CARBON FOOTPRINTING 101

A Practical Guide to Understanding and Applying Carbon Metrics

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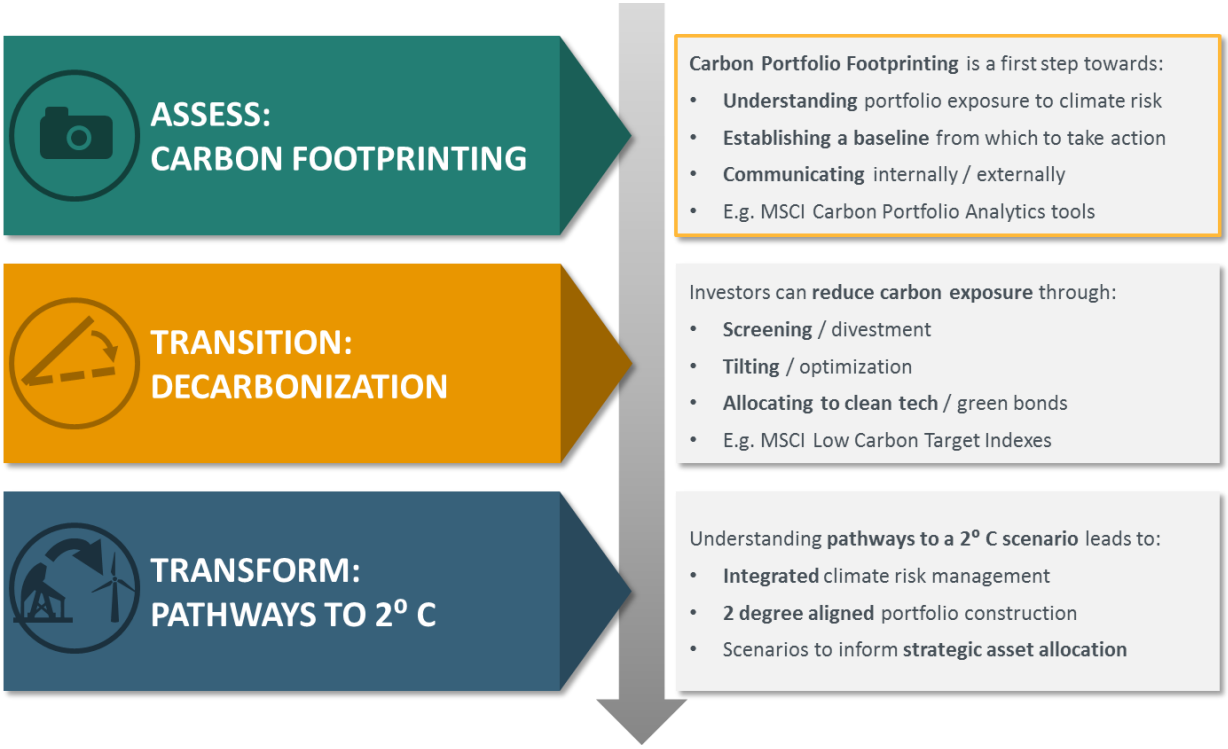
EXECUTIVE SUMMARY

Climate change presents one of the largest economic and political challenges of the 21st century. Over the coming decades, efforts to mitigate and adapt to climate change may have wide-ranging policy, economic, and technological impacts, potentially creating risks and opportunities for institutional investors.

Assessing the carbon footprint of a portfolio is the first step in addressing the investment implications of climate change. Carbon footprinting sets a baseline to inform future actions, which can range from reporting and engagement to decarbonization and integrated risk management.



The role of footprinting as a first step has driven initiatives such as the Montreal Pledge[1] (targeting carbon footprinting of $3tr in assets under management) and the Portfolio Decarbonization Coalition[2] (targeting carbon footprinting of $500 billion in AUM).

This paper explores the key practical and theoretical considerations to applying carbon metrics to portfolio analysis.

[1] http://montrealpledge.org

[2] http://unepfi.org/pdc/

KEY FINDINGS

- After an extensive market consultation, MSCI ESG Research identified a desire for consistent market standards in carbon footprint metrics. Four key metrics emerged designed to provide standard answers to four key questions typically asked by institutional investors:

Carbon Emissions	*What is my portfolio's normalized carbon footprint per million dollars invested?*
Total Carbon Emissions	*What is my portfolio's total carbon footprint?*
Carbon Intensity	*How efficient is my portfolio in terms of emissions per unit of output?*
Weighted Average Carbon Intensity	*What is my portfolio's exposure to carbon-intensive companies?*

- Footprinting applies only one lens, whereas additional metrics – including fossil fuel exposure, clean tech exposure, and carbon risk management – provide a deeper assessment of climate risk and opportunity.
- This paper presents the initial footprinting results for 19 MSCI Indexes as of 31 August, 2015.
  - The highest-emitting index was the **MSCI Emerging Market Index**, followed by the **MSCI Pacific**, **MSCI Europe**, and **MSCI North America Indexes**.
  - The **Low Carbon Target** variants of each index had the lowest emissions, with reductions ranging from 70-75% compared to their respective parent indexes.
  - A USD 1,000,000 investment in a sample portfolio tracking the **MSCI ACWI Index** was associated with emissions of **192 t CO2e**, equivalent to the emissions of approximately 40 passenger vehicles per year[3].
  - A case study of the **MSCI ACWI Index** and the **MSCI ACWI Low Carbon Target Index** illustrates a practical application of additional metrics to inform a deeper understanding of the carbon characteristics of a portfolio. As of 21 September, 2015:The Utilities, Materials, and Energy sectors represented 80% of total ACWI Carbon Emissions, but only 15% of Portfolio Weight
  - The **MSCI ACWI Low Carbon Target** had over 80% lower exposure to owners of High-Impact Fossil Fuel Reserves, including coal, oil sands, shale oil, and shale gas.

[3] Based on US EPA's calculation for converting greenhouse gas emissions (tCO2e) numbers into different types of equivalent units More information on conversion methodology can be found at: http://www.epa.gov/cleanenergy/energy-resources/refs.html

CONSULTATION FINDINGS

With the goal of aligning footprint metrics with market needs, in April 2015, MSCI ESG Research carried out a consultation with leading Asset Owners and Asset Managers globally – representing over USD 1.6 trillion in assets and over USD 2.4 trillion in assets under management, respectively – to gather feedback regarding the establishment of a market standard in carbon footprinting.

To date, the lack of industry consensus on how to assess portfolio carbon exposure has made it difficult to compare carbon footprints of different portfolios. Without market standards, it is impossible to understand the reason for footprint differences. Variance may come from portfolio size, asset classes, or methodology.

The two key areas of feedback received through the consultation outlined **1) the need for a market standard in carbon footprinting** and **2) the need for additional relevant** metrics to assess a portfolio's baseline exposure to climate related risks and opportunities.

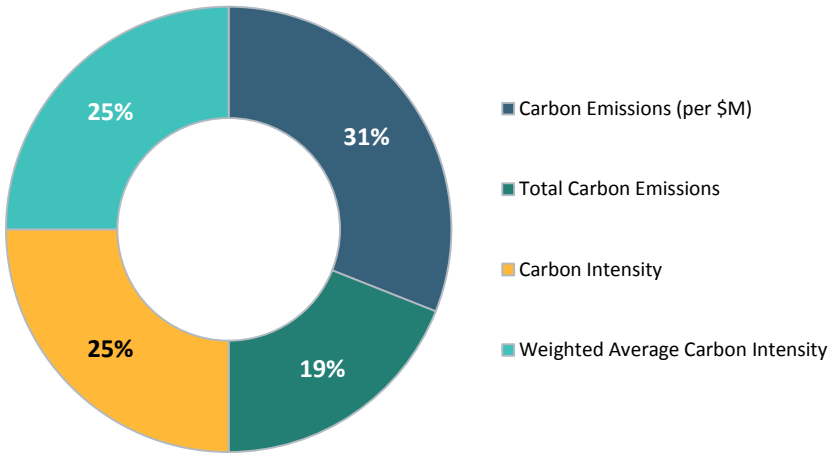
Figure 1 – Summary of Consultation Feedback

Lack of consensus on Carbon Footprint metric	•Consultees were split as to the best way to measure the carbon footprint at the portfolio level. Expressed strong desire for standards on metrics and methodology.
Presenting multiple metrics makes sense	•Broad consensus that presenting multiple metrics for emissions and intensity is useful because different use cases may warrant different measurements.
Simplicity is key	•Metrics must be transparent and easy to understand and explain.
Incorporating fixed income is on the horizon	•Equity portfolios are currently the focus but there is broad interest in expanding to Fixed Income, albeit with an acknowledgement that this asset class is more challenging.
Data Quality is crucial	•Any footprint measure is only as good as the underlying carbon emissions data.
Carbon Footprint is important but more analysis is needed	•Measuring footprint is useful but is limited in what it can tell you about a portfolio's exposure to carbon risks. Additional metrics and context may be needed.

The final point on the list was stressed as the most important. Clients emphasized that while core footprint metrics are an appropriate starting point to establish their baseline exposure, more in-depth analysis is essential to inform actual decision making. Without an understanding of characteristics such as fossil fuel reserves and carbon risk mitigation, it is not possible to make fully educated decisions.

Consultees were also asked what single carbon footprint metric is of most importance to them. Figure 2 shows that opinions were almost evenly distributed, underscoring the importance of providing multiple metrics.

Figure 2 – Poll: Which Carbon Portfolio Metric is Most Important?



As of May 2015, based on interviews with assets owners and asset managers. n=16.

CARBON FOOTPRINT METRICS

After the market consultation, MSCI ESG Research developed four key metrics designed to establish baseline carbon exposure, with a single metric – **Carbon Emissions (per million dollars invested)** – established as the standard metric to measure the carbon footprint of equity portfolios.

Figure 3 – Carbon Footprint Metrics

	Carbon Emissions tons CO2e / $M invested	**Total Carbon Emissions** tons CO2e	**Carbon Intensity** tons CO2e / $M sales	**Weighted Average Carbon Intensity** tons CO2e / $M sales
Question:	***What is my portfolio's normalized carbon footprint per million dollars invested?***	***What is my portfolio's total carbon footprint?***	***How efficient is my portfolio in terms of carbon emissions per unit of output?***	***What is my portfolio's exposure to carbon-intensive companies?***
Key Strengths:	✓ Allows for comparison regardless of portfolio size ✓ Enables portfolio decomposition and attribution analysis	✓ Most literal carbon footprint from GHG accounting perspective ✓ Absolute number can be used for carbon offsetting	✓ Provides overall intensity of portfolio by adjusting for company size ✓ Allows for comparison regardless of portfolio size	✓ Applicable across asset classes, including fixed income ✓ Simple and intuitive calculation ✓ Does not require corresponding market cap or sales data ✓ Enables simple attribution analysis and portfolio decomposition
Key Weaknesses:	○ Requires underlying issuer market cap data ○ Ownership perspective means it is only applicable to equity portfolios ○ Sensitive to changes in market value of portfolio	○ Limited usefulness for benchmarking and comparison to other portfolios due to link to portfolio size ○ Requires underlying issuer market cap data ○ Ownership perspective means it is only applicable to equity portfolios	○ Complex calculation, challenging to communicate and understand ○ Requires underlying issuer market cap data ○ Ownership perspective means it is only applicable to equity portfolios	○ Does not capture any measure of investor responsibility ○ Sensitive to outliers

TOTAL CARBON EMISSIONS

Total Carbon Emissions measures the absolute tons of CO2e (Scope 1 + 2)[4] for which an investor is responsible. It is apportioned to the investor based on an equity ownership perspective, and can be explained with a simple example:

> *If an investor's position in a company is equal to 1% of the company's total market capitalization, then the investor owns 1% of the company, and is consequently responsible for 1% of the company's carbon emissions (tons CO2e).*

Calculating the "owned" emissions from each position in the portfolio and summing those emissions yields the total carbon emissions for the portfolio. This is shown in Figure 4 below.

Figure 4 – Carbon Emissions Calculation Example

	Portfolio Position	Total Market Capitalization	Ownership Percentage (Portfolio Position/Total Market Cap)	Company Carbon Emissions	Total Carbon Emissions (Ownership % * Carbon Emissions)
ABC Inc	**$1,000,000**	**$20,000,000**	**5%**	**8,000 t CO2e**	**400 t CO2e**
XYZ Corp	**$4,000,000**	**$40,000,000**	**10%**	**2,000 t CO2e**	**200 t CO2e**
Sum					**600 t CO2e**

Key Strengths and Weaknesses

- ✓ Most literal carbon footprint from GHG accounting perspective
- ✓ Useful for reporting the total carbon footprint of portfolios
- ✓ Absolute number can be used for carbon offsetting
- ○ Limited usefulness for benchmarking and comparison to other portfolios due to link to portfolio size
- ○ Requires underlying issuer market cap data
- ○ Ownership perspective means it is only applicable to equity portfolios

[4] Scope 1 refers to direct GHG emissions, Scope 2 refers to indirect GHG emissions from the consumption of purchased electricity. For more details on the scope of GHG emissions, see "Defining the Scope" on page 13.

CARBON EMISSIONS (PER MILLION DOLLARS INVESTED)

Total Carbon Emissions are directly linked to the market value of the portfolio. For instance, if two portfolios have identical securities and weights, but one has twice the market value, then the larger one will also have twice the Total Carbon Emissions. This presents limitations when comparing the carbon footprint between portfolios or against a benchmark index. Presenting the footprint as a normalized figure enables cross-portfolio comparison.

Carbon Emissions is identical to Total Carbon Emissions, except that rather than providing the total carbon emissions for the portfolio it normalizes the carbon emissions for every $1,000,000 of market value. As a normalized metric, it can be used to accurately compare portfolios of any size.

Figure 5 – Carbon Emissions Calculation Example

	Portfolio Carbon Emissions	Portfolio Market Value	Portfolio Carbon Emissions per $M Invested
Portfolio A	**600 t CO2e**	**$5,000,000**	**120 t CO2e / $M**
Portfolio B	**6,000 t CO2e**	**$100,000,000**	**60 t CO2e / $M**

Key Strengths and Weaknesses

- ✓ Allows for comparison regardless of portfolio size
- ✓ Enables portfolio decomposition and attribution analysis
- ○ Requires underlying issuer market cap data
- ○ Ownership perspective means it is only applicable to equity portfolios
- ○ Sensitive to changes in market value of portfolio

CARBON INTENSITY

Carbon Intensity expresses the carbon efficiency of the portfolio and allows institutional investors to measure the volume of carbon emissions per dollar of sales generated by portfolio companies over a specified time frame. This metric adjusts for company size and is a more accurate measurement of the efficiency of output, rather than a portfolio's absolute footprint.

Although efficiency at the company level is best measured using industry-specific measures of output (e.g. per tons of steel, miles flown, MWh of power generated, etc.), sales are used in the portfolio context as the best available measure of output when comparing across industries.

Portfolio Carbon Intensity is calculated by dividing the portfolio's total Carbon Emissions (apportioned by the investor's ownership share) by the portfolio's total Sales over that same period of time (also apportioned by the investor's ownership share).

> *E.g. If a portfolio's position in a company is equal to 1% of the company's total market capitalization, then the investor owns 1% of the company and has a claim on 1% of the company's sales. Summing those sales for each investment yields the total portfolio sales.*

Figure 6 – Carbon Intensity Calculation Example

	Portfolio Position	Total Market Cap	Owner-ship %	Company Carbon Emissions	Portfolio Carbon Emissions	Company Sales	Portfolio Claim on Sales (% Owned * Sales)	Portfolio Carbon Intensity (Total Emissions / Total Sales)
ABC Inc	$1,000,000	$20,000,000	5%	8,000 t CO2e	400 t CO2e	$60 M	$3 M	
XYZ Corp	$4,000,000	$40,000,000	10%	2,000 t CO2e	200 t CO2e	$20 M	$2 M	
Sum					**600 t CO2e**		**$5 M**	**120 t CO2e /$M**

Key Strengths and Weaknesses

- ✓ Provides overall intensity of portfolio by adjusting for company size
- ✓ Allows for comparison regardless of portfolio size
- ○ Complex calculation, challenging to communicate and understand
- ○ Requires underlying issuer market cap data
- ○ Ownership perspective means it is only applicable to equity portfolios

WEIGHTED AVERAGE CARBON INTENSITY

The Weighted Average Carbon Intensity measures a portfolio's exposure to carbon intensive companies. Since companies with higher carbon intensity are likely to face more exposure to carbon related market and regulatory risks, this metric can serve as a proxy for a portfolio's exposure to potential climate change-related risks relative to other portfolios or relative to a benchmark.

Calculating a portfolio's Weighted Average Carbon Intensity is simple, achieved by calculating the carbon intensity (Scope 1 + 2 Emissions / $M Sales) for each portfolio company and calculating the weighted average by portfolio weight. Unlike the Portfolio Carbon Intensity, carbon emissions are apportioned based on portfolio weights / exposure, rather than the investor's ownership share of emissions or sales.

Figure 7 – Weighted Average Carbon Intensity Calculation Example

	Portfolio Position	Portfolio Weight (Portfolio Position / Total Mkt Cap)	Company Carbon Emissions	Company Sales	Carbon Intensity (Emissions / Sales)	Weighted Average Carbon Intensity (Weight * Intensity)
ABC Inc	$1,000,000	20%	8,000 t CO2e	$60,000,000	133 t CO2e / $M	27
XYZ Corp	$4,000,000	80%	2,000 t CO2e	$20,000,000	100 t CO2e / $M	80
Sum						**107 t CO2e / $M**

Key Strengths and Weaknesses

- ✓ Applicable across asset classes, including fixed income
- ✓ Simple and intuitive calculation
- ✓ Does not require corresponding market cap or sales data
- ✓ Enables simple attribution analysis and portfolio decomposition
- ○ Does not capture any measure of investor responsibility
- ○ Sensitive to outliers

BEYOND FOOTPRINTING

While the core footprint metrics are an important starting point to understanding a portfolio's exposure to climate risks, basic footprinting may not fully illustrate carbon characteristics of a portfolio. This can be done by considering additional measures.

First, the carbon footprint provides a snapshot of the overall portfolio, but deeper analysis may be needed to inform any action to reduce a portfolio's footprint:

- **Portfolio Decomposition** of the footprint explains the sectors and companies that drive the portfolio footprint. This can be used to help prioritize areas of action, or identify candidates for corporate engagement.
- **Attribution Analysis** explains how sector allocation and stock selection contribute to a smaller or larger footprint relative to a benchmark. This can be used to identify opportunities for future footprint reduction.

Second, the carbon footprint is by nature backwards-looking as it measures the carbon emitted by portfolio companies over the prior fiscal year. While this helps to establish a baseline, additional metrics can help to further analyze companies' management of and exposure to climate-related risks:

- The **Historical Trend** of a portfolio's footprint reveals if the held companies have had increasing or decreasing carbon emissions over the last three years. A decreasing trend line indicates that companies in the portfolio have been reducing their emissions over the previous year.
- **Fossil Fuel Reserves** represent another source of carbon risk in the form of potential stranded assets. By assuming that current fossil fuel reserves will become "future" carbon emissions, the potential footprint of the reserves can be calculated just like the footprint for carbon emissions. This can be looked at from a variety of angles, such as analysis by reserve type (coal, oil, and gas), or by reviewing the contribution to potential emissions coming from the highest-impact reserves like oil sands and shale gas.
- **Carbon Risk Management** captures companies' response to carbon concerns by looking at companies' reduction targets, reduction programs and initiatives, and three-year carbon emissions trend. Two companies with identical carbon emissions today could have vastly differing strategies for managing emissions in the future. This information may also help to identify potential engagement targets.

Finally, the carbon footprint provides an indication of risk, but does not capture opportunities arising from companies that are developing solutions to the challenges raised by climate change:

- **Clean Technology Solutions** data can be looked at as involvement by theme (Energy Efficiency, Alternative Energy, etc.) and by the percent of revenue generated from clean tech solutions.

DEFINING THE SCOPE: DIRECT VS INDIRECT EMISSIONS

MSCI's carbon footprint calculations are based on Scope 1 + Scope 2 carbon emissions:

- **Scope 1:** All direct GHG emissions from sources owned or controlled by the company. Some examples include emissions from fossil fuels burned on site, emissions from entity-owned or leased vehicles.

  As of 21 Sept 2015, Scope 1 emissions comprised 81% of total emissions of the MSCI ACWI Index.

- **Scope 2:** Indirect GHG emissions from consumption of purchased electricity, heat, or steam, and the transmission and distribution (T&D) losses associated with some purchased utilities.

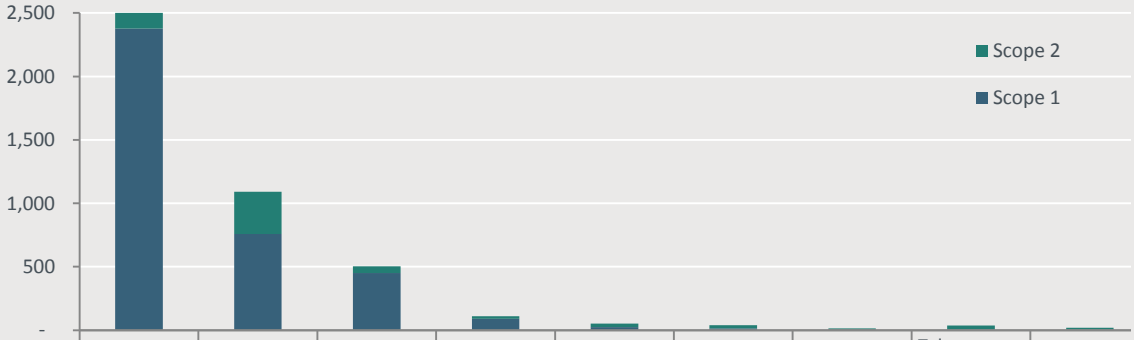
  As of 21 Sept 2015, Scope 2 emissions comprised 19% of total emissions of the MSCI ACWI Index.

- **Scope3:** Other indirect emissions that occur from sources not owned or controlled by the company. Some examples of scope 3 activities are extraction and production of purchased materials; transportation of purchased fuels; and use of sold products and services.

  Since Scope 3 emissions occur from sources not owned or controlled by the company, and the boundaries to measure scope 3 emissions are not well-defined, it is not consistently calculated or disclosed by companies.

  The inconsistency of scope 3 emissions data makes it difficult to perform any meaningful comparative analysis across companies or industries. Further, due to lack of control of the emission sources and boundaries, it is difficult to estimate such emissions comprehensively.

Figure 8 – Scope 1 vs. Scope 2 Emissions by Sector



	Utilities	Materials	Energy	Industrials	Consumer Staples	Consumer Discretionary	Financials	Telecommunication Services	Information Technology
Scope 2	124	332	53	20	26	24	9	33	15
Scope 1	2,377	758	451	90	25	15	5	5	5

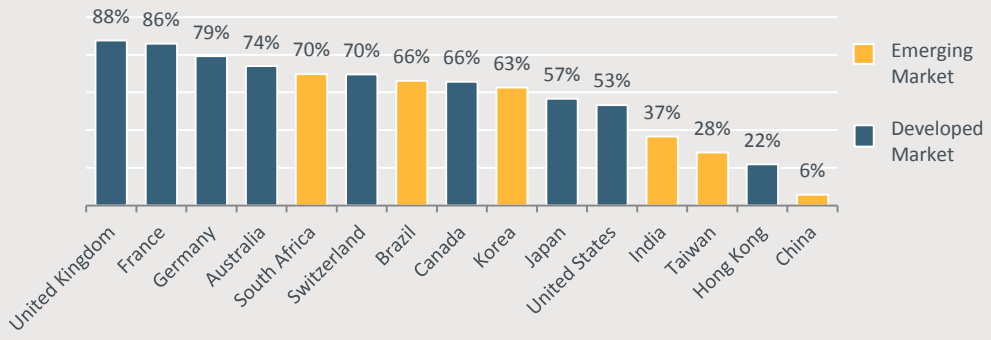
Source of definitions: GHG Protocol

FOCUS ON CARBON DATA QUALITY

As indicated by many of the consultation participants, the quality of the underlying data is critical to providing accurate or meaningful carbon footprint measurements.

While the quality of company-reported carbon data is certainly improving, it is still not fully reliable as only 61% of the constituents of the MSCI ACWI Index reported their carbon emissions within the last two years. The remaining 39% must be supplemented with estimates (see Appendix for estimation methodology).

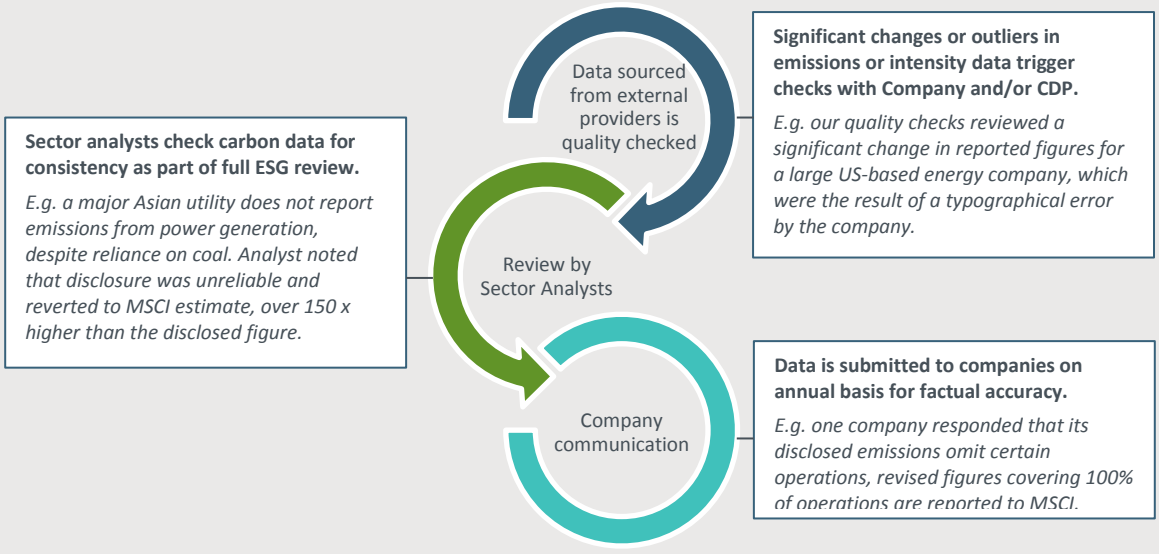
Figure 11 – Percentage of MSCI ACWI Constituents Disclosing Carbon Emissions by Country



As of 21 Sept, 2015.

Secondly, the data that companies report in their investor documentation or to third parties such as the Carbon Disclosure Project (CDP) is also often unreliable. Company reporting may overlook certain operations, or show unexplained deviations from prior years.

Figure 10 – MSCI's Process to Address Data Quality



INDEX CARBON FOOTPRINT RESULTS

MSCI reports the carbon footprint of its flagship global indexes in response to the growing commitments by asset owners and asset managers to understand, measure, and manage carbon risk in their portfolios.

Figure 11 – Carbon Footprint of Flagship MSCI Indexes as of 31 August, 2015

Index Name	Carbon Emissions *tons CO2e / $M invested*	Carbon Intensity *tons CO2e / $M sales*	Weighted Average Carbon Intensity *tons CO2e / $M sales*
MSCI ACWI Index	**192.0**	**234.7**	**211.2**
ACWI ESG	126.6	171.5	174.5
ACWI LOW CARBON TARGET*	43.9	58.7	87.7
ACWI LOW CARBON LEADERS*	110.3	127.0	102.3
ACWI ex FOSSIL FUELS	153.2	201.1	187.4
MSCI WORLD Index	**166.0**	**216.0**	**186.0**
WORLD ESG	120.7	167.9	175.1
WORLD LOW CARBON TARGET*	43.6	64.1	84.9
WORLD LOW CARBON LEADERS*	87.4	109.5	78.4
MSCI EMERGING MARKETS Index	**439.1**	**341.0**	**451.4**
EM (EMERGING MARKETS) ESG	183.1	198.6	168.7
MSCI EUROPE Index	**202.8**	**184.3**	**132.3**
EUROPE ESG	121.6	127.8	140.3
EUROPE LOW CARBON LEADERS*	96.9	89.3	62.0
MSCI NORTH AMERICA Index	**128.4**	**228.0**	**207.5**
NORTH AMERICA ESG	105.9	195.8	195.8
NORTH AMERICA LOW CARBON LEADERS*	66.7	112.9	92.4
MSCI PACIFIC Index	**273.0**	**249.1**	**190.8**
PACIFIC ESG	187.4	171.6	147.4

As of 31 Aug, 2015.

*The Low Carbon Target and Low Carbon Leaders Indexes are optimized to minimize Carbon Intensity, subject to tracking error and other constraints.

KEY FINDINGS AS OF 31 AUGUST, 2015:

- Regionally, the **MSCI Emerging Markets Index** had the highest carbon emissions, with emissions per dollar exceeding those of the **MSCI World Index** (i.e. developed markets) by over 2.5-fold.
- Within Developed Markets, the **MSCI Pacific Index** had the highest carbon emissions, followed by the **MSCI Europe** and **MSCI North America Indexes**.
- From a normalized perspective (i.e. after adjusting emissions by company sales), the **MSCI Europe** Index had the lowest Carbon Intensity of the three regions.
- Within each regional family, the MSCI **Low Carbon Target**, **Low Carbon Leaders**, and **ESG Indexes** exhibited lower carbon intensity than their parent indexes.
- The Carbon Intensity of the MSCI **ACWI ESG, ACWI Low Carbon Leaders,** and **ACWI Low Carbon Target Indexes** were respectively 27%, 46% and 75% lower than the Carbon Intensity of the MSCI ACWI Index.
- The MSCI **ACWI Ex-Fossil Fuel Index** had a more modest Carbon Intensity reduction relative to the ACWI Index, reducing Carbon Intensity by 14%. This can be explained by the fact that the Ex-Fossil Fuel Index screens out companies based on their ownership of fossil fuel reserves, but leaves in companies with high operating emissions such as Utilities.

CASE STUDY: MSCI ACWI VS MSCI ACWI LOW CARBON TARGET

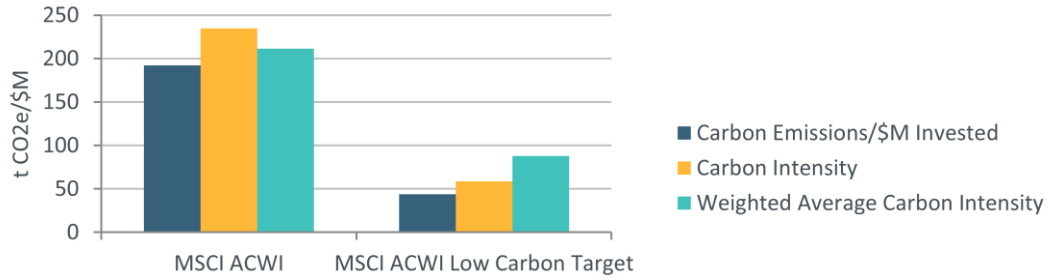
In this section we compare the carbon characteristics of USD 1 billion investments in sample portfolios replicating the MSCI ACWI and MSCI ACWI Low Carbon Target Indexes (ACWI LC) in terms of the carbon emissions, fossil fuel reserves, and other carbon-related characteristics of the entities that issue those securities.

BENCHMARKING THE PORTFOLIO'S CARBON FOOTPRINT

As expected, the headline carbon metrics for the ACWI LC were significantly lower than those of the ACWI. The Carbon Emissions, Carbon Intensity, and Weighted Average Carbon Intensity were 77%, 75%, and 58% lower than the ACWI Low Carbon Target Index, respectively.

Figure 12 – Carbon Footprint – MSCI ACWI vs. MSCI ACWI Low Carbon Target

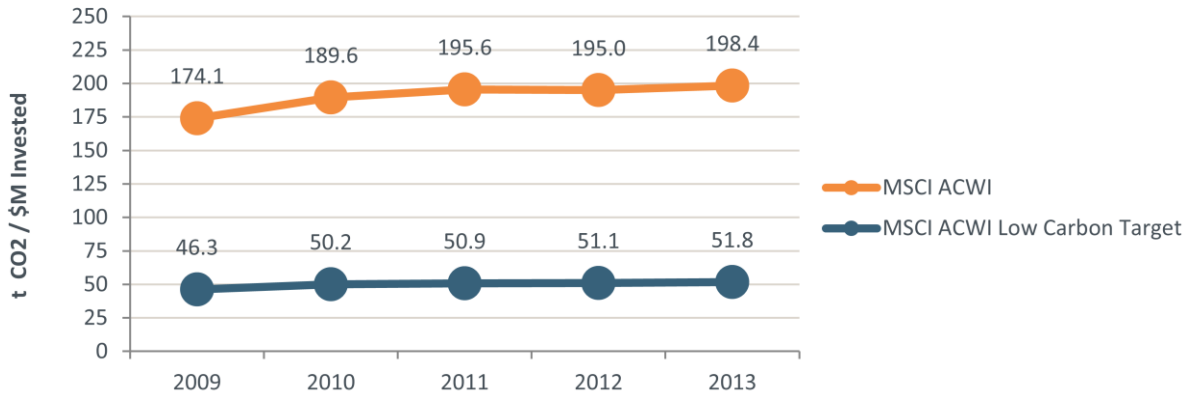
	MSCI ACWI	MSCI ACWI Low Carbon Target	Units
Carbon Emissions/$M Invested	192.0	43.9	t CO2e / $M Invested
Carbon Intensity	234.7	58.7	t CO2e / $M Sales
Weighted Average Carbon Intensity	211.2	87.7	t CO2e / $M Sales



As of 31 Aug 2015

Analysis of carbon emissions trend data can shed further light on whether portfolio companies have increased or decreased their carbon emissions over time. As shown below, we find that the carbon emissions of the companies in the MSCI ACWI modestly increased on average between fiscal year 2009 and fiscal year 2013, while those of the ACWI LC were relatively stable over the same time period. Assessing the trend in this way, year over year footprint changes were isolated to changes in portfolio companies' emissions rather than portfolio turnover.

Figure 13 – Carbon Emissions Trend of Current Holdings

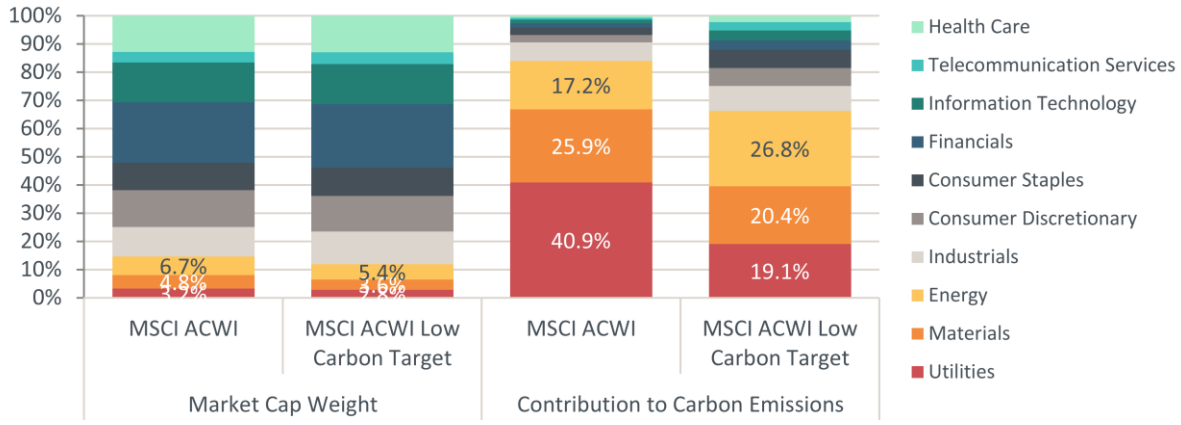


As of 21 Sept, 2015

WHAT IS DRIVING THE PORTFOLIO'S CARBON FOOTPRINT?

To help understand what is driving the portfolio's carbon footprint, we drill down to examine sector weights versus their contribution to carbon emissions. Figure 14 shows that carbon emissions were largely driven by three sectors: Utilities, Materials, and Energy. Those sectors represented less than 15% of portfolio weight, but over 80% of the overall carbon footprint.

Figure 14 – Sector Weight versus Contribution to Emissions



As of 21 Sept, 2015

Taking that step further, we can look at the actual footprint for each sector. In other words, if we treated each sector as its own portfolio, what would its footprint be? Not surprisingly, Figure 15 indicates that the highest footprints were in the Utilities, Materials, and Energy sectors. Additionally, it shows that the ACWI LC was significantly lower in every sector where carbon is a significant issue. As an example, in Utilities, the ACWI LC footprint was 351.5 t CO2e/$M, over 85% lower than the ACWI.

Figure 15 – Carbon Footprint by Sector

	MSCI ACWI	MSCI ACWI Low Carbon Target	Difference
	t CO2e/$M Invested		
Utilities	2,531.5	351.5	2,180.0
Materials	1,080.4	293.8	786.6
Energy	512.1	257.8	254.3
Industrials	124.6	39.9	84.7
Consumer Staples	51.5	32.9	18.5
Consumer Discretionary	39.8	26.1	13.7
Telecommunication Services	37.5	36.8	0.7
Information Technology	19.9	13.1	6.8
Financials	13.8	7.7	6.1
Health Care	10.0	9.3	0.7

As of 21 Sept, 2015

Drilling down even further, Figure 16 shows the companies with the largest contributions to the ACWI's footprint. The five companies shown in Figure 16 made up only 1.07%% of the index weight, but accounted for 9.92% of the footprint. Transparency to the individual company level helps to elucidate potential trade-offs, targets for divestment, or targets for engagement to better manage carbon footprint.

For an expanded view, institutional investors may also choose to consider each company's position on a range of carbon characteristics, including its strategy, targets, and initiatives to manage carbon-related risks. In this group, **Duke Energy** is notable for having high Carbon Emissions, but it also ranks as a leader within its industry on carbon risk management. **Tokyo Electric Power**, on the other hand, is noted as a laggard on carbon risk management.

The commentary in the table below is an excerpt from a larger written analysis of each company's exposure to, and management of, carbon emissions risk, which is part of MSCI's ESG Ratings product.

Figure 16 – Top Five Contributors to MSCI ACWI Carbon Emissions

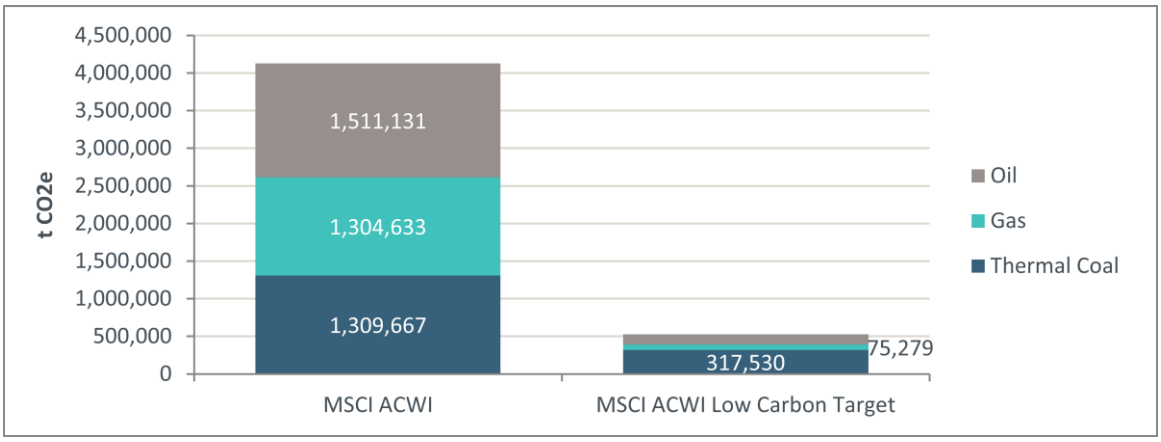
Largest Contributors to Portfolio Emissions	Sector	Weight	Issuer Carbon Emissions (t CO2e)	Percent of Portfolio Carbon Emissions	Carbon Risk Mgmt vs. Industry	Commentary
Tokyo Electric Power Company	Utilities	0.03%	161,963,690	**2.17%**	**Laggard**	✓ Eased regulatory pressure by Japanese government ○ Increased reliance on coal and oil based power generation following nuclear shutdown ○ Increasing carbon emissions
NRG Energy, Inc	Utilities	0.02%	136,259,445	**2.06%**	Average	✓ Modest programs to mitigate risk including increase in renewable capacity ○ Moderate exposure to US regulatory risks through power generation ○ Emissions intensity higher than industry average
RWE AG	Utilities	0.02%	158,000,000	**1.98%**	Average	✓ Modest carbon reduction efforts include targets, use of clean energy, efficiency measures, and demand-side management ○ High geographic exposure to carbon regulation ○ Lags peers on GHG intensity
Duke Energy	Utilities	0.14%	124,592,000	**1.88%**	**Leader**	✓ Improving emissions over 3 years ✓ Fuel switching and coal capacity retirement initiatives ✓ Customer efficiency programs ✓ Growing renewable investments ○ Coal-heavy generation assets (22%) ○ Exposure to new US EPA rules
Exxon Mobil	Energy	0.87%	122,000,000	**1.83%**	Average	✓ Carbon reduction initiatives ✓ GHG intensity better than industry average ○ High geographic exposure to emissions restrictions ○ Lags peers on renewables
Top 5 Contributors		**1.07%**		**9.92%.**		

As of 21 Sept, 2015

EXPOSURE TO POTENTIAL EMISSIONS FROM FOSSIL FUEL RESERVES

Heavy carbon emitters are not the only companies that may be affected by global climate change mitigation efforts; owners of fossil fuels also stand to lose if fossil fuel prices are affected causing assets to lose value. Converting owned fossil fuels into potential future emissions, based on each fuel's carbon content, Figure 15 shows that a USD 1 billion investment in a sample portfolio tracking the MSCI ACWI LC would have a potential emissions footprint over 85% lower than that of the same investment in a sample portfolio tracking the MSCI ACWI Index as of 21 September, 2015.

Figure 17 – Potential Emissions from USD 1 Billion Investment

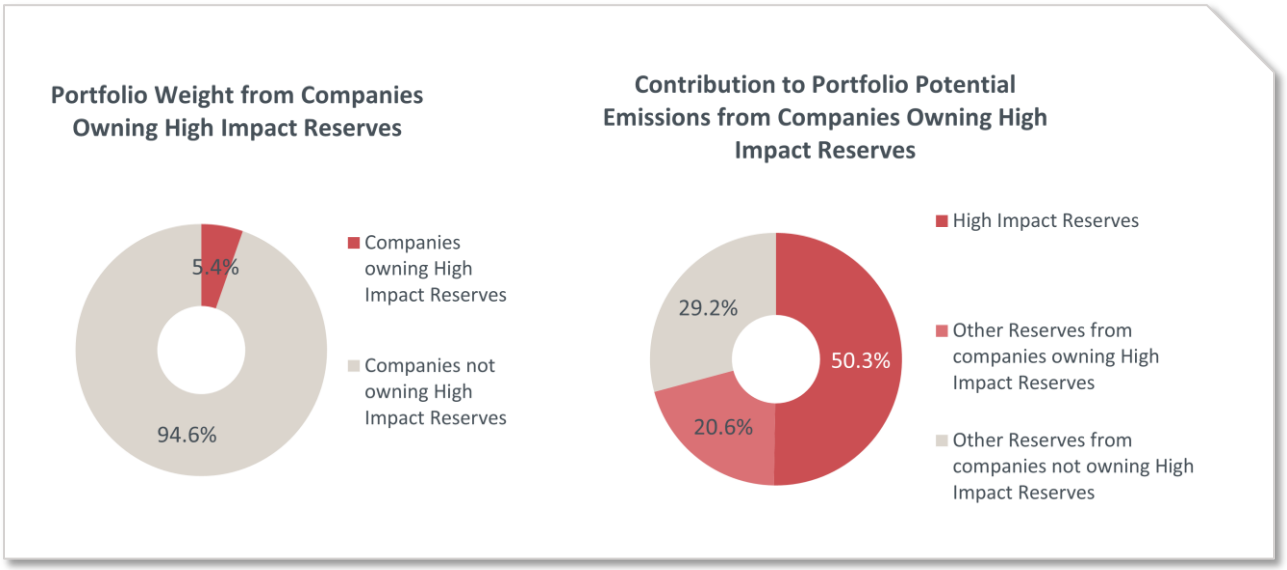


As of 21 Sept, 2015

Certain fuels such as coal, oil sands, shale oil and shale gas are arguably more exposed to stranded assets risk as they have higher carbon content than other types of oil and gas. Coal is by far the most carbon intensive fuel type, emitting roughly twice as much carbon emissions per kilowatt hour (kwh) than natural gas. In addition to higher carbon intensity, the extraction of unconventional sources of oil and gas can be costly because of various geological, technical and environmental challenges – as is the case with oil sands, which have been targeted as being particularly climate-unfriendly.

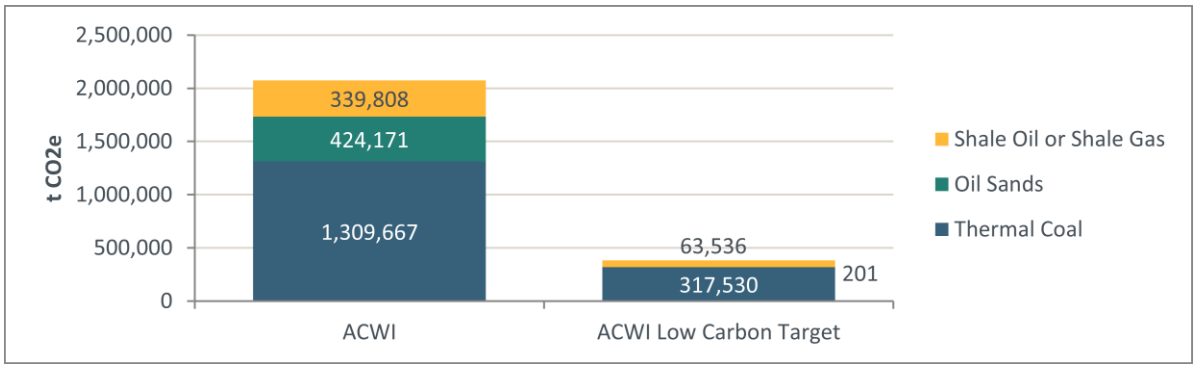
Comparing the data in Figure 18 we see that 5.4% of the weight of the ACWI came from companies owning high impact reserves, and those high impact reserves accounted for 50% of the total potential emissions for the ACWI. The group as a whole represents potential candidates for further review.

Figure 18 – Exposure to High Impact Reserves – MSCI ACWI



By this measure, the investment in the ACWI LC could be responsible for nearly 80% lower exposure to high impact reserves relative to the equivalent investment in the ACWI (Figure 19).

Figure 19 – Potential from High Impact Reserves – ACWI vs. ACWI Low Carbon Target



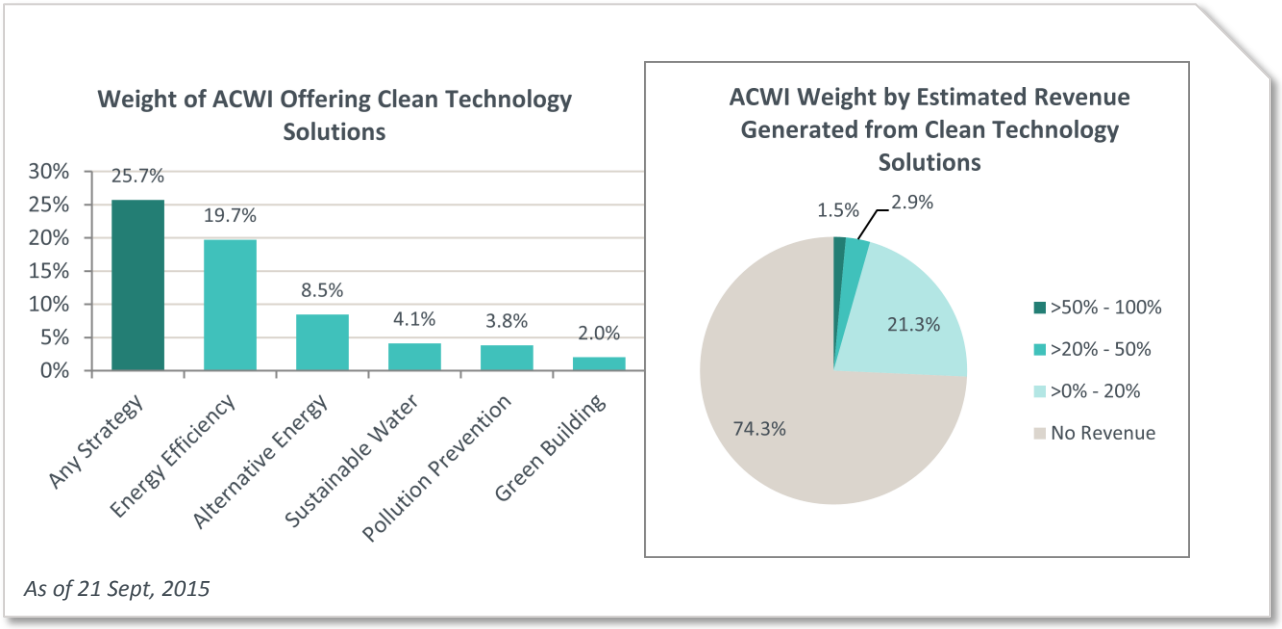
As of 21 Sept, 2015

INVESTMENTS IN CLEAN TECH SOLUTIONS

To assess the contribution of the portfolio to potential climate change solutions, and also understand its overall exposure to climate-related market opportunities, MSCI ESG Research analyzes companies involved in clean technology solutions including: Alternative Energy, Energy Efficiency, Green Building, Pollution Prevention, and Sustainable Water.

Figure 20 notes the weight of the ACWI coming from companies involved in technologies aligned with a low carbon economy. Based on this analysis, over 25% of the market value of the ACWI had some involvement in clean technologies, with the largest segment driven by opportunities in Energy Efficiency. However, only 1.5% were considered "pure play" (50-100% revenues from clean tech), and around 4.4% had clean technology as a core business (>20% of annual revenues).

Figure 20 – Exposure to Clean Technology Solutions – MSCI ACWI



As of 21 Sept, 2015

APPENDIX

FORMULAS

CARBON EMISSIONS

$$\sum_n^i \frac{\$\ investment_i}{Issuer's full\ mcap_i} * Issuer's\ emissions_i$$

CARBON EMISSIONS PER $M INVESTED

$$\left(\frac{\sum_n^i \frac{\$\ investment_i}{Issuer's full\ mcap_i} * Issuer's\ emissions_i}{Portfolio\ mkt\ value_i} \right) * 1{,}000{,}000$$

CARBON INTENSITY

$$\frac{\sum_n^i \frac{\$\ investment_i}{Issuer's full\ mcap_i} * Issuer's\ emissions_i}{\sum_n^i \frac{\$\ investment_i}{Issuer's full\ mcap_i} * Issuer's\ sales_i}$$

WEIGHTED AVERAGE CARBON INTENSITY

$$\sum_n^i Portfolio\ \ weight_i * \frac{Issuer's\ emissions_i}{Issuer's\ sales_i}$$

ESTIMATING CARBON EMISSIONS

MSCI ESG CarbonMetrics evaluates approximately 8,500 companies, covering the MSCI ACWI IMI. When reported data is not available, Scope 1 & 2 carbon emissions are estimated using MSCI's proprietary carbon estimation model. While we do report Scope 3 emissions where available, we do not estimate Scope 3 because the definitions of which emissions should or should not be included in Scope 3 are not well defined or consistently calculated by companies. Also, these emissions are not fully within the company's control.

When there is no reported data, MSCI uses one of three models. We start with the Company Specific Intensity Model, which is based either on emissions data previously reported by the particular company or in the case of electric utilities, on the fuel mix the company uses for electricity generation (e.g. coal, natural gas, hydro), and therefore reflects the specifics of the businesses that the company is in and its own production processes. If the company does not report, we use the Global Industry Classification Standard[1] (GICS®) Sub-Industry Model, which is more generalized but is based on our own emissions database.

In order to refine these models, we built a robust data set of reported emissions for the years 2008 to 2012 for companies in our research universe (reported data on about 1900 global companies). Lastly, for those companies that did not report data and whose GICS Sub-Industry was not represented in our data set, we used the Economic Input-Output Life-Cycle Assessment Model, a generalized model based on Standard Industrial Classification (SIC) codes.

[1] The Global Industry Classification Standard (GICS®) was developed by MSCI and Standard & Poor's. For more information, please see http://www.msci.com/products/indices/sector/gics/

ESTIMATING POTENTIAL EMISSIONS

To convert reserves data to potential carbon emissions, MSCI ESG Research applies a formula from the Potsdam Institute for Climate Impact Research (see Malte Meinshausen, Nicolai Meinshausen, William Hare, Sarah C. B. Raper, Katja Frieler, Reto Knutti, David J. Frame & Myles R. Allen. *Greenhouse-gas emission targets for limiting global warming to 2 °C.* ***Nature*** 458, 1158-1162 (30 April 2009) | doi:10.1038/nature08017; Received 25 September 2008; Accepted 25 March 2009. Supplementary Information, p. 7.

MSCI LOW CARBON INDEXES

MSCI LOW CARBON TARGET INDEX

Overweight companies with low carbon emissions and reserves intensity. The indexes are designed to maximize Carbon Intensity reduction given a specific tracking error target. The Index is based on the MSCI ACWI Index, the global policy benchmark covering developed and emerging markets, and utilizes MSCI ESG CarbonMetrics data from MSCI ESG Research Inc.

THE MSCI GLOBAL LOW CARBON LEADERS INDEXES

Select companies with low carbon emissions intensity and those with low carbon reserves intensity, identifying companies with a lower carbon exposure than that of the broad market. They also aim to minimize the tracking error relative to the market capitalization weighted Parent index through an optimization process, uniquely powered by the Barra Open Optimizer.

THE MSCI GLOBAL EX FOSSIL FUELS INDEX

Designed to eliminate 100% of carbon reserves exposure by excluding companies that own oil, gas and coal reserves.

For more information, visit: www.msci.com/ESGLowCarbon

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