S&P Dow Jones Indices

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Trucost by S&P Dow Jones Indices
ESG Analysis

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Considering the Risk From Future Carbon Prices:
The S&P Carbon Price Risk Adjusted Index Series

INTRODUCTION

Along with the advent of the 2015 Paris Climate Agreement has come a growing understanding of the structural changes required across the global economy to shift to low- (or zero-) carbon, sustainable business practices.

The increasing regulation of carbon emissions through taxes, emissions trading schemes, and fossil fuel extraction fees is expected to feature prominently in global efforts to address climate change. Carbon prices are already implemented in 40 countries and 20 cities and regions. Average carbon prices could increase more than sevenfold to USD 120 per metric ton by 2030, as regulations aim to limit the average global temperature increase to 2 degrees Celsius, in accordance with the Paris Agreement.[1]

S&P Dow Jones Indices launched the S&P Carbon Price Risk Adjusted Indices to embed future carbon price risk into today's index constituents.

The key points included in the index concept are as follows:

- Carbon pricing risk from a growing array of new policies and taxes leading to potentially significant increased costs for companies.
- Every company having a different carbon emissions profile—its total greenhouse gas (GHG) emissions footprint and where geographically these emissions occur.
- Carbon pricing risk could vary substantially among companies operating in the same business sector.

This development is an example of the broader move toward incorporating environmental, social, and governance (ESG) considerations in asset management.

[1] Trucost Analysis OECD/IEA and IRENA. 2017. Chapter 2 of "Perspectives for the Energy Transition: Investment Needs for a Low-Carbon Energy System."
OECD. 2016. "Effective Carbon Rates: Pricing CO2 through Taxes and Emissions Trading Systems." OECD Publishing. Paris.

SIDEBAR: KEY CARBON PRICING POLICIES[2]

Exhibit 1: Prices in Implemented Carbon Pricing Initiatives

CARBON PRICING INITIATIVE	CARBON PRICE (USD PER TON OF CO_2e)	CARBON PRICING INITIATIVE	CARBON PRICE (USD PER TON OF CO_2e)
Sweden Carbon Tax	139	New Zealand ETS, California CaT, Ontario CaT, Québec CaT	15
Switzerland Carbon Tax, Liechtenstein Carbon Tax	101	Beijing Pilot ETS	9
Finland Carbon Tax	77	Portugal Carbon Tax, Switzerland ETS	8
Norway Carbon Tax (Upper)	64	Shenzhen Pilot ETS	7
France Carbon Tax	55	Shanghai Pilot ETS, Saitama ETS, Tokyo CaT, Colombia Carbon Tax, Latvia Carbon Tax	6
Iceland Carbon Tax	36	Chile Carbon Tax	5
Denmark Carbon Tax (Fossil Fuels)	29	RGGI, Chongqing Pilot ETS, Norway Carbon Tax (Lower)	4
British Columbia Carbon Tax	27	Fujian Pilot ETS, Mexico Carbon Tax (Upper), Japan Carbon Tax	3
UK Carbon Price Floor, Spain Carbon Tax, Ireland Carbon Tax, Denmark Carbon Tax (F-Gases)	25	Estonia Carbon Tax, Hubei Pilot ETS, Guangdong Pilot ETS	2
Alberta CCIR, Alberta Carbon Tax	23	Tianjin Pilot ETS	1
Slovenia Carbon Tax, Korea ETS	21	Mexico Carbon Tax (Lower), Poland Carbon Tax, Ukraine Carbon Tax	<1
EU ETS	16		

Source: World Bank Group, State and Trends of Carbon Pricing 2018. Data as of April 1, 2018. Table is provided for illustrative purposes.

To help companies and their investors assess exposure to future carbon pricing risk, Trucost, part of S&P Dow Jones Indices, developed the Corporate Carbon Pricing Tool.

ASSESSING EXPOSURE TO FUTURE CARBON PRICING RISK

While the number of carbon pricing schemes has grown rapidly over the past 10 years, prices in most jurisdictions are currently well below the level required to achieve the Paris Agreement's 2 degrees Celsius goal.

To help companies and their investors assess exposure to future carbon pricing risk, Trucost, part of S&P Dow Jones Indices, developed the Corporate Carbon Pricing Tool.[3]

The tool features a "carbon pricing risk premium," representing the gap between current carbon prices and expected future prices in today's monies under a 2 degrees Celsius scenario (see Exhibit 2). This gap varies

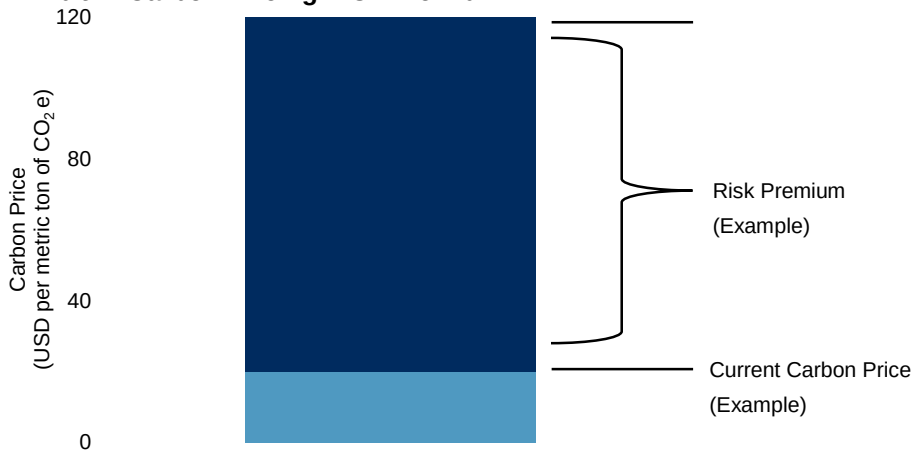
[2] Lord, Rick. "Talking Points Internal Carbon Pricing: Stress Testing Business for Climate Change Risk." January 2017. Trucost, part of S&P Dow Jones Indices.

[3] Bernick, Libby, Bullock, Steven, and Lord, Rick. "Carbon Pricing: Discover Your Blind Spots on Risk and Opportunity." January 2018. Trucost, part of S&P Dow Jones Indices.

depending on the current status of carbon pricing in each country, as well as the speed and degree to which prices are expected to rise in the future. Research by the International Energy Agency found that carbon prices in OECD countries could increase to USD 120 per metric ton by 2030, as regulations are introduced to achieve the Paris Agreement goal to limit global warming to 2 degrees Celsius.[4]

By applying the carbon pricing risk premium to a company's regional GHG emissions, it is possible to quantify the potential additional costs that could materialize in the transition to a low-carbon economy. This approach to assessing financial risk from carbon pricing trajectories—based on the scale and spread of an individual company's current operations—allows an estimation to be made as to how a company's market valuation could be affected in the future.

Exhibit 2: Carbon Pricing Risk Premium



Source: Trucost. Data as of December 2017. Chart is provided for illustrative purposes.

Applying the carbon pricing risk premium to companies in the S&P 500 shows that USD 1.3 trillion may be at risk from 2030 carbon prices across these listed companies—or 5.6% of the S&P 500's market capitalization.

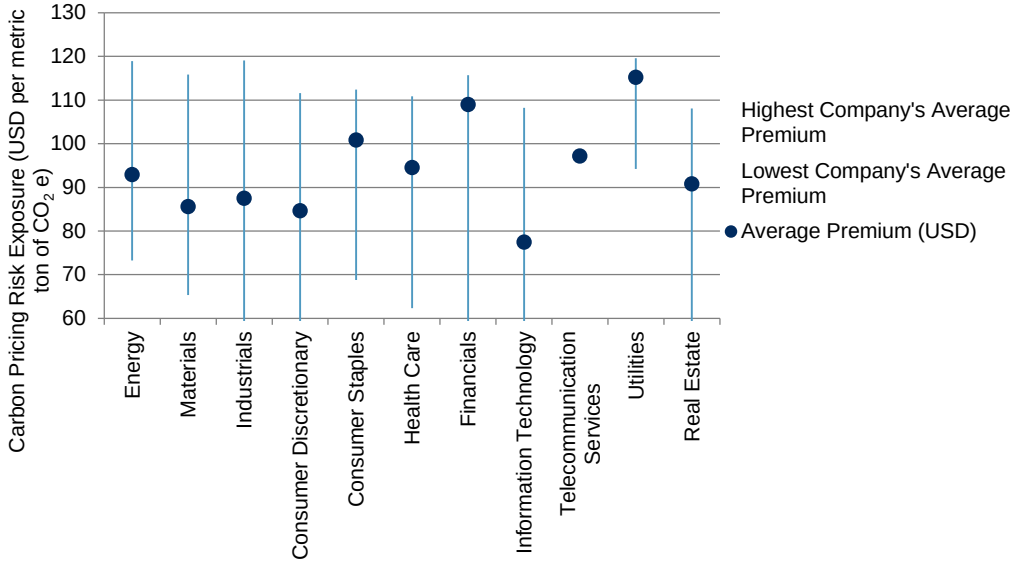
CARBON PRICING COULD LEAD TO SIGNIFICANT COSTS FOR COMPANIES

For the purposes of the current set of indices, we have focused on potential carbon pricing in the year 2030. However, this index methodology could also be used for other points in the future.

Applying the carbon pricing risk premium to companies in the S&P 500® shows that USD 1.3 trillion may be at risk from 2030 carbon prices across these listed companies—or 5.6% of the S&P 500's market capitalization. Carbon pricing risk was further found to vary significantly among companies operating within the same business sectors, creating investment opportunities as well as risks for financial institutions.

[4] OECD/IEA and IRENA. 2017. Chapter 2 of "Perspectives for the Energy Transition: Investment Needs for a Low-Carbon Energy System."

Exhibit 3: Carbon Pricing Risk Exposure Varies Significantly Within Business Sectors



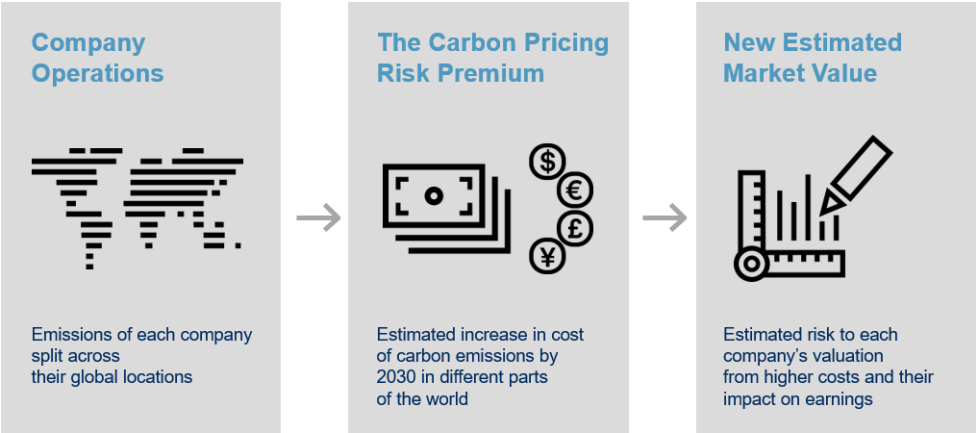
Source: Trucost Corporate Carbon Pricing Tool 2018 and S&P DJI's S&P 500 constituent data as of the December 2017 rebalance date. Chart is provided for illustrative purposes.

INDEX OVERVIEW

For the first time, the S&P Carbon Price Risk Adjusted Index Series enables investors to consider 2030 carbon pricing risk exposures alongside company earnings in investment decisions.

The S&P Carbon Price Risk Adjusted Indices seek to measure the performance of companies in each respective underlying index with a weighting scheme based on estimated company market valuation at risk from predicted 2030 carbon prices.

Exhibit 4: S&P Carbon Price Risk Adjusted Indices Methodology



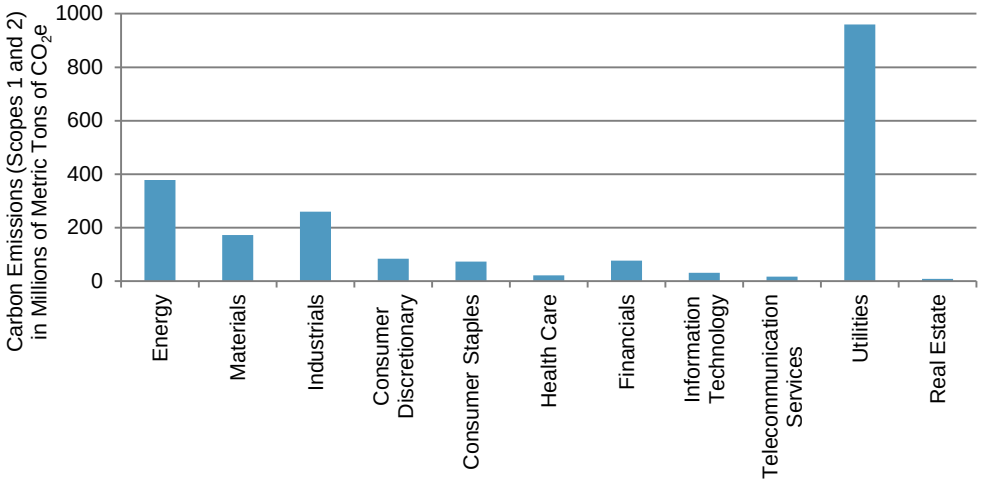
Source: S&P Dow Jones Indices LLC. Data as of 2018. Chart is provided for illustrative purposes. For more information, view the S&P Carbon Price Risk Adjusted Indices Methodology.

The index series seeks to measure the performance of companies in each respective underlying index with a weighting scheme based on estimated company market valuation having allowed for the risk from predicted 2030 carbon prices, taking into account the following factors.

1. Company Carbon Emissions

Exhibit 5 shows the range of S&P 500 companies' carbon emissions across different business sectors, generated by company operations and purchased electricity supplies.

Exhibit 5: Range of Operational Carbon Emissions for the S&P 500 Business Sectors



Source: Trucost Corporate Carbon Pricing Tool 2018 and S&P DJI's S&P 500 constituent data as of the December 2017 rebalance date. Chart is provided for illustrative purposes.

2. Company Operating Geographies

Exhibit 1 demonstrates how carbon pricing risk exposure can vary significantly across geographies. The carbon pricing risk premium varies depending on the current status of carbon pricing in each country, as well as the speed and degree to which prices are expected to rise in the future. The geographic distribution of a company's carbon emissions, therefore, needs to be considered when estimating exposure to future carbon pricing risk. To take this into account, carbon distribution data disclosed by companies to the CDP is applied.[5]

Companies may have different exposures to carbon pricing risk due to the locations of their operations.

3. Company Ability to "Pass On" Rather Than Absorb Carbon Costs

Companies operating in different business sectors may have more flexibility in being able to "pass on" carbon costs to consumers or purchasers.[6]

This can be demonstrated by comparing different business sectors' total costs (as a percentage of earnings) to the estimated valuation at risk as a result of these estimated costs. For example, utilities companies, in general, tend to have high carbon price risk costs compared with earnings. However, since utilities is a highly inelastic industry, companies may be

[5] GeoRev data from FactSet is used as a proxy when CDP location data is unavailable.

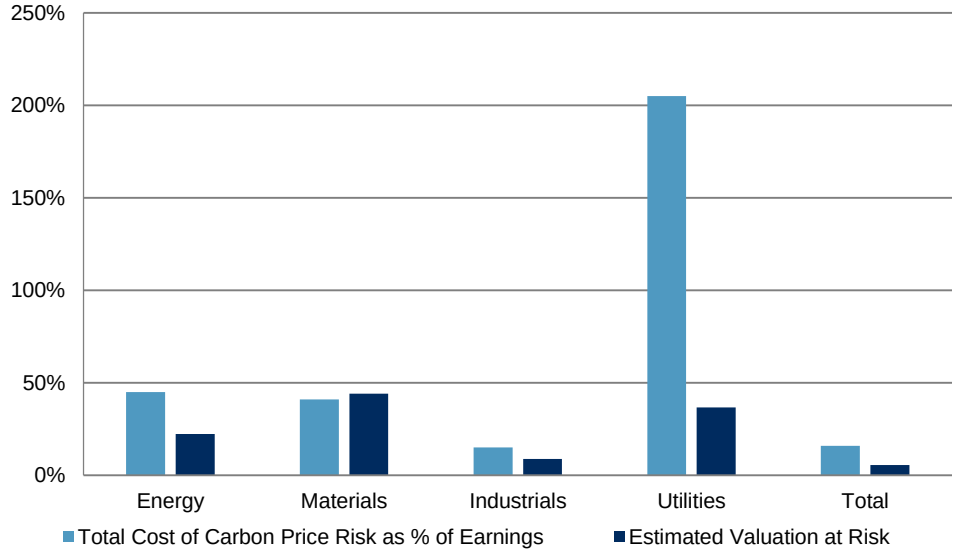
[6] In order to take this into account, some assumptions have been made as to the extent to which increased costs will actually end up being a cost to the company themselves based on different industry group's estimated "price elasticity of demand."

able to "pass on" most of these costs by raising prices without suffering from a large drop in demand. Therefore, the estimated valuation at risk is comparatively much lower. In contrast, materials companies may not be able to raise prices without a significant fall in demand; therefore, their estimated valuations at risk may be more affected.

Exhibit 6 demonstrates the range in ability of four business sectors with high exposure to carbon price risk to "pass on" rather than absorb carbon costs.

Companies operating in different business sectors may have more flexibility in being able to "pass on" carbon costs to consumers or purchasers.

Exhibit 6: Range in Ability of High Impact Business Sectors to "Pass on" Rather Than Absorb Carbon Costs



Source: Trucost Corporate Carbon Pricing Tool 2018 and S&P DJI's S&P 500 constituent data as of the December 2017 rebalance date. Chart is provided for illustrative purposes.

S&P CARBON PRICE RISK ADJUSTED INDEX HIGHLIGHTS

1. Carbon Comparison

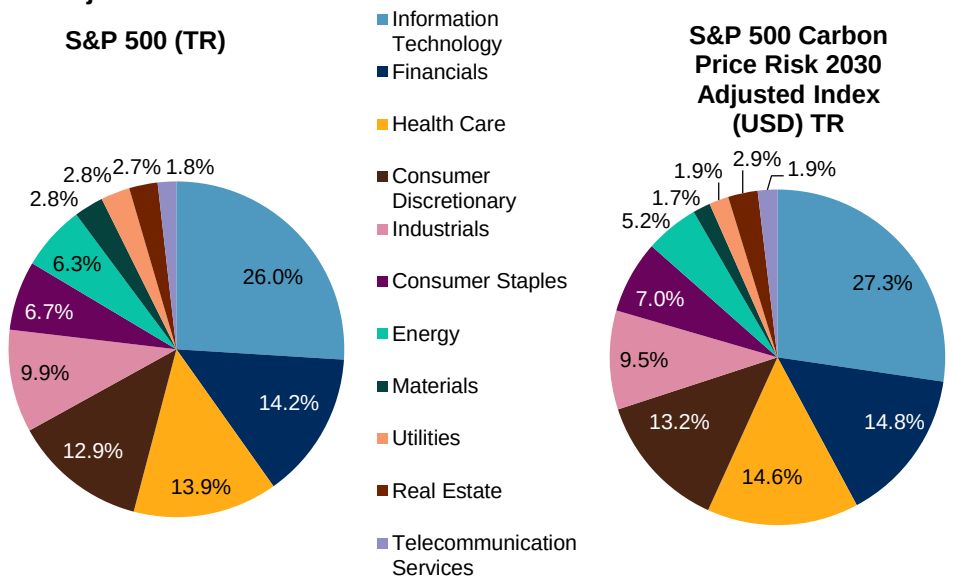
Exhibit 7: Carbon Performance of the S&P 500 Carbon Price Risk 2030 Adjusted Index

INDEX	CARBON TO VALUE INVESTED (METRIC TONS CO_2e/USD 1 MILLION INVESTED)	CARBON TO REVENUE INTENSITY (METRIC TONS CO_2e/USD 1 MILLION REVENUES)	WEIGHTED AVERAGE CARBON INTENSITY (METRIC TONS CO_2e/USD 1 MILLION REVENUES)	FOSSIL FUEL RESERVE EMISSIONS (METRIC TONS CO_2e/USD 1 MILLION INVESTED)
S&P 500 (TR)	83.44	240.79	250.93	821.88
S&P 500 Carbon Price Risk 2030 Adjusted Index (USD) TR	54.73	161.07	171.4	680.86
Reduction (%)	**34.41**	**33.11**	**31.69**	**17.16**

Source: S&P Dow Jones Indices LLC. Data as of May 31, 2018. 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.

2. Sectors

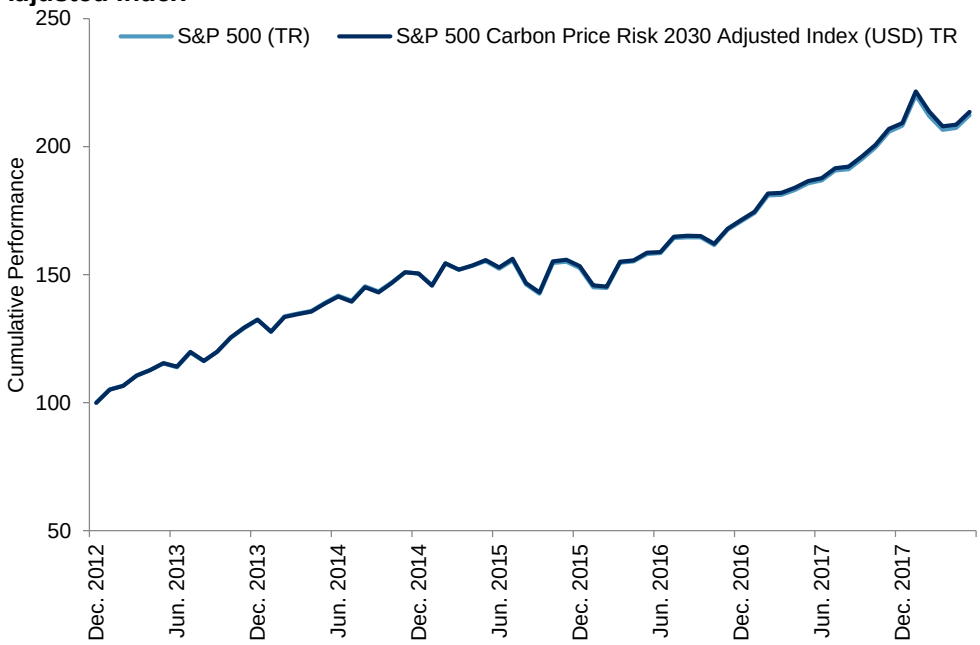
Exhibit 8: Sector Composition of the S&P 500 and S&P 500 Carbon Price Risk 2030 Adjusted Index



Source: S&P Dow Jones Indices LLC. Data as of May 31, 2018. Charts are provided for illustrative purposes.

3. Performance

Exhibit 9: Cumulative Performance of the S&P 500 Carbon Price Risk 2030 Adjusted Index



Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 2012, to May 31, 2018. 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 10: Performance of the S&P 500 Carbon Price Risk 2030 Adjusted Index

PERIOD	S&P 500 (TR)	S&P 500 CARBON PRICE RISK 2030 ADJUSTED INDEX (USD) TR
RETURNS (%)		
1-Year	14.38	**14.52**
3-Year	10.97	**11.12**
5-Year	12.98	**13.09**
December 2012 to May 2018	14.93	**15.05**
TRACKING ERROR (%)		
1-Year	-	**0.28**
2-Year	-	**0.27**
3-Year	-	**0.28**
December 2012 to May 2018	-	**0.28**

Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 2012, to May 31, 2018. 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.

CONCLUSION

The S&P Carbon Price Risk Adjusted Indices are intended to address the question of future company-specific risks associated with the increasing cost of carbon emissions.

The S&P Carbon Price Risk Adjusted Indices are intended to address the question of future company-specific risks associated with the increasing cost of carbon emissions.

In so doing, the indices seek to:

1. Support the recommendations of the Task Force on Climate-related Financial Disclosures to price climate-related risks in investment decision-making;
2. Show how companies can be weighted in different ways according to their emissions, but with a forward-looking, financial cost perspective;
3. Highlight how historically a company's level and geographic spread of carbon emissions have not substantially affected performance; and
4. Show the difference that may be made in the future from a company's ability to manage its carbon pricing risk exposure.

APPENDIX

S&P Carbon Price Risk Adjusted Indices

- S&P 500 Carbon Price Risk 2030 Adjusted Index
- S&P MidCap 400® Carbon Price Risk 2030 Adjusted Index
- S&P SmallCap 600® Carbon Price Risk 2030 Adjusted Index
- S&P Europe 350 Carbon Price Risk 2030 Adjusted Index
- S&P Global 1200 Carbon Price Risk 2030 Adjusted Index
- S&P South Africa Composite Carbon Price Risk 2030 Adjusted Index
- S&P Global LargeMidCap Carbon Price Risk 2030 Adjusted Index
- S&P Developed LargeMidCap Carbon Price Risk 2030 Adjusted Index
- S&P Emerging LargeMidCap Carbon Price Risk 2030 Adjusted Index
- S&P Europe Developed LargeMidCap Carbon Price Risk 2030 Adjusted Index
- S&P North America LargeMidCap Carbon Price Risk 2030 Adjusted Index
- S&P Asia Pacific Developed LargeMidCap Carbon Price Risk 2030 Adjusted Index

Decarbonizing Indices

The S&P Carbon Price Risk Adjusted Indices are part of a broader series that seeks to address the question of decarbonization.

- The S&P Carbon Efficient Indices tilt constituents based on their current emissions.
- The S&P Fossil Fuel Free Indices remove companies deemed to be involved in the fossil fuel business.
- The S&P Carbon Price Risk Adjusted Indices address the potential risk to companies from future carbon prices by reweighting companies through an adjusted market valuation.

S&P DJI's ESG Index Offerings

S&P Dow Jones Indices entered the ESG investment space in 1999 with the launch of the Dow Jones Sustainability Indices. These have become globally recognized corporate rankings for sustainability leaders.

Since then, S&P Dow Jones Indices has continued to innovate with the launches of the S&P Low Carbon Equity Indices in 2009, the S&P Green Bond Indices in 2014, and thematic indices such as the S&P Global Clean Energy Index.

The complete ESG index suite from S&P Dow Jones Indices is comprehensive in its nature, covering everything from core integration (which can be considered as addressing ESG risks), to ESG interplay with factors, to targeted, themed indices that look to concentrate on specific ESG, green, or transition-related solutions (see Exhibit 11).

Exhibit 11: Headline S&P DJI ESG Indices by Category

Core ESG	• ESG: S&P Environmental & Socially Responsible Indices • Low Carbon: S&P Fossil Fuel Free Indices • Low Carbon: S&P Carbon Efficient Indices
Smart Beta ESG	• S&P Europe 350 Carbon Efficient Select Low Volatility Index • S&P Long-Term Value Creation Global Index • JPX/S&P CAPEX & Human Capital Index
Thematics & SDGs	• S&P Global Clean Energy Index • S&P Global Water Index • DJB Water Infrastructure, S&P Muni Bond Water & Sewer
Green Finance	• S&P Green Bond Index • S&P Green Bond Select Indices
ESG Innovations	• Low Carbon: S&P Carbon Price Risk Adjusted Indices • ESG: Dow Jones Sustainability Indices (DJSI) ○ Top scorers, well-known corporate benchmark since 1999

Other related indices include the S&P 500 Catholic Values Index.

Source: S&P Dow Jones Indices LLC. Data as of 2018. Chart is provided for illustrative purposes.

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PERFORMANCE DISCLOSURE

The S&P 500 Carbon Price Risk 2030 Adjusted Index was launched on May 31, 2018. 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.

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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.

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