decisions. While carbon footprinting is a valuable tool for understanding portfolio exposure to carbon, it offers a snapshot in time and may not directly inform future financial impact.

The Financial Stability Board's TCFD and the EU's High-Level Expert Group on Sustainable Finance recommend using scenario analysis to determine the possible future financial impact on investments under different legislative, market-based, consumer-driven, or climatic shifts.

The financial implications of tightening carbon regulations could be material and widespread. Carbon prices have already been implemented in 40 countries and 20 cities and regions. In the vast majority of cases, existing carbon prices are well below the level that the International Energy

Association (IEA) believes are required in order to limit global warming to 2 degrees Celsius by 2100, per the 2015 Paris Agreement. For example, the IEA has suggested that the price of carbon for countries that are part of the Organisation for Economic Co-operation and Development (OECD) should be USD 120 per tonne by 2030 (in today's money) to be on a 2 degree path.

Trucost has developed a methodology to quantify the estimated total cost of carbon price risk by calculating the premium between what constituents are already paying for their carbon emissions today and what they may have to pay in 2030. Sectoral and regional factors are taken into account. This methodology has been applied to the S&P DJI benchmark indices to determine how well each is currently positioned should constituents have to absorb all future prices for the tonnes of carbon they emit today.

Exhibit 7: Estimated Earnings at Risk

INDEX	ESTIMATED CARBON PRICE RISK COST (% OF EARNINGS – EXCLUDING PRICE ELASTICITY)
S&P/IFCI	27
S&P Latin America 40	26
S&P/TSX 60	23
S&P/TOPIX 150	21
S&P Europe 350	20
S&P/ASX All Australian 50	19
S&P Global 1200	18
S&P 500	17
S&P United Kingdom	16
S&P Asia 50	10

Source: Trucost. Data as of Dec. 29, 2017. Table is provided for illustrative purposes.

The S&P/IFCI and S&P Latin America 40 are currently most exposed, as they are set to lose an estimated 27% and 26% of earnings, respectively, if constituents paid the difference between current and future prices today.

Sectors such as utilities are more able to pass through carbon costs than industry segments such as materials or automotives.

The S&P/TSX 60 is also highly exposed; 51% of the absolute carbon price risk premium lies with the energy sector, which makes up 21% of 2017's overall index weight.

The S&P 500, S&P United Kingdom, and S&P Asia 50 are all best positioned. While the energy, utilities, materials, and industrials sectors drive the most exposure across all indices, the relative earnings and carbon price premium can have a significant effect on the overall risk.

Price elasticity can be considered to give a more nuanced understanding of sectoral challenges and how much of the carbon cost might be absorbed by constituents. Sectors such as utilities are more able to pass through carbon costs than industry segments such as materials or automotives.

WHAT TO EXPECT IN 2019

No single metric will answer all the questions an investor might have about carbon risk, impact, transition, and financial materiality—now or in the future. S&P Dow Jones Indices has expanded its coverage of climate risk-related metrics to five measurements, in recognition of the growing importance of such market information. This analysis is designed to highlight the carbon exposure of global equity and fixed income benchmarks to illustrate some key risk areas.

Increasing voluntary and mandatory reporting requirements, as well as investors' increased understanding of the financial implications of the transition to a lower-carbon economy, will necessitate more data and analytics to support market needs across a broader range of asset classes.

Globally, more than one-quarter of all professionally managed assets are now managed under responsible investment strategies. We will undoubtedly see continued innovation as investors seek to drive better financial outcomes in combination with reducing exposure to carbon risks. S&P Dow Jones Indices is committed to providing index solutions that offer choices and reflect low-carbon options. Index offerings include strategies that simply reweight all components of an underlying index based on carbon intensity, indices that optimize after excluding high emitters, or ones that offer the same factor exposure while reducing carbon, among other concepts.

Globally, more than one-quarter of all professionally managed assets are now managed under responsible investment strategies.

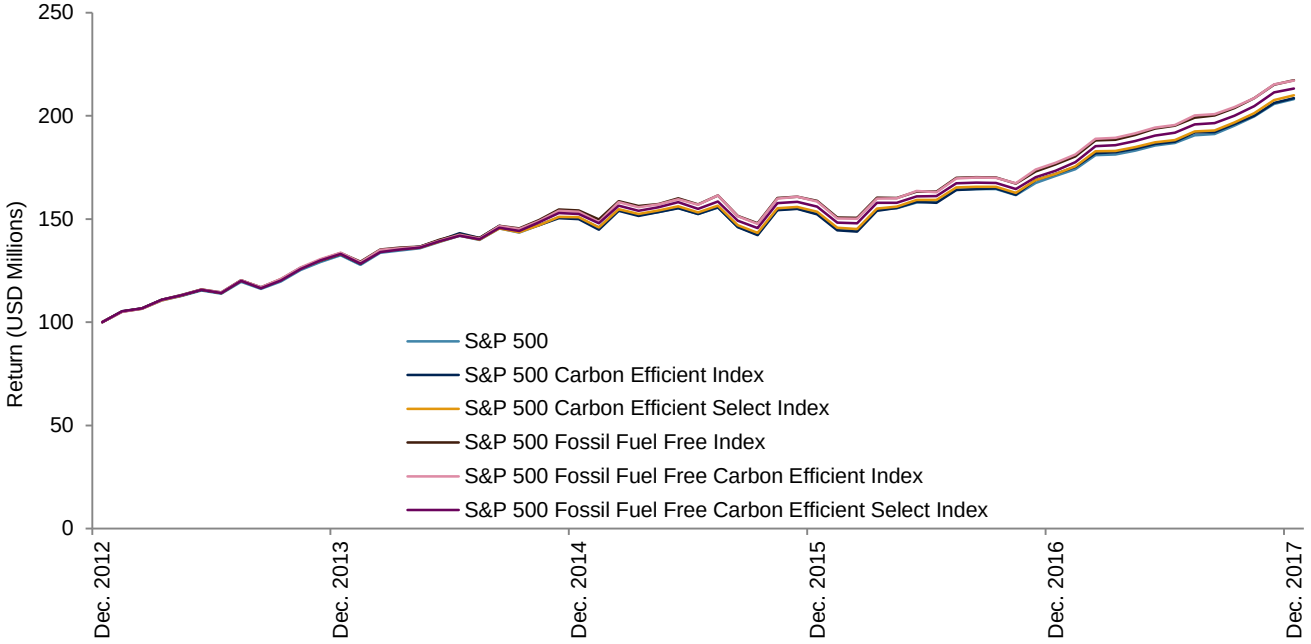
Historically, there has been concern that incorporating environmental considerations may hurt performance. However, when we compare the indices with their carbon-focused counterparts, the low-carbon versions actually outperformed the benchmarks over a five-year period in most cases. In fact, a recent independent academic study by Stanford and Yonsei Universities showed that factoring carbon into investment strategies can actually deliver enhanced returns.[11]

Change is being driven at pace by regulators across the world. The EU's landmark Action Plan on Sustainable Finance is explicitly designed to mobilize finance for sustainable growth, speed up technological developments, and may provide a blueprint for change for other global jurisdictions. Sustainable finance looks set to become a permanent feature of global markets and policy. We look forward to seeing the fruits of this reflected in 2019's Carbon Scorecard.

[11] Dr. Richard Mattison, "Can Being Green Deliver Enhanced Returns?" S&P Dow Jones Indices Indexology® Blog.
"Is 'Being Green' Rewarded in the Market?: An Empirical Investigation of Decarbonization Risk and Stock Returns," Soh Young In, Ki Young Park, and Ashby Monk.

APPENDIX

Exhibit 8: S&P 500 Low-Carbon Indices Return



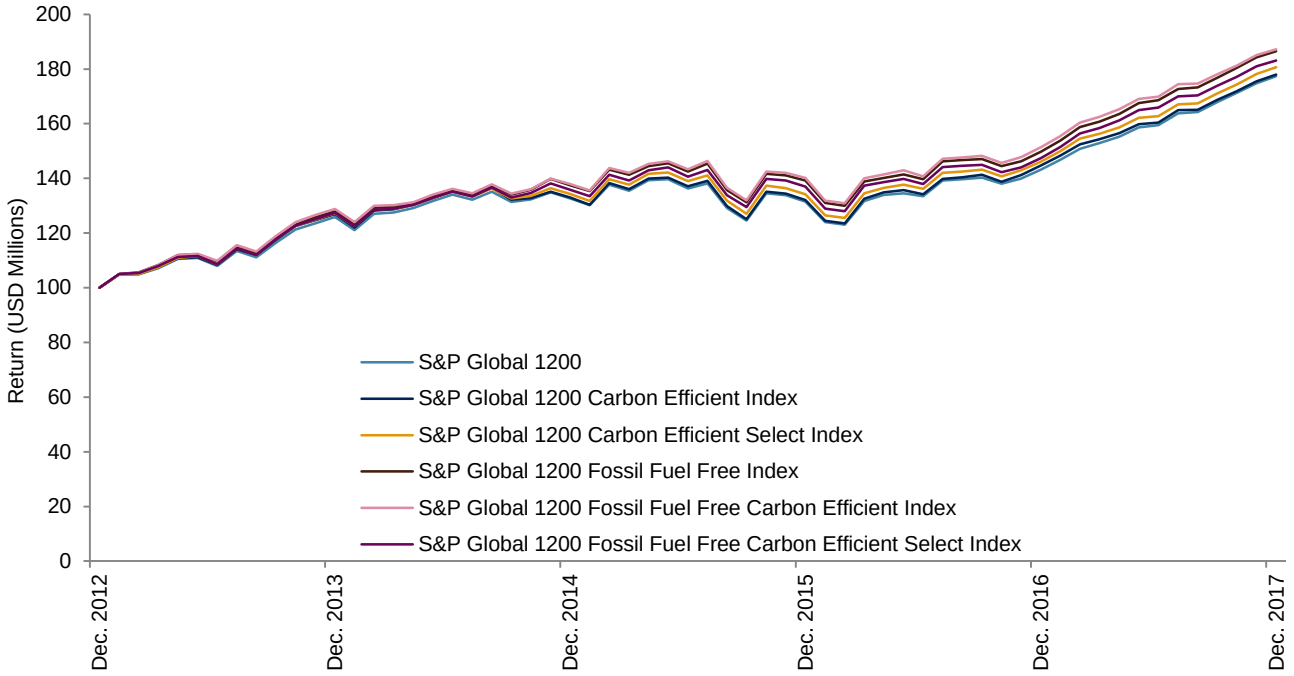
Source: S&P Dow Jones Indices LLC. Data as of Dec. 29, 2017. Index performance based on total return in USD. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Exhibit 9: Performance of the S&P 500 Low-Carbon Indices

INDEX	S&P 500	S&P 500 CARBON EFFICIENT INDEX	S&P 500 CARBON EFFICIENT SELECT INDEX	S&P 500 FOSSIL FUEL FREE INDEX	S&P 500 FOSSIL FUEL FREE CARBON EFFICIENT INDEX	S&P 500 FOSSIL FUEL FREE CARBON EFFICIENT SELECT INDEX
ANNUALIZED RETURNS (%)						
1-Year	21.83	21.34	22.23	23.16	22.51	23.00
3-Year	11.41	11.60	11.67	12.13	12.22	11.83
5-Year	15.79	15.83	16.00	16.79	16.77	16.36
ANNUALIZED RISK (%)						
3-Year	10.07	10.45	10.22	10.11	10.36	10.10
5-Year	9.49	9.80	9.59	9.54	9.71	9.56
TRACKING ERROR						
1-Year	-	0.55	0.47	0.66	0.78	0.74
3-Year	-	0.85	0.52	0.84	1.00	0.62
5-Year	-	0.81	0.50	0.83	0.89	0.58
CARBON REDUCTION						
Relative to the S&P 500 (%)	-	34.32	45.29	18.60	49.75	59.78

Source: S&P Dow Jones Indices LLC. Data as of Dec. 29, 2017. Index performance based on total return in USD. Past performance is no guarantee of future results. 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.

Exhibit 10: S&P 1200 Low-Carbon Indices Return



Source: S&P Dow Jones Indices LLC. Data as of Dec. 29, 2017. Index performance based on 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.

Exhibit 11: Performance of the S&P Global 1200 Indices

INDEX	S&P GLOBAL 1200	S&P GLOBAL 1200 CARBON EFFICIENT INDEX	S&P GLOBAL 1200 CARBON EFFICIENT SELECT INDEX	S&P GLOBAL 1200 FOSSIL FUEL FREE INDEX	S&P GLOBAL 1200 FOSSIL FUEL FREE CARBON EFFICIENT INDEX	S&P GLOBAL 1200 FOSSIL FUEL FREE CARBON EFFICIENT SELECT INDEX
ANNUALIZED RETURNS (%)						
1-Year	19.65	19.37	19.47	20.18	20.13	19.86
3-Year	8.51	8.47	8.83	9.65	9.81	9.31
5-Year	11.55	11.66	11.91	12.78	12.93	12.32
ANNUALIZED RISK (%)						
3-Year	10.36	10.67	10.58	10.41	10.52	10.54
5-Year	9.78	10.05	9.94	9.77	9.87	9.91
TRACKING ERROR						
1-Year	-	0.68	0.53	0.78	0.68	0.77
3-Year	-	0.65	0.57	1.21	1.24	0.97
5-Year	-	0.59	0.52	1.09	1.08	0.83
CARBON REDUCTION						
Relative to the S&P Global 1200 (%)	-	32.37	46.54	27.26	53.19	63.30

Source: S&P Dow Jones Indices LLC. Data as of Dec. 29, 2017. Index performance based on total return in USD. Past performance is no guarantee of future results. 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.

PERFORMANCE DISCLOSURE

The S&P 500 Carbon Efficient Index and S&P Global 1200 Carbon Efficient Index were launched on August 20, 2015. The S&P 500 Fossil Fuel Free Index, S&P Global 1200 Carbon Efficient Select Index, and S&P Global 1200 Fossil Fuel Free Index were launched on August 28, 2015. The S&P 500 Fossil Fuel Free Carbon Efficient Index and S&P Global 1200 Fossil Fuel Free Carbon Efficient Index were launched on November 16, 2015. The S&P 500 Fossil Fuel Free Carbon Efficient Select Index and S&P Global 1200 Fossil Fuel Free Carbon Efficient Select Index were launched on January 11, 2016. All information presented prior to an index's Launch Date is hypothetical (back-tested), not actual performance. The back-test calculations are based on the same methodology that was in effect on the index Launch Date. Complete index methodology details are available at www.spdji.com.

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 at a fixed value for calculation purposes. The Launch Date designates the date upon which 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 datafeed 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.

Past performance of the Index is not an indication of future results. Prospective application of the methodology used to construct the Index may not result in performance commensurate with the back-test returns shown. The back-test period does not necessarily correspond to the entire available history of the Index. Please refer to the methodology paper for the Index, available at www.spdji.com 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.

Another limitation of using back-tested information is that the back-tested calculation is generally prepared with the benefit of hindsight. Back-tested information reflects the application of the index methodology and selection of index constituents in hindsight. No hypothetical record can completely account for the impact of financial risk in actual trading. For example, there are numerous factors related to the equities, fixed income, or commodities markets in general which cannot be, and have not been accounted for in the preparation of the index information set forth, all of which can affect actual performance.

The Index returns shown do not represent the results of actual trading of investable assets/securities. S&P Dow Jones Indices LLC 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