
Measuring Transition Risk in Fund Portfolios

The Morningstar® Portfolio Carbon Risk Score™

Morningstar Research

30 April 2018

Jon Hale, Ph.D., CFA
Director, Sustainability Investing Research
+1 312 696-6093
jon.hale@morningstar.com

Important Disclosure

The conduct of Morningstar's analysts is governed by Code of Ethics/Code of Conduct Policy, Personal Security Trading Policy (or an equivalent of), and Investment Research Policy. For information regarding conflicts of interest, please visit: <http://global.morningstar.com/equitydisclosures>

Key Takeaways

- ▶ Investors are increasingly interested in understanding carbon risk in portfolios.
- ▶ The Morningstar® Portfolio Carbon Risk Score™ moves beyond carbon footprinting to provide a direct assessment of the carbon risk embedded in a portfolio.
- ▶ The Morningstar Portfolio Carbon Risk Score is the asset-weighted Sustainalytics carbon-risk rating of companies held in a portfolio.
- ▶ The Sustainalytics company carbon-risk rating evaluates how much unmanaged carbon risk remains for a company after accounting for its management activities that mitigate overall carbon-risk exposure.
- ▶ The company ratings reflect differences in exposure and management across sectors and within sectors.
- ▶ Portfolios with overweightings to the energy, utilities, materials, and industrials sectors have higher levels of carbon risk, but risk levels can vary depending on the specific companies held in portfolios.
- ▶ Portfolios with overweightings to the technology and healthcare sectors have lower levels of carbon risk.
- ▶ Diversified developed-markets portfolios have lower carbon risk than emerging-markets portfolios.
- ▶ In global developed-markets and emerging-markets categories, it is estimated that portfolio carbon risk may be reduced by 10% without making otherwise significant changes to a portfolio, while lowering carbon risk by 30% in global developed markets may result in shifts toward growth and quality and in emerging markets may result in lower overall volatility.
- ▶ Investors can use the initial Morningstar Portfolio Carbon Risk Score to establish a baseline for ongoing assessments of a portfolio's carbon risk.
- ▶ Investors can use the Carbon Risk Score to identify the source of carbon risk within a portfolio and to compare portfolios with peers and benchmarks; the Carbon Risk Score can also inform portfolio decisions, company engagements, and stakeholder communications.
- ▶ Beyond the Carbon Risk Score, funds will be designated as low carbon if they have low carbon-risk scores and low levels of fossil-fuel exposure over the trailing 12 months; this gives investors and others a way to easily identify low-carbon funds in the marketplace.

Introduction

Investors are increasingly recognizing the risks posed by climate change. Climate-related risks range from the increasingly evident physical effects of global warming to the low-carbon economic transition that is necessary to mitigate the worst effects of global warming. Climate change poses physical risks resulting from the increased severity and incidence of extreme weather events and from the longer-term changes in precipitation and variability of weather patterns due to rising temperatures and rising sea levels. These risks can have disparate impacts on industries and on companies within a given industry both in terms of their operations and demand for their products and services. Climate change also poses

transition risk, also referred to as *carbon risk*, which addresses how vulnerable a company is to the transition away from a fossil-fuel-based economy to a lower-carbon economy. Such a transition is required to meet the goals of the Paris Agreement to keep the global-temperature rise this century well below 2 degrees Celsius above preindustrial levels and to pursue efforts to limit the rise in temperature to 1.5 degrees Celsius. Specific transition risks include policy and legal regulations limiting carbon emissions, pressure on firms to align their strategies with the Paris Agreement's 2-degree scenario, switching costs to new technologies, and changing consumer preferences.

Exhibit 1 Climate-Related Risks: Transition (or Carbon) and Physical

Type	Climate-Related Risks	Potential Financial Impacts
Transition	Policy and Legal	
	<ul style="list-style-type: none"> ▶ Increased pricing of GHG emissions ▶ Enhanced emissions-reporting obligations ▶ Regulation of existing products and services ▶ Exposure to litigation 	<ul style="list-style-type: none"> ▶ Increased operating costs ▶ Write-offs and asset impairment ▶ Increased costs/reduced demand for products and services ▶ Fines and judgments
	Technology	
	<ul style="list-style-type: none"> ▶ Substitution of existing products and services with lower emissions options ▶ Unsuccessful investment in new technologies ▶ Costs to transition to lower emissions technology 	<ul style="list-style-type: none"> ▶ Write-offs and early retirement of existing assets ▶ Reduced demand for products and services ▶ Research & development expenditures and capital investments in new and alternative technologies
Physical	Market	
	<ul style="list-style-type: none"> ▶ Changing customer behavior ▶ Uncertainty in market signals ▶ Increased cost of raw materials 	<ul style="list-style-type: none"> ▶ Reduced demand for products and services ▶ Increased production costs due to changing input prices (e.g., energy, water) and output requirements (e.g., waste treatment) ▶ Abrupt, unexpected shifts in energy costs ▶ Decreased revenues ▶ Re-pricing of assets (e.g., fossil-fuel reserves, land valuations, securities valuations)
	Reputation	
	<ul style="list-style-type: none"> ▶ Shifts in consumer preferences ▶ Stigmatization of sector ▶ Increased stakeholder concern or negative stakeholder feedback 	<ul style="list-style-type: none"> ▶ Reduced revenue from decreased demand ▶ Reduced revenue from decreased production capacity (e.g., delayed planning approvals, supply chain interruptions) ▶ Reduced revenue from negative impacts on workforce management and planning (e.g., employee attraction and retention) ▶ Reduction in capital availability
Physical	Acute	
	<ul style="list-style-type: none"> ▶ Increased severity of extreme weather events such as hurricanes, drought, floods 	<ul style="list-style-type: none"> ▶ Reduced revenue from decreased production capacity (e.g., transport difficulties, supply chain interruptions) ▶ Reduced revenue and higher costs from negative impacts on workforce (e.g., health, safety, absenteeism)
	Chronic	
	<ul style="list-style-type: none"> ▶ Changes in precipitation patterns and extreme variability in weather patterns ▶ Rising mean temperatures ▶ Rising sea levels 	<ul style="list-style-type: none"> ▶ Write-offs and early retirement of existing assets (e.g., damage to property and assets in high-risk locations) ▶ Increased operating costs (e.g., inadequate water supply for hydroelectric plants or to cool nuclear and fossil-fuel plants) ▶ Increased capital costs (e.g., damage to facilities) ▶ Reduced revenues from lower sales/output ▶ Increased insurance premiums and potential for reduced availability of insurance on assets in high-risk locations

Source: TCFD, Final Report, Recommendations of the Task Force on Climate-Related Financial Disclosures, P. 10, <https://www.fsb-tcfd.org/wp-content/uploads/2017/06/FINAL-TCFD-Report-062817.pdf>

Investors are increasingly urging companies to address climate risk. The Financial Stability Board's Task Force on Climate-Related Financial Disclosures issued guidance in 2017 for companies to report to investors on climate-related risks. The TCFD recommends that companies disclose to investors how their corporate strategy is affected by climate risk; how they identify, assess, and manage climate risk; the metrics and targets they use to manage climate risk; and their governance oversight of climate-related risks and opportunities. In late 2017, a group of investors launched the Climate Action 100+ initiative, pledging to actively engage with the 100 global companies that have the highest levels of carbon emissions about taking action in line with the TCFD recommendations. To date, investors with \$28 trillion in assets under management have signed on to the initiative.¹

Exhibit 2 Core Elements of Recommended Climate-Related Financial Disclosures

Governance	The organization's governance around climate-related risks and opportunities
Strategy	The actual and potential impacts of climate-related risks and opportunities on the organization's business strategy and financial planning.
Risk Management	The processes used by the organization to identify, assess, and manage climate-related risks
Metrics and Targets	The metrics and targets used to assess and manage relevant climate-related risks and opportunities

Source: TCFD, Final Report, Recommendations of the Task Force on Climate-Related Financial Disclosures, p. v, <https://www.fsb-tcfid.org/wp-content/uploads/2017/06/FINAL-TCFD-Report-062817.pdf>

Although understanding both physical risk and transition risk is important, investors are increasingly attempting to measure transition risk, or carbon risk, in their portfolios. The TCFD recommends that asset managers and asset owners report on the carbon emissions associated with their portfolios, viewing it as a step toward the development of decision-useful climate-related risk metrics. Signatories to the 2014 Montreal Carbon Pledge, sponsored by the Principles for Responsible Investment and signed by more than 120 asset owners and asset managers with more than \$10 trillion in assets, have committed to measuring and disclosing the carbon footprint of their equity portfolios on an annual basis.² The Portfolio Decarbonization Coalition has 28 asset owners and asset managers with \$3 trillion in assets committing to reducing the carbon exposure in their portfolios and aligning them with the goals of a low-carbon economy.³ Article 173 of France's Law on Energy Transition for Green Growth, which went into effect in 2016, requires asset owners and asset managers of portfolios with more than EUR 500 million in assets to report on their exposure to transition risk or explain why they do not think doing so is necessary.⁴

Understanding carbon risk in a portfolio can help investors make better decisions. Investors typically do not know the extent to which a portfolio is exposed to carbon risk. While a portfolio's exposure to fossil

¹ <http://www.climateaction100.org/>

² <http://montrealpledge.org/>

³ <http://unepfi.org/pdc/>

⁴ http://www.frenchsif.org/isr-esg/wp-content/uploads/Understanding_article173-French_SIF_Handbook.pdf

fuel is a major component of its carbon risk, a much wider range of industries, approaching half the overall market cap by some estimates, have exposure to carbon risk through trends like the shift to renewables or electric vehicles.⁵ A portfolio carbon-risk assessment can provide information on overall risk exposure and where in the portfolio the risk is located.

Understanding portfolio carbon risk gives investors the ability to make strategic decisions to mitigate carbon risk and a basis for measuring carbon-risk reduction. This applies to asset managers as well as asset owners and fund investors. An asset manager can use carbon-risk information to inform buy-sell and portfolio-construction decisions, to make decisions on which companies to engage with to better understand their climate-risk mitigation strategies, and to communicate with clients and other stakeholders about their activities. An asset owner or fund investor can use carbon-risk information to better understand how climate risk affects their investments overall and as a basis for action to reduce their exposure to climate risk. This information allows fund investors to take climate risk into consideration as they monitor, compare, and select funds and asset managers.

Morningstar began providing information pertinent to these issues in 2016 with the launch of the Morningstar Sustainability Rating. The rating is based on Sustainalytics company-level ESG scores, which do reflect assessments of companies' carbon exposure but as part of a broader evaluation of their exposure to ESG risks and opportunities. To help investors specifically focus on and better understand carbon risk in portfolios, Morningstar has developed portfolio-level carbon-risk scores that are based on an innovative new set of company carbon-risk ratings from Sustainalytics, covering more than 4,000 companies.

The remainder of this paper describes the Sustainalytics company carbon-risk model and the Morningstar Portfolio Carbon Risk Score, then presents information on the first quarterly calculation of the scores and suggests how investors can incorporate them into their decisions.

Measuring Carbon Risk

Most efforts to measure carbon risk in portfolios rely on a technique called *carbon footprinting*. A portfolio's carbon footprint is calculated by estimating the greenhouse gas emissions that are attributable to each underlying holding. Scope 1 emissions emanate from a company's internal operations, including on-site energy production, vehicle fleets, manufacturing operations, and waste. Scope 2 emissions are indirect emissions generated by the production of energy used by the company. Scope 3 emissions are indirect emissions that occur in the upstream and downstream value chain.

Carbon footprinting has widely acknowledged limitations. These include GHG emissions data provided by companies that can be incomplete, inaccurate, or not independently verified. Footprinting typically does not account for Scope 3 emissions. Furthermore, a carbon footprint is not a direct measure of risk, but more of a starting point for considering the magnitude of carbon risk faced by a company. A carbon

⁵ Kepler Cheuvreux Transition Research, "Investor primer to transition risk analysis," P. 9, <http://et-risk.eu/wp-content/uploads/2018/02/Investor-primer-to-transition-risk-analysis.pdf>

footprint does not consider the financial materiality of a company's carbon-risk exposure or its strategy to manage such risk.

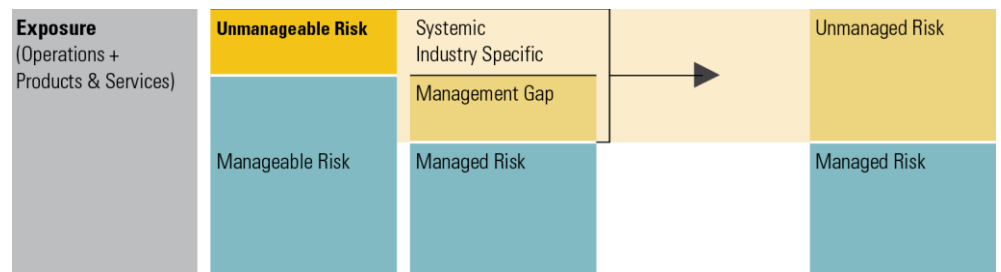
Sustainalytics has developed a carbon-risk rating for companies that provides deeper insights than carbon footprinting alone can provide. The carbon-risk rating evaluates the degree to which a company's economic value is at risk in the transition to a low-carbon economy. The rating is based on an assessment of a company's overall carbon exposure and its management of that exposure. It recognizes that not all industries and not all companies are equally exposed to carbon risk. A company's carbon risk is defined as the unmanaged carbon exposure that remains after considering the management activities being taken to mitigate it.

Using Sustainalytics' carbon-risk rating for companies, Morningstar has created the Morningstar Portfolio Carbon Risk Score, a new metric that investors can use to evaluate carbon risk at the portfolio level.⁶ The Carbon Risk Score for portfolios is calculated across Morningstar's global mutual fund and managed accounts universe, thereby allowing for fund-to-fund comparisons, category and benchmark comparisons, and longitudinal comparisons.

Sustainalytics Carbon-Risk Rating for Companies

The carbon-risk rating is based on assessments across two dimensions: exposure and management. Exposure is a measure of the degree to which carbon risks are material across the entire value chain--in the firm's supply chain, its own operations, and in its products and services. Management is a measure of the ability of the firm to manage, and the quality of the management approach, to reduce emissions and related carbon risks. The carbon-risk rating is the remaining unmanaged carbon risk of a company after taking into account its efforts to mitigate carbon risk through its management activities.

Exhibit 3 The Sustainalytics Carbon-Risk Model



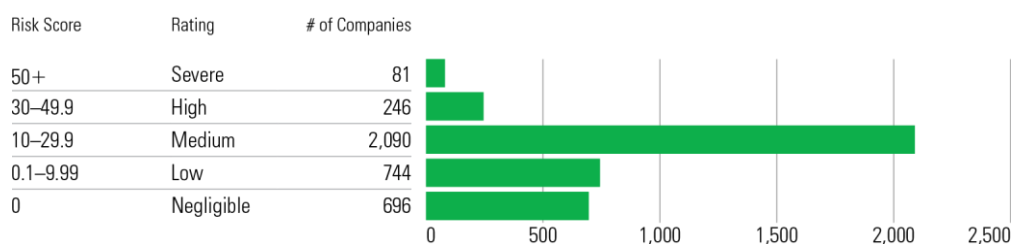
Source: Sustainalytics.

Company unmanaged risk scores range from low to high (lower is better) starting from zero and are sorted into five risk categories, as shown in Exhibit 4. Many companies have scores of zero, indicating that their carbon risk is negligible. Companies with non-zero scores of less than 10 are considered to

⁶ Morningstar is also providing portfolio carbon-emissions data as part of its portfolio carbon-metrics data, enabling the Carbon Risk Score to be used in conjunction with carbon-footprint assessments.

have Low levels of unmanaged carbon risk that could have some material impact on company value. At the other end of the scale, companies with scores from 30 to 49.99 have High carbon risk, and those at 50 or above carry Severe carbon risk. Companies with High and Severe carbon risk are those for whom transition risk poses a more serious financial threat that may lead to significant underperformance relative to the overall market or that may even be existential in nature.⁷

Exhibit 4 Sustainalytics Company Carbon-Risk Rating



Source: Sustainalytics. Data as of April 2018.

Company Carbon-Risk Exposure--Manageable and Unmanageable

The Sustainalytics company carbon-risk rating begins with an assessment of a company's exposure to carbon risk, which is largely driven by the type of business in which a firm is engaged. Carbon exposure is measured by subindustry, with company-specific adjustments made as necessary. Sustainalytics divides the universe into 146 subindustries, some of which have significantly more carbon-risk exposure than others. For some subindustries, a significant portion of their carbon-risk exposure is intrinsic to the industry and cannot be effectively managed away. Take airlines, for example: Sustainalytics assesses that 60% of the carbon-risk exposure they face in their own operations is unmanageable because there are no current alternatives to fossil-fuel-based jet fuel. The other 40% of exposure faced by airlines can be managed through actions such as increases in routing efficiency or engineering planes for better fuel economy.

For most subindustries, carbon risk is manageable either in total or in substantial part. Manageable carbon risk in a firm's "Own Operations" across most subindustries largely consists of carbon emissions related to energy use. For "Products & Services," a firm's carbon risk includes the degree of fossil-fuel involvement in its products and services and the degree to which the firm can transition its product mix to reduce its carbon impact or to produce new carbon solutions.⁸

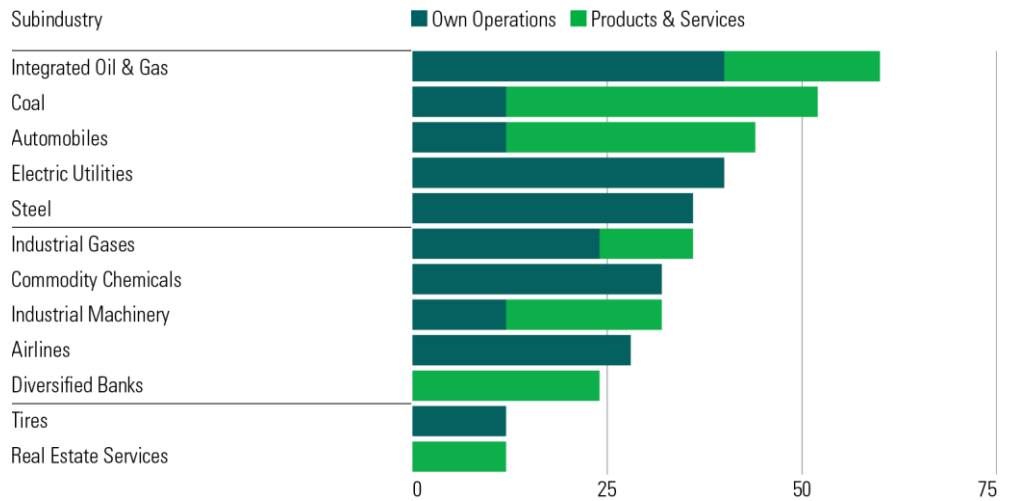
The carbon-risk rating accounts for the fact that some subindustries are fundamentally better positioned for the transition to a low-carbon economy than others. Some subindustries have more carbon exposure than others and, among subindustries, the distribution of exposure across Own Operations and Products

⁷ Because carbon risks can materialize at an unknown future time, a company's carbon-risk level is not a specific prediction of financial or share-price impacts or of the time horizon over which such impacts might be felt.

⁸ While carbon emissions are often present in a company's supply chain, Sustainalytics found that it only rarely materializes as carbon risk to the company itself. The risk is borne by the firm's upstream suppliers.

& Services varies. Exhibit 5 shows the carbon-risk exposure levels of various subindustry groups. Those with the highest levels of carbon-risk exposure are in energy-related and automobile subindustries, while healthcare and technology subindustries are among those with the lowest levels. For some groups, like utilities, exposure is entirely in Own Operations; for others, like real estate, exposure is embedded in Products & Services.

Exhibit 5 Carbon-Risk Exposure – Selected Subindustries



Source: Sustainalytics. Data as of April 2018.

Within a subindustry, each company starts with the same level of carbon exposure assessed across Own Operations and Products & Services. Company-specific adjustments are made for those firms whose operations or product mix cause their exposure to deviate from the subindustry norm. These adjustments also have financial-strength and geographical components. Companies that are weaker financially have less capacity to address carbon risk. Those operating in more highly regulated areas may face greater costs, and may face them sooner, than those operating in less-regulated areas.

An example of how this works can be seen in the automobile subindustry by comparing Tesla and Ford. Both companies have carbon-emissions intensity levels higher than the automobile subindustry average within their own operations, so both have initial carbon-risk exposures higher than the subindustry norm for the Own Operations component. Because Tesla manufactures only electric vehicles, its initial exposure for Products & Services is below the subindustry norm, while Ford's is higher because of its much-higher fleet emissions. As a result, Ford starts off with a higher level of overall exposure to carbon risk than does Tesla and its average automobile subindustry peer.

Exhibit 6 Carbon-Risk Exposure – Tesla and Ford

Carbon-Risk Exposure	Automobiles	Tesla	Ford
Own Operations	12	13.5	14.2
Products & Services	32	30.1	41
Overall Exposure	44	43.6	55.2

Source: Sustainalytics. Data as of April 2018.

Company Carbon-Risk Management

Carbon-risk management is an assessment of how much of a firm's risk is being successfully managed away by the firm's activities. This is referred to as "managed risk." It is measured through a firm's policies, programs, and management systems and is applied to the firm's Own Operations and its Products & Services. The primary manageable risk, which applies across most subindustries albeit to varying degrees, is that companies can bring down their carbon emissions by switching to renewable energy and improving energy efficiency in their Own Operations. The management assessment includes carbon-reduction and overall environmental management policies and systems. It also considers a firm's track record of reducing carbon intensity. In their Products & Services, companies managing carbon risk more effectively are reducing the reliance of their products and services on fossil fuels and placing a greater emphasis on developing "greener" products and services. The management assessment includes carbon-reduction goals for products, design and development of sustainable products, and the carbon-intensity trend in the use of a firm's products and services. In the automobile example, while Ford is doing a better job than Tesla in managing its carbon exposure within Own Operations, Tesla is doing a far better job than Ford at managing carbon exposure in the Products & Services area.

Exhibit 7 Carbon-Risk Management – Tesla and Ford

Carbon-Risk Management	Tesla	Ford
Own Operations	1.2	6.7
Products & Services	24.1	2.3
Overall Management	25.3	9

Source: Sustainalytics. Data as of April 2018.

Company Carbon-Risk Rating

A company's carbon-risk rating is the unmanaged risk that remains after accounting for carbon-risk management. This unmanaged risk is a combination of unmanageable risk over which a company has no control and manageable risk that has the potential to be managed but has not been. Overall, Sustainalytics evaluates Tesla as having managed a significant portion of its carbon risk (about 58% of it, based on the scores in Exhibit 8), leaving it with a Medium carbon-risk rating of 18.3. Ford, on the other hand, is managing only a small portion of its carbon risk, leaving it with a High carbon-risk rating of 46.2.

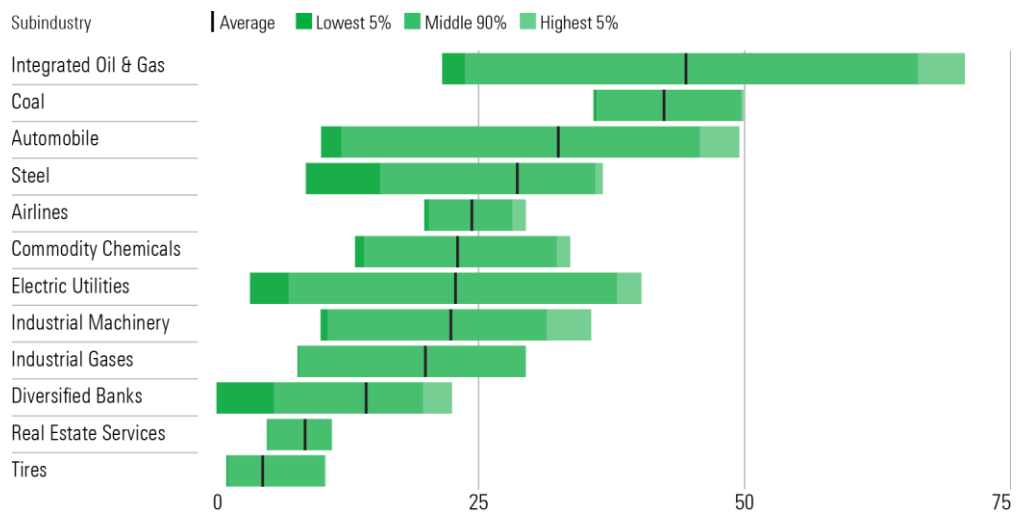
Exhibit 8 Carbon-Risk Rating – Tesla and Ford

	Own Operations			Products & Services			Overall Carbon Risk			Risk Level
	Exposure	Managed	Unmanaged	Exposure	Managed	Unmanaged	Exposure	Managed	Unmanaged	
Tesla	13.5	1.2	12.3	30.1	24.1	6.0	43.6	25.3	18.3	Medium
Ford	14.2	6.7	7.5	41.0	2.3	38.7	55.2	9.0	46.2	High

Source: Sustainalytics. Data as of April 2018.

Exhibit 9 shows the carbon-risk rating across selected subindustries. The exhibit highlights the variation in carbon risk across subindustries as well as the often-considerable variation within subindustries. While the rating allows investors to make carbon-risk comparisons across subindustries, it also allows for intragroup comparisons for investors interested in best-in-class analysis.

Exhibit 9 Carbon-Risk Rating – Selected Subindustries



Source: Sustainalytics. Data as of April 2018.

Morningstar Portfolio Carbon Risk Score

Based on Sustainalytics company carbon-risk ratings, the Morningstar Portfolio Carbon Risk Score is the asset-weighted company carbon-risk rating of the holdings in a portfolio. A portfolio with a lower Carbon Risk Score is positioned to fare better in the transition to a low-carbon economy than is a portfolio with a higher Carbon Risk Score.

Carbon Risk Scores, calculated quarterly based on the most recent portfolios in the Morningstar database, can be used to compare funds with each other, with their Morningstar Category average, and with their benchmarks. Because funds will receive Carbon Risk Scores on a quarterly basis going forward and will receive 12-month average scores, it will be possible to evaluate change over time and the extent to which portfolio managers are addressing carbon risk.

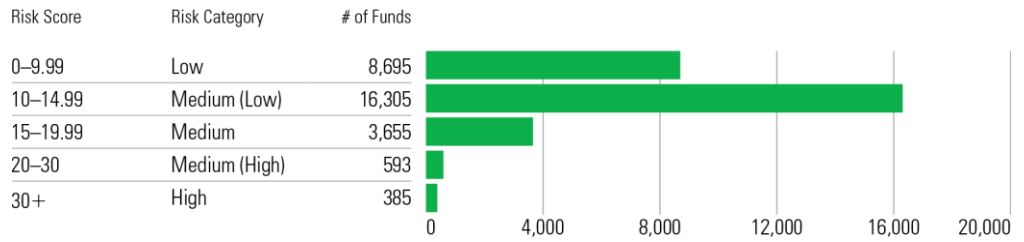
While carbon footprinting is a useful first step in understanding the carbon risk in a portfolio, the Morningstar Portfolio Carbon Risk Score advances that understanding by providing a direct assessment of material carbon risk itself. The initial scores also provide, for the first time, a baseline carbon-risk measurement of funds across the global universe. While there have been some limited efforts in this direction, none span a global universe of more than 30,000 funds. The scores will give investors a better understanding of the carbon risk in funds by investment style and region and a better understanding of the range of carbon risk among portfolios that share an investment style or region.

Carbon Risk in Mutual Funds

Based on the initial Morningstar Portfolio Carbon Risk Scores, this section presents the carbon-risk profile of global funds by Morningstar Category. Fund scores were calculated in April 2018 and averaged based on quarterly portfolios from the past 12 months. The scores are based on the initial Sustainalytics company carbon-risk ratings. While these initial company ratings were just released in April 2018, Sustainalytics has been calculating them over the past year, so they can reasonably be applied to fund portfolios over that time frame. The initial Sustainalytics company carbon-risk ratings will continue to be applied to portfolios for the coming year. Sustainalytics will update the ratings annually during the first quarter of each calendar year. Updated ratings will be used to calculate Carbon Risk Scores for the subsequent 12 months.

Exhibit 10 shows the 12-month average Carbon Risk Scores as of April 2018. The average fund has a score of 12, which is in the Medium risk range. Two thirds of funds have scores between 10 and 19.99, while only about 4% have scores of 20 or higher. About 29% of funds have scores in the Low risk range.

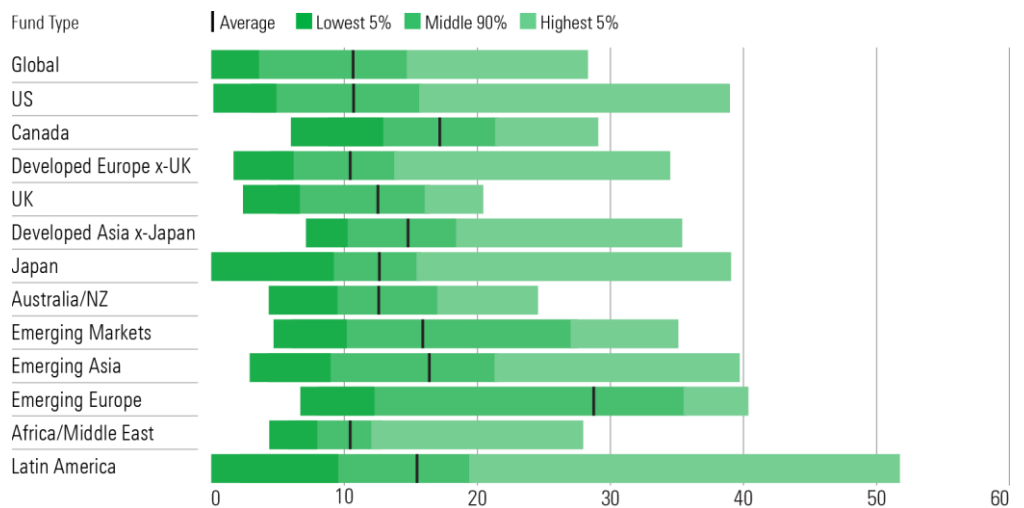
Exhibit 10 Morningstar Portfolio Carbon Risk Scores



Source: Morningstar. Data as of April 2018.

Exhibit 11 shows the average Carbon Risk Scores across a range of Morningstar global investment categories. Diversification helps keep the average fund’s Carbon Risk Score in the Medium risk range, with developed-markets equity funds landing near the low end of it. Diversified global equity portfolios that invest primarily in developed-markets equity have an average Carbon Risk Score of 10.42. Within developed-markets regions, Europe ex-UK has the lowest score, 10.05, while Asia ex-Japan has the highest, at 14.54. The average Carbon Risk Score for U.S. funds is 10.45. Risk scores are higher for emerging-markets funds. Diversified emerging-markets equity funds have an average Carbon Risk Score of 15.59. Within the emerging-markets group, emerging Europe, a group dominated by Russia funds, has the highest average Carbon Risk Score (28.53), while Africa/Middle East funds have the lowest (10.23).

Exhibit 11 Morningstar Portfolio Carbon Risk Score – Global Regions

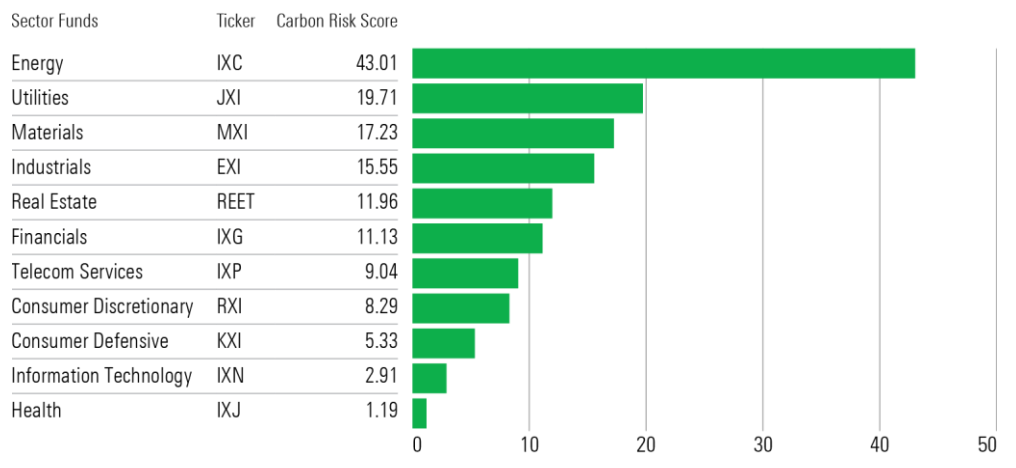


Source: Morningstar. Data as of April 2018.

Carbon Risk Scores of funds can be explained, in part, by their sector weightings. Exhibit 12 shows the Carbon Risk Scores by GICS sector, using iShares global sector exchange-traded funds as proxies. The energy sector, not surprisingly, carries the largest carbon risk, at 43.01, more than twice that of utilities, which has a Carbon Risk Score of 19.71. Materials and industrials also have higher relative scores. On

the low end of the range are technology, which weighs in at 2.91, and healthcare, which has an ultralow score of 1.19.

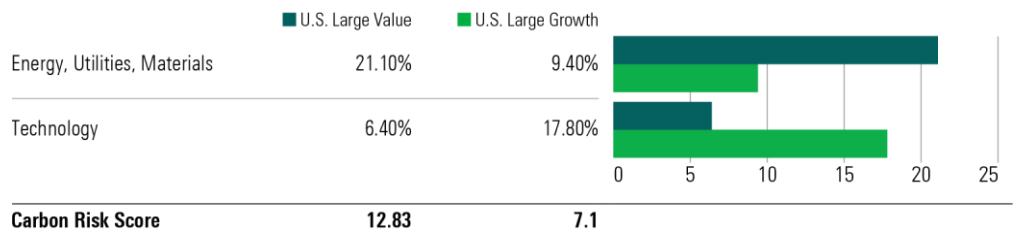
Exhibit 12 Morningstar Portfolio Carbon Risk Score – Sector



Source: Morningstar. Data as of April 2018.

Funds that have overweightings to the higher carbon-risk sectors tend to have higher Carbon Risk Scores, while those with overweightings to the lower carbon-risk sectors tend to have lower Carbon Risk Scores. U.S. large-value funds, for example, have an average Carbon Risk Score of 12.83, considerably higher than the 7.1 average score of U.S. large-growth funds. As shown in Exhibit 13, large-value funds devote more than one fifth of their assets to the three sectors with the highest Carbon Risk Scores (energy, utilities, and materials), while U.S. large-growth funds have less than one tenth of their assets invested in those sectors. Large-value funds average just a 6.4% weighting in technology, which has one of the lowest carbon-risk profiles, compared with 17.8% for large-growth funds. Large-value and large-growth funds have similar average exposure to the healthcare sector, so both benefit about equally from that sector’s low carbon risk.

Exhibit 13 Morningstar Portfolio Carbon Risk Score – Style



Source: Morningstar. Data as of April 2018.

Regional differences play a role as well. Emerging-markets managers, for example, generally must choose among higher carbon-risk companies compared with developed-markets managers. In the automobile subindustry, emerging-markets firms have an average Carbon Risk Score of 41.2, in the High risk range, while developed-markets firms have a much lower average Carbon Risk Score of 26.3, in the Medium risk range. Funds in all emerging-markets regions, except for Africa/Middle East, have average Carbon Risk Scores of 15 or more.

Considerable variation in fund Carbon Risk Scores exists within most categories. Intracategory comparisons of Carbon Risk Scores can highlight the possibilities for investors wanting to lower the carbon risk in their portfolios. Asset managers, for example, can compare their risk scores with those of peer funds that are significantly lower to understand whether and how lower-carbon portfolios differ from higher-carbon portfolios across other standard portfolio metrics. This information can help asset managers assess the feasibility of lowering carbon risk in their own portfolios. Fund investors can set a goal for carbon-risk reduction and use it to find lower-carbon alternatives.

To illustrate, two Morningstar Categories, world large cap and diversified emerging markets, were analyzed using the Morningstar Risk Model to assess the differences between average carbon-risk funds and lower carbon-risk funds. For each of the two categories, an iShares ETF was selected to represent a market-cap-weighted average portfolio. Next, the five funds in each category with the Carbon Risk Scores closest to 10% below the iShares ETFs were selected and another five funds with the Carbon Risk Scores closest to 30% below the iShares ETFs were selected. The 10% group and the 30% group were then compared with the iShares portfolios using the Morningstar Risk Model.

For world large cap, the average factor profile of the funds with 10% less carbon risk was similar to that of the iShares portfolio. This suggests that investors can lower their carbon risk by 10% without otherwise altering their factor exposures in any significant way. As Exhibit 14 shows, the 10% lower carbon-risk funds are somewhat more growth-oriented (Value-Growth), but otherwise their factor premiums are close to those of the market-cap-weighted portfolio. Investors wanting to lower carbon risk more significantly in their global equity exposure would experience a more noticeable shift in style and quality. The 30% lower carbon-risk funds are more growth-oriented (Value-Growth, Valuation) and higher quality (Economic Moat).

Exhibit 14 Reducing Carbon Risk: World Large Cap Stock

World Large Cap Stock	ACWI	10% Lower Carbon Risk	30% Lower Carbon Risk
Valuation	0.02	0.04	-0.06
Economic Moat	0.82	0.87	1.04
Valuation Uncertainty	-0.77	-0.83	-0.74
Financial Health	0.58	0.56	0.65
Ownership Risk	-0.42	-0.42	-0.35
Ownership Popularity	-0.38	-0.42	-0.34
Value-Growth	0.05	0.20	0.43
Size	-1.43	-1.43	-1.41
Liquidity	0.21	0.24	0.22
Momentum	0.19	0.22	0.27
Volatility	-0.6	-0.63	-0.61

Source: Morningstar Direct. Data as of April 2018.

For diversified emerging markets, the results were similar, as shown in Exhibit 15. The 10% lower-carbon emerging-markets funds do not differ markedly from the iShares portfolio. Modest differences in the average premiums of three factors (Ownership Risk, Price Volatility, Size) suggest the 10% group is somewhat less risky in traditional investment terms and invests in smaller companies. Emerging-markets investors could lower carbon risk without otherwise making significant changes to the overall risk profile, as traditionally measured, of their investment. As was the case with global equity, the 30% lower carbon-risk funds exhibit greater differences from the market-cap-weighted average portfolio across several factors in the Risk Model. The 30% lower-carbon funds are more growth-oriented (Value-Growth, Valuation), less volatile (Price Volatility, Valuation Uncertainty) and higher quality (Moat, Financial Health).

Exhibit 15 Reducing Carbon Risk: Diversified Emerging Markets

Diversified Emerging Markets	EEM	10% Lower Carbon Risk	30% Lower Carbon Risk
Valuation	-0.13	-0.16	-0.22
Economic Moat	0.42	0.39	0.82
Valuation Uncertainty	-0.09	-0.13	-0.31
Financial Health	0.43	0.46	0.55
Ownership Risk	0.31	0.22	0.26
Ownership Popularity	0.51	0.54	0.38
Value-Growth	-0.04	-0.05	0.21
Size	-1.24	-1.06	-1.18
Liquidity	-0.2	-0.21	-0.23
Momentum	0.43	0.37	0.45
Price Volatility	-0.49	-0.55	-0.56

Source: Morningstar Direct. Data as of April 2018.

Using the Morningstar Portfolio Carbon Risk Scores

Fund investors can use the Morningstar Portfolio Carbon Risk Scores in several ways. The initial scores can be used to set a baseline for ongoing monitoring of the carbon-risk exposure of an investor's portfolio holdings. Portfolio scores can be compared with category averages and benchmarks to determine whether funds are above or below the category average or benchmark exposure. Finally, as we saw in the last section, the portfolio scores can be used to identify and evaluate lower carbon-risk alternatives, allowing fund investors to lower the carbon risk in their portfolios.

For asset managers, the initial portfolio scores can also be used to set a baseline for ongoing monitoring of their funds' carbon-risk exposures. Those that have or are considering carbon-reduction targets can use the portfolio scores over time to evaluate their progress. The portfolio scores give asset managers an ongoing comparison with their peers and with benchmarks. Asset managers can also use the portfolio scores to communicate with interested stakeholders about carbon risk and any efforts they are making to reduce it.

The Morningstar® Low Carbon Designation™

Portfolios that exhibit low overall carbon risk and have lower-than-average fossil-fuel exposure will receive the Morningstar® Low Carbon Designation™, shown in Exhibit 16. This designation, represented by a green leaf icon, is meant to help investors quickly and easily identify low-carbon funds and, in general, to educate key stakeholders and the public about the availability of low-carbon investment choices. The designation is an indicator that a portfolio's holdings are in general alignment with the transition to a low-carbon economy.

For a fund to receive the Low Carbon designation, it must have a Morningstar Portfolio Carbon Risk Score below 10 for the trailing 12 months and fossil-fuel exposure below 7% over the same trailing 12 months. The initial Carbon Risk Scores were calculated in April 2018 and applied to quarterly portfolios over the prior year. Fossil-fuel exposure was calculated over the same period. A list of funds receiving the designation will be created every quarter.

Exhibit 16 Morningstar Low Carbon Designation



Source: Morningstar.

The fossil-fuel exposure requirement is designed to highlight the degree to which a portfolio is exposed to this most significant carbon risk. Companies with fossil-fuel exposure are defined as those with involvement, based on a percentage of revenue, in the following five activities:

Thermal coal extraction	(5% revenue threshold)
Thermal coal power generation	(5% revenue threshold)
Oil & gas production	(5% revenue threshold)
Oil & gas power generation	(5% revenue threshold)
Oil & gas products and services	(50% revenue threshold)

The portfolio exposure threshold was set at 7% because it represents about a one-third lower level of exposure to fossil fuel than that of major global indexes. The S&P 500, MSCI ACWI, MSCI World, and MSCI Europe indexes all have exposures between 10% and 11% to companies involved in the activities listed above.

In the Morningstar database, approximately 6,000 portfolios out of 30,000, or about one in five, receive the Low Carbon designation initially. Many of these portfolios invest in areas of the market that are low-carbon, so they receive the designation by virtue of their investment style. The designation will help investors better understand what areas of the market are intrinsically low-carbon. Many diversified portfolios also receive the designation. This will highlight the fact that investors have low-carbon fund choices across virtually all investment styles and regions.

Conclusion

The Morningstar Portfolio Carbon Risk Score provides investors and other interested stakeholders with unique portfolio-level carbon-risk information on approximately 30,000 funds globally. Using Sustainalytics' innovative new company carbon-risk ratings, the Morningstar Portfolio Carbon Risk Scores go beyond traditional carbon footprinting, taking account of management actions to mitigate a firm's carbon risk. The vast coverage of the global-funds universe and the uniqueness of the measure itself open new doors for investors analyzing the carbon risk of portfolios.

Based on the initial scores, we observed a range of Carbon Risk Scores by Morningstar Categories. Funds investing in Europe ex-UK and in the U.S. have the lowest average carbon risk, while those investing in Asia ex-Japan and in emerging markets have the highest average carbon risk. Most categories of diversified funds, however, have low-carbon fund choices regardless of their average risk levels. Investors can use the Morningstar Portfolio Carbon Risk Scores and the Morningstar Low Carbon Designation to identify such funds. Investors can now incorporate carbon risk into their due diligence process alongside traditional investment criteria. ■■■

For More Information

Jon Hale, Ph.D., CFA

Director, Sustainability Investing Research

+1 312 696-6093

jon.hale@morningstar.com



22 West Washington Street
Chicago, IL 60602 USA

©2018 Morningstar. All Rights Reserved. Unless otherwise provided in a separate agreement, you may use this report only in the country in which its original distributor is based. The information, data, analyses, and opinions presented herein do not constitute investment advice; are provided solely for informational purposes and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete, or accurate. The opinions expressed are as of the date written and are subject to change without notice. Except as otherwise required by law, Morningstar shall not be responsible for any trading decisions, damages, or other losses resulting from, or related to, the information, data, analyses, or opinions or their use. The information contained herein is the proprietary property of Morningstar and may not be reproduced, in whole or in part, or used in any manner, without the prior written consent of Morningstar. To license the research, call +1 312 696-6869.