

Carbon Counts USA

The Carbon Footprints of Mutual Funds in the US

APRIL 2009



TRUCOST^{PLC}

EXECUTIVE SUMMARY

Carbon Counts USA examines the carbon performance of 91 mutual funds in the United States, with a combined value of \$1,551,067 million. The research covers 75 of the largest equity funds and 16 major sustainability/SRI funds. The report examines the greenhouse gas emissions associated with eight investment styles: Sustainability/SRI, Core, Growth, Value, Index, Country/Regional, Equity Income and Sector.

Research findings by environmental data provider Trucost include:

- The combined global emissions associated with fund holdings analyzed amount to over 615 million metric tons of greenhouse gases. This is equivalent to 8.6% of US emissions in 2007.
- For each million dollars of revenue generated by companies in the S&P 500, 384 metric tons of greenhouse gases are emitted.¹ The carbon intensity of the S&P 500 is slightly higher than that of the MSCI Europe Index and more than 50% lower than the relatively carbon-intensive MSCI Asia ex-Japan Index.
- The carbon intensity of funds varies widely. The highest-carbon fund analyzed is 38 times more carbon intensive than the fund with the lowest carbon footprint. Funds with lower carbon intensities are likely to be less exposed to carbon pricing introduced under cap-and-trade programs.
- The combined funds analyzed are 13% less carbon intensive than the S&P 500 Index. Aggregated fund holdings are associated with 335 metric tons of greenhouse gas emissions per million dollars of revenue.
- Fund holdings were also aggregated according to their investment styles. Of these, combined Sustainability/SRI funds have the smallest carbon footprint. However, within this category, carbon efficiency varies widely – some of the largest SRI funds are more carbon intensive than the S&P 500. The combined Country/Regional funds have the largest carbon footprint and are therefore most exposed to potential carbon costs.
- Fund managers can reduce fund exposure to carbon liabilities without sacrificing returns. A UBS Europe Carbon Optimized Index, which invests more in carbon-efficient companies while keeping the stock universe constant relative to the DJ STOXX 600, has achieved a 39% lower carbon footprint while closely tracking the financial performance of the underlying index.
- Index provider Standard & Poor's has launched the S&P U.S. Carbon Efficient Index using Trucost carbon data to select companies with low carbon emissions relative to sector peers, reducing carbon intensity by 48% while seeking to closely track the returns of the S&P 500.

KEY DATA

Number of funds analyzed	91
Value of holdings analyzed ¹	\$1,551,067 million

Carbon footprint (metric tons of CO₂-equivalent emissions per \$ million)

Aggregated US funds carbon footprint	335
S&P 500 carbon footprint	384
MSCI World Index carbon footprint	394
Lowest fund carbon footprint	40
Highest fund carbon footprint	1,549
Lowest by investment style – aggregated Sustainability/SRI funds	226
Highest by investment style – aggregated Country/Regional funds	460



FURTHER INFORMATION

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¹ Free float adjusted holdings data as at 31 December 2008

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Trucost is an environmental data provider which has helped investors and companies understand the environmental impacts of business activities since 2000. Trucost provides data and analysis on company emissions and natural resource use in financial as well as quantity terms to help identify how environmental issues could affect companies' future earnings.

Trucost maintains data on the environmental impacts and disclosures of over 4,500 companies and has the world's largest database of greenhouse gas emissions. Institutional investors and fund managers use the information to assess the carbon or environmental footprints of their funds, identify differences in performance, address environmental risks and create investment strategies with lower carbon or environmental impacts. Coverage includes the S&P 500, Russell 1000, MSCI World, FTSE All-Share, Nikkei 225, DJ STOXX 600, MSCI Europe, MSCI Asia ex-Japan and ASX 200 indices.

Lipper, a Thomson Reuters company, is a global leader in supplying mutual fund information, analytical tools and commentary. Lipper's benchmarking provides the trusted guidepost to asset managers, fund companies, financial intermediaries, traditional media, websites, and individual investors.

With three decades of fund analysis experience, bolstered by the resources and knowledge of Reuters, the world's largest financial information and news provider, Lipper provides unparalleled expertise and insight to the funds industry. Lipper's products and services provide accurate, insightful, and timely mutual fund data and analysis.

PROJECT SCOPE

Carbon Counts USA provides a ground-breaking quantitative assessment of carbon risks embedded in US funds. Trucost partnered with Lipper, who supplied fund data, to conduct the analysis into the carbon footprints of 91 US-listed equity mutual funds.

Trucost assesses 75 of the largest US equity funds to identify the greenhouse gas emissions and exposure to carbon costs associated with holdings in 2,994 companies. A further 16 Sustainability/Socially Responsible Investing (SRI) funds are analyzed. These funds consist of up to five share class offerings – such as “Institutional” and “Investor” – with the same underlying holdings.

The analysis covers holdings valued at \$1,551,067 million, based on data as of 31 December 2008. For each fund included in this report, Trucost holds corporate greenhouse gas emissions data on more than 90% of the value of holdings.

The funds have a variety of indices as their benchmarks. Trucost compares the funds with the carbon footprint of the S&P 500 Index, using free float adjusted holdings data only. Trucost has environmental data on over 4,500 companies globally, including those listed in the S&P 500 and Russell 1000, and constituents of most major international indices. The report includes the carbon footprints of the MSCI World, MSCI Asia ex-Japan, and MSCI Europe indices for comparison.

Trucost analyses the carbon intensity of funds according to eight investment styles: Sustainability/SRI, Index, Sector, Growth, Value, Core, Equity Income and Country/Regional. The research examines how the approach to stock selections characteristic of each style could affect the carbon intensity of funds.

Funds comprised of companies that are carbon-efficient relative to sector peers may be less exposed to escalating carbon liabilities. Funds with low carbon intensities will be better placed for sustained returns from companies that will be well-positioned under carbon constraints.

Trucost assesses the overall exposure to carbon costs of the combined fund holdings, using a scenario for carbon pricing that assumes an allowance price of \$28.24 per metric ton of greenhouse gas emissions in 2012, under a US cap-and-trade program with a target to reduce greenhouse gas emissions by 14% below 2005 levels by 2012, and by 83% below by 2050 (see page 4).

The price of \$28.24 is based on the estimated price of allowances under a draft Dingell-Boucher Bill to establish a cap-and-trade program, which could form the starting point for legislative drafting in 2009 (see page 7). Actual prices could vary depending on factors including the scope of sectors covered and levels of auctioning at the outset of the program.

The report highlights some of the tools and opportunities available to investors to manage fund carbon risks. Trucost outlines how the index provider Standard & Poor's and financial firm UBS are using carbon data to create investment strategies with reduced carbon intensity and exposure to carbon liabilities.

US GOVERNMENT POLICIES TO PRICE CARBON EMISSIONS

President Barack Obama plans to address climate change alongside economic recovery and energy security in his budget for fiscal year 2010. The 2010 budget outlines plans to develop an economy-wide program to reduce the greenhouse gas emissions that contribute to global warming by some 14% from 2005 levels within 11 years from now, and by 83% by 2050.

This will mean reversing a trend of rising emissions. Between 2005 and 2007, US greenhouse gas emissions, measured as their carbon dioxide-equivalent (CO₂-e), rose by 0.4% to 7.13 billion metric tons.² This amounts to a 17% increase on 1990 levels, largely due to higher carbon dioxide emissions from fossil fuel combustion.

To achieve the targets, the federal Government plans to introduce a cap-and-trade scheme that will create a business cost for greenhouse gas emissions from 2012. Companies in sectors such as electricity utilities and cement production will have to purchase a permit or allowance for each ton of greenhouse gases they emit. Current proposals would see 100% of allowances auctioned in order to prevent free allocations of carbon allowances from generating windfall profits for carbon-intensive companies and

suppressing carbon prices.

Companies that have more permits than needed, or those reducing their GHG emissions, will be able to sell excess allowances to businesses facing a shortfall. The US budget predicts \$79 billion in proceeds from the trading scheme in its first year, rising to \$646 billion by 2019.³

Several US states have already set GHG reduction targets and are participating in regional cap-and-trade schemes to cut emissions.

International climate framework

The US cap-and-trade program is likely to require allowances for all six greenhouse gases included under the UN Kyoto Protocol international agreement on climate change. The US Government plans to re-engage

Regional emission trading schemes		
Regional Greenhouse Gas Initiative (RGGI) – 2009-2018	Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York, Vermont, Massachusetts, Maryland, Rhode Island.	Target: The cap-and-trade scheme aims to stabilize CO ₂ emissions between 2009 and 2014, and cut emissions by 10% between 2015-2018. The majority of CO ₂ allowances are auctioned. Scope: Utilities. Carbon price: CO ₂ allowance contracts on the carbon market are trading at nearly \$4, and are expected to retain value under a federal program. ⁴
Western Climate Initiative (WCI) – 2012-2020	US: Arizona, California, Montana, New Mexico, Ontario, Oregon, Utah, Washington. Canada: British Columbia, Manitoba, Quebec.	Target: The planned cap-and-trade scheme aims to cut GHG emissions by 15% below 2005 levels between 2012 and 2020. Scope: Economy-wide.
Midwestern Greenhouse Gas Reduction Accord – likely from 2012	Illinois, Iowa, Kansas, Michigan, Minnesota, Wisconsin, and Manitoba (Canada).	Draft target: The multi-sector cap-and-trade scheme aims to reduce greenhouse gas emissions by 60-80% below 2005 levels by 2050. Scope: Economy-wide.

² 2009 Draft US Greenhouse Gas Inventory Report

³ A new era of responsibility, The 2010 Budget, US Office of Management and Budget, February 2009

“The Administration is developing a comprehensive energy and climate change plan to invest in clean energy, end our addiction to oil, address the global climate crisis... the Administration will work expeditiously with key stakeholders and the Congress to develop an economy-wide emissions reduction program to reduce greenhouse gas emissions approximately 14% below 2005 levels by 2020, and approximately 83% below 2005 levels by 2050. This program will be implemented through a cap-and-trade system.”

A New Era of Responsibility, US Office of Management and Budget³

with the UN Framework Convention on Climate Change – the international forum behind the UN Kyoto Protocol. Under the Protocol, 37 industrialized countries agreed to cut GHG emissions by at least 5% from 1990 levels between 2008 and 2012. The agreement covers six greenhouse gases: Carbon dioxide (CO₂), methane (CH₄), dinitrogen oxide (N₂O), sulphur hexafluoride (SF₆), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs).

However, scientists have warned that far greater GHG reductions are needed to have a chance of avoiding the most dangerous climate change impacts. The science-based Intergovernmental Panel on Climate Change says emissions in industrialized countries should fall by 25% to 40% by 2020, and by 50% to 85% by 2050 to keep average temperature rises below 2°C.

So far, G8 nations – the US, UK, Japan, Canada, Germany, France, Italy, and Russia – have pledged to work towards a goal to at least halve emissions by 2050. International UN negotiations to agree to deeper emission reduction targets from 2013 onwards will culminate in Denmark in December 2009.

Carbon prices would need to reach \$200-\$500 per metric ton to spur investment in the low-carbon energy and technology revolution needed to halve emissions.⁵ The UK Government’s 2006 Stern Review on the economics of climate change estimates that at least \$650 billion will need to be spent on mitigation annually by 2050, or roughly 1% of global GDP, though costs are growing the longer that action is delayed.

If governments and industry fail to cut greenhouse gas emissions adequately, climate change could wipe 5% to 20% off annual world GDP in the long term. Most international policymakers now recognize that the relatively low cost of mitigation is a price worth paying to avert the risk of climate change impacts that could have severe economic and social consequences.

Under a cap-and-trade scheme in place in the European Union, allocations of carbon allowances have been tightened during the second phase from 2008-2012. Further emission trading schemes are planned in the UK, New Zealand, South Korea, Canada and Australia, and an International Carbon Action Partnership is working towards a global cap-and-trade market.

Carbon intensity indicates financial risk

To succeed in creating a transition to a low-carbon economy, cap-and-trade schemes will have to change cost structures for industries. This will have knock-on effects on investment returns. There will be winners and losers, and the carbon intensity of companies will influence which are most exposed to carbon constraints.

Carbon costs will increase operating costs for companies with carbon-intensive energy sources and industrial processes that are directly covered by the cap-and-trade scheme. Attempts to pass on carbon costs are likely to drive up the price of goods and spur customers to switch to lower-carbon alternatives where possible. Nearly all companies will be affected by carbon costs passed on in energy prices. In Europe, the pass on of carbon costs by electric utilities has added to rising input costs for energy-intensive manufacturers in particular.

⁴ US market comment: RGGI rallies on expectations of federal cap, *Point Carbon*, 5 March 2009

⁵ Now or Never - Energy Technology Perspectives 2008 shows pathways to sustained economic growth based on clean and affordable energy technology, International Energy Agency

Companies that rely heavily on carbon-intensive operations and supply chains relative to sector peers could be most exposed to carbon liabilities. High emitters which find it difficult to fully pass these liabilities on in higher prices without losing market share could see profits fall, unless they profoundly change the goods they produce or how they produce them. Companies that are more carbon-efficient for their sectors, with limited exposure to direct carbon costs or indirect costs passed on in input prices, stand to gain competitive advantage. Carbon pricing could present opportunities for low-emission companies in carbon-intensive sectors.

Carbon prices will need to be high enough to become financially material to investors so that they send a clear price signal to inform investment decisions. Investment in assets such as power stations, industrial plants and buildings could have an effect on exposure to carbon costs for decades to come. Investment in capital stock – particularly in the energy and manufacturing sectors – could be directed towards low-carbon options to reduce potential liabilities.

Carbon intensity will be factored into capital allocation decisions and asset valuations will take greater account of carbon performance, unless markets fail to adequately consider potential liabilities under future carbon prices.

Al Gore, former Vice President of the US, now Chairman of Generation Investment Management, warned investors at a summit on climate risk last year that, “If you really take a fine-toothed comb and go through your funds, many of you will find them chock-full of subprime carbon assets.”⁶

As corporate carbon emissions become an important source of financial risk and opportunity at a fund level, institutional investors will expect fund managers to identify the carbon profiles of companies. Managing exposure to carbon risks in funds will form an integral part of investment management.

“You need to really scrub your investment portfolios. Because I guarantee you, that if you really take a fine-toothed comb and go through your portfolios, many of you will find them chock-full of subprime carbon assets...”

Al Gore, former US Vice President⁶

Measuring footprints

Institutional investors and fund managers use Trucost “carbon footprints” as a quantitative assessment of fund carbon risk. Carbon footprints are based on standardized GHG emissions data and provide a comparable measure of the emissions associated with each fund.

The equity fund carbon footprint is calculated by measuring each constituent company’s GHG emissions. Quantities of each GHG are converted into their carbon dioxide-equivalent (CO₂-e) emissions. CO₂-e emissions associated with a company are allocated to the fund in proportion to ownership. The carbon footprint is expressed as metric tons of CO₂-e emitted by the companies within each fund per million dollars of revenue.

A carbon footprint indicates “carbon intensity” and enables valid comparison between companies and funds irrespective of size and investment style. The carbon emissions and revenues allocated to each fund are summed up to calculate the total carbon footprints of investment style categories and all aggregated holdings.

Greenhouse gas emissions are measured in metric tons throughout this analysis. The currency used throughout the report is US dollars (\$) and figures are rounded up. To find out more about Trucost’s methodology, see page 15.

⁶ 2008 Investor Summit on Climate Risk, Final Report, 14 February 2008

FUND CARBON PERFORMANCE

The combined holdings analyzed in all 91 funds are associated with 615,533,454 metric tons of CO₂-e globally. This is equivalent to 8.6% of US greenhouse gas emissions of almost 7.13 billion metric tons in 2007.³ The emissions associated with fund holdings amount to 4.7% of the total of over 13 billion metric tons of CO₂-e emitted globally by the 2,994 companies analyzed.⁷ The funds own 5.75% of the total market capitalization of these companies, with the value of fund holdings totalling \$1,551,067 million as of 31 December 2008.

For every \$1 million invested, 335 metric tons of CO₂-e (tCO₂-e) are emitted. The carbon footprint of the combined funds is 13% smaller than the carbon footprint of the S&P 500 index, at 384 tCO₂-e per \$ million (see Table 1). The carbon intensity of the S&P 500 is virtually the same as that of the MSCI Europe Index and slightly more efficient than the MSCI World Index. Both the combined

funds and the S&P 500 are around 50% less carbon-intensive than the MSCI Asia Ex-Japan index.

This suggests that if global carbon pricing were introduced, companies held in the funds and S&P 500 index constituents would be less exposed to carbon costs.

Trucost applied a carbon price to the emissions associated with the funds to identify potential exposure to carbon costs. Last October, Congressmen Dingell and Boucher proposed an emission trading scheme capping GHG emissions at 6% below 2005

levels in 2012 and at 80% below in 2050. The estimated price of carbon allowances from 2012 under this scheme is \$20- \$30.⁸ If the actual program sets the stricter caps outlined in the US budget, the higher price will be more likely. Adjusting the \$30 price to metric tons and the 83% GHG reduction target for 2050, carbon costs in 2012 could start at \$28.24.

If the 2,994 companies analyzed had to pay a carbon price of \$28.24 for every metric ton of greenhouse gases associated with fund holdings, carbon costs under a US cap-and-trade-scheme from 2012 could amount to \$17,382,664,741. Under this scenario, carbon costs in 2012 would equate to around 0.9% of revenue associated with combined fund holdings.

Carbon costs would be unevenly distributed between funds. For example, for the Financial Select Sector SPDR Fund, ranked as the most carbon-efficient fund analyzed in Table 2 on page 9, carbon costs at \$28.24 per metric ton of CO₂-e would amount to \$8,357,233. This equates to 0.1% of revenue attributed to the fund. For the relatively carbon-intensive Fidelity Capital Appreciation Fund, carbon costs at \$28.24/tCO₂-e would amount to \$124,765,845, or 3.32% of revenue. The Fidelity fund would therefore be more exposed to future carbon costs. Given the lack of carbon pricing to date, fund managers have so far had little incentive to factor carbon intensity criteria into their stock selections.

Index*	Total carbon emissions (metric tons CO ₂ -e)	Carbon footprint** (tCO ₂ -e/\$ million)
Aggregated holdings in 91 funds	615,533,454	335
MSCI Europe	3,700,833,064	383
S&P 500	3,297,138,863	384
MSCI World	9,536,219,251	394
MSCI Asia Ex-Japan	2,387,814,074	700

* Free float adjusted holdings only as at 31 December 2008

** Metric tons of carbon dioxide-equivalent emissions per million US dollars of revenue 'owned' by the index

⁷ The number of unique companies, which more than one fund may invest in

⁸ Summary of the Dingell-Boucher Discussion Draft, Pew Center on Global Climate Change, December 2008

Distribution of fund carbon footprints

The carbon footprints of funds analyzed vary significantly. The footprint of the most carbon-intensive fund is over 38 times larger than the lowest-carbon fund, reflecting the range in potential carbon risk. As shown in Chart 1, 24 funds are clustered with footprints in the range of 250-350 tCO₂-e/\$ million.

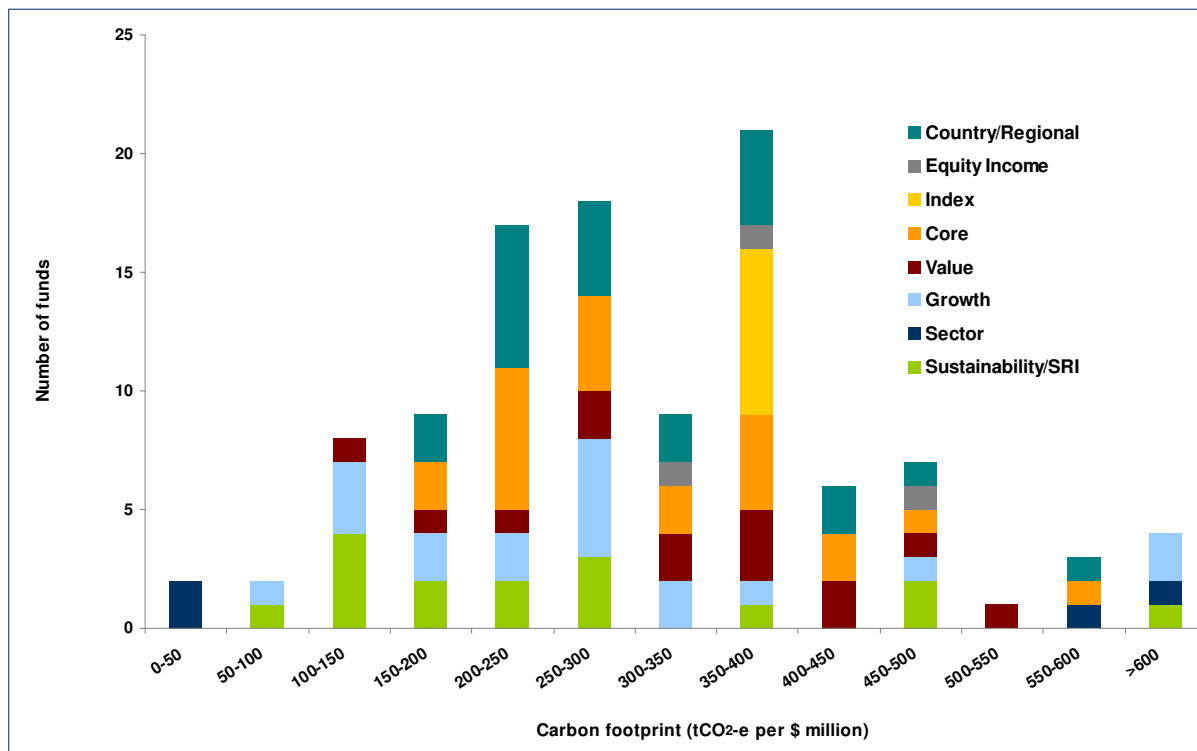


Chart 1: Carbon footprint distribution of funds

Funds ranked among the top and bottom funds on carbon intensity are dominated by Growth, Sector and Sustainability/SRI investment styles. Funds using each of these investment styles are among both the lowest-carbon and the highest-carbon overall – highlighting large variations in carbon intensity within these styles. Many of the managers of funds that are relatively carbon intensive also manage funds with small carbon footprints. For instance, the Vanguard Health Care Fund is ranked 2nd on carbon intensity, while the Vanguard Energy Fund is ranked 85th.

The five least carbon-intensive funds and five most carbon-intensive funds are ranked in Table 2 on page 9. The top 5 funds are more carbon efficient than the MSCI Europe, MSCI World, and S&P 500 indices. Only three funds are more carbon-intensive than the MSCI Asia ex-Japan Index.

Lowest/highest funds

The funds with the lowest carbon footprints tend to exclude investments in relatively carbon-intensive sectors. The fund with the smallest carbon footprint at 40 tCO₂-e/\$ million (Financial Select Sector SPDR Fund) excludes the Basic Resources, Oil & Gas and Utilities sectors. The iShares FTSE/Xinhua China 25 Index Fund, which invests in carbon-intensive coal-fired utilities in China, has the largest carbon footprint at 1,549 tCO₂-e/\$ million.

Table 2: Fund ranking of lowest/highest carbon footprints

Fund	Investment style	Fund value (\$ million)	Carbon footprint (tCO ₂ -e/\$ million)	Rank (total = 91)
Financial Select Sector SPDR Fund	Sector	7,751.79	40	1
Vanguard Health Care Fund	Sector	21,687.00	48	2
PowerShares QQQ Trust	Growth	12,165.71	69	3
Ariel Appreciation Fund	SRI	910.05	98	4
Oppenheimer Global Fund	Growth	8,623.11	111	5
Aggregated Sustainability/SRI funds			226	
Aggregated Sector funds			233	
Aggregated Growth funds			294	
Aggregated Value funds			305	
Aggregated Core funds			342	
Aggregated Index funds			370	
MSCI Europe			383	
S&P 500			384	
MSCI World			394	
Aggregated Equity Income funds			408	
Aggregated Country/Regional funds			460	
Energy Select Sector SPDR Fund	Sector	4,477.92	613	87
Sentinel Sustainable Core Opportunities Fund	SRI	559.02	692	88
MSCI Asia ex-Japan			700	
Janus Fund	Growth	8,876.85	744	89
Fidelity Capital Appreciation Fund	Growth	3,853.76	758	90
iShares FTSE/Xinhua China 25 Index Fund	Country/Region.	5,938.99	1,549	91

Top five funds

Each of the five most carbon-efficient funds has a different manager. The top five funds have several overall characteristics:

- Four of the funds do not invest in the Basic Resources sector.
- The top three do not invest in the carbon-intensive Utilities and Oil & Gas sectors, and have 80%+ invested in low-carbon sectors such as Financial Services, Banks, and Healthcare.
- Three of the funds are underweight in Food & Beverage companies relative to the S&P 500; the other two do not invest in the sector.
- The top two funds have a Sector investment style; two of the top five are Growth funds, and one is a Sustainability/SRI fund.

Bottom five funds

Each of the five most carbon-intensive funds has a different manager. Fund characteristics include:

- Four are underweight the Utilities sector against the S&P 500, but three pick Utilities stocks that are more carbon intensive than sector peers in the Index.
- For four of the five funds, stock selection rather than sector allocation is the main cause of their high carbon intensity against the benchmark S&P 500.
- Two are Growth funds, two are specific to either a sector or country, and the fifth is a Sustainability/SRI fund.
- The iShares FTSE/Xinhua China 25 Index Fund is an outlier, with more than twice the carbon intensity of the Fidelity Capital Appreciation Fund, ranked 90th.

CARBON INTENSITY BY INVESTMENT STYLE

Funds have been categorized according to their investment styles: Sustainability/SRI, Index, Sector, Growth, Value, Core, Equity Income and Country/Regional. The aggregated holdings by each investment style are ranked in Table 3.

Style	Number of funds	Aggregated value of holdings (\$ million)	Aggregated carbon footprint (tCO ₂ -e/\$ mn)
Sustainability/SRI	16	24,406.84	226
Sector	4	45,043.57	233
Growth	19	232,212.96	294
Value	15	397,723.30	305
Core	22	426,329.18	342
Index	7	307,165.17	370
S&P 500	-	-	384
Equity Income	3	40,743.13	408
Country/Regional	5	77,443.17	460

Sustainability funds

Of the 91 analyzed funds, 16 include sustainability or socially responsible investing (SRI) considerations. These 16 funds comprise holdings valued at over \$24 billion and have the smallest aggregated carbon footprint at 226 tCO₂-e per \$ million. However, the Sustainability/SRI funds differ significantly in the amount of carbon emitted per million dollars. Sentinel Sustainable Core Opportunities Fund has the largest carbon footprint, which is seven times greater than the smallest (692 vs. 98 tCO₂-e per \$ million). The divergence in carbon intensity among the Sustainability/SRI funds reflects diverse approaches to implementing wide-ranging environmental, social, and governance criteria.

Investment focuses within Sustainability/SRI funds include:

- **Clean tech investing:** Firms that are involved in areas such as energy efficiency, waste and water management, and other 'solutions'.
- **Ethical investing:** Screening out companies that do not match the mission or value system of particular investor groups, such as excluding tobacco companies or weapons manufacturers.
- **Responsible investing:** Meeting fiduciary duties to clients and beneficiaries through a "universal" approach to ownership that recognizes that long-term returns are influenced by the overall capacity to create value.
- **Social investing:** Positive impacts on others through investment.
- **Sustainable investing⁹:** Typically driven by long-term economic, environmental and social risks and opportunities. As there is no single definition of "sustainability" in investment terms, different fund managers will have different interpretations of how to apply it within their funds.

⁹ Adapted from *Sustainable Investing: The Art of Long-Term Performance*, Krosinsky/Robins, 2008

Where climate change criteria are included in stock selections, managers may focus on clean technology or renewable energy developers rather than carbon performance from operations. Since operations to develop environmental “solutions” generate greenhouse gas emissions, these production processes are exposed to carbon costs which are likely to apply across industrial sectors and energy users. This analysis therefore considers emissions regardless of the effects of products in use. Carbon savings from clean technologies and renewable energy are accounted for in the carbon footprints of companies that deploy them. Similarly, emissions from fossil fuels produced by Oil & Gas companies are accounted for in the carbon footprints of companies that use them. Some Sustainability/SRI funds focus on water and waste industries, which can be relatively

carbon intensive, but deliver other environmental benefits.

Within the 16 Sustainability/SRI funds researched, the Ariel Appreciation Fund has the smallest carbon footprint (98 tCO₂-e per \$ million). The fund’s carbon efficiency is mainly driven by its exclusion of the Utilities sector, which is typically a major

contributor to a fund’s carbon footprint. In addition, the value of holdings in the relatively low-carbon Media and Real Estate sectors is overweight compared to the sector weightings in the S&P 500.

The relatively high carbon intensity of the Sentinel Sustainable Core Opportunities Fund is mainly due to the overweighting of holdings in carbon-intensive stocks in the Utilities sector when compared with the S&P 500. The fund also selects higher-carbon stocks in the Industrial Goods and Services sector. However, fund holdings in the Oil & Gas sector have a lower average carbon intensity than sector peers in the S&P 500.

Index funds

Index funds are constructed to track the performance of their index benchmarks. The seven Index funds included in this report are benchmarked against indices including the S&P 500. Over \$307 billion is invested in these funds.

Each fund has a carbon footprint within 8% of the S&P 500, at 384 tCO₂-e/\$ million. Variation in the carbon footprints of these funds is partly due to the weightings given to particular firms, likely caused by different dates for fund re-weighting.

Carbon risk can be reduced in Index funds by using a carbon overlay to rebalance the weightings of securities relative to their benchmark to reduce fund carbon intensity (see page 13).

Table 4: Lowest/highest carbon footprint Sustainability/SRI funds

Fund	Fund value (\$ million)	Carbon footprint (tCO ₂ -e/\$ million)	Rank in investment style grouping	Rank overall (total = 91)
Ariel Appreciation	910.05	98	1	4
Aggregated Sustainability funds		226		
S&P 500		384		
Sentinel Sustainable Core Opportunities	559.02	692	16	88

Table 5: Lowest/highest carbon footprint Index funds

Fund	Fund value (\$ million)	Carbon footprint (tCO ₂ -e/\$ million)	Rank in investment style grouping	Rank overall (total = 91)
T Rowe Price Equity Index 500	9,185.81	352	1	54
Aggregated Index funds		370		
S&P 500		384		
SPDR Trust	94,940.77	394	7	70

Variation in carbon intensity of stock selections by investment style

Attribution analysis was used to identify the effect of stock selections in each Industry Classification Benchmark (ICB) super sector on the carbon performance of the combined 91 funds relative to the S&P 500 Index. Stock selections in two sectors have the greatest negative effects on the funds’ overall carbon performance against the benchmark: Construction & Materials and Travel & Leisure.

Trucost then analyzed variations in the average carbon intensity of stocks selected in these sectors according to each investment style (see Chart 2).

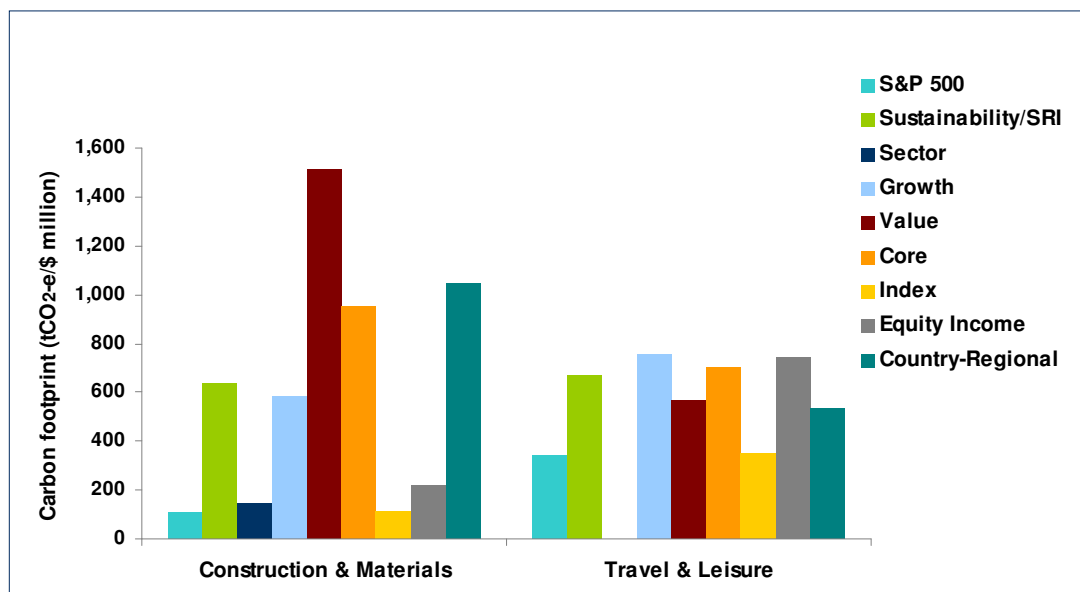


Chart 2: Average carbon footprint by super sector and investment style

The carbon intensity of stock selections in different sectors varies between investment styles, indicating differences in exposure to potential carbon liabilities.

Findings include:

- Differences in the carbon intensity of stock selections are most marked in the Construction & Materials sector.
- The combined Value funds select the most carbon-intensive Construction & Materials companies.
- Index funds select the most carbon-efficient companies in both sectors analyzed. The average carbon intensity of Index fund holdings is similar to that of the S&P 500, although not all Index funds track the S&P 500.
- For all investment styles, the average carbon intensity of holdings in each sector analyzed is higher than the S&P 500 sector averages.
- On average, Growth funds select the most carbon-intensive stocks in the Travel & Leisure sector.
- None of the Sector funds analyzed invest in the Travel & Leisure sector. Funds that specialize in the sector are not included in this analysis.
- The relatively large carbon footprints of combined holdings in the Core and Sustainability/SRI funds in both sectors suggest that carbon intensity is not a major criteria in selecting Construction & Materials and Travel & Leisure stocks.

The carbon footprints of investment styles are analyzed further in Appendix 2 on page 16.

MANAGING FUND CARBON RISK

Cap-and-trade programs in the US and elsewhere will create a cost for carbon with real financial consequences for business. Forward-thinking companies have begun to improve their carbon performance to reduce exposure to escalating costs. Companies with a less carbon-efficient use of resources than sector peers are likely to see profit margins tighten, resulting in lower returns for investors.

Fund managers with a range of investment strategies, particularly Growth and Sustainability/SRI, have begun to pursue opportunities to invest in companies that are either pursuing carbon reduction strategies or providing “solutions” including renewable energy, energy efficiency and clean technologies.

Investors have also started to look at ways to reduce exposure to carbon costs in more diversified funds. One approach is to analyze carbon data to address the risk of carbon prices affecting financial returns from companies held in funds. This report focuses on some pioneering ways in which carbon data is being used to manage carbon risks in indices and funds.

Carbon optimizing indices and funds

Asset managers are using carbon footprint data to reduce exposure to carbon costs without changing investment styles. The carbon performance of an index or fund can be optimized by rebalancing holdings within each sector based on carbon efficiency, while maintaining sector allocations relative to the benchmark index or fund.

UBS has used Trucost carbon analysis to create the UBS Europe Carbon Optimized Index, based on the DJ STOXX 600 Index. The UBS index, launched last March, matches the sector weightings of the benchmark but overweights carbon-efficient stocks and underweights those that are carbon inefficient within each sector. Back-testing from 31 January 2007 to 27 February 2009 has shown the UBS Europe Carbon Optimized Index closely tracked financial performance over a 25-month period versus the DJ STOXX 600 while achieving a 39% lower carbon footprint. The UBS Europe Carbon Optimized Index constrains adjustments to holdings in order to limit deviations from the underlying Index. UBS put a cap on the level of re-weighting of holdings to limit tracking error, and did not exclude any companies. The annualized tracking error is approximately 0.71%.

The carbon overlay maintains diversification of stocks available to the funds and could be applied to any passive or active investment strategy. Rebalancing stocks within each sector typically reduces the fund’s carbon footprint by approximately 25%. Key features of carbon optimization include:

- Carbon data can be combined with financial analysis for integrated stock picking.
- Tilts toward carbon-efficient stocks within a sector.
- Sector neutrality maintained to avoid size and sector bias.
- Full stock universe rebalancing while maintaining financial returns.

NYSE Euronext has also used the DJ STOXX 600 Index as a benchmark for a Low Carbon 100 Europe® Index, launched last October. The Index is designed to measure the performance of the 100 largest blue-chip European companies with the lowest CO₂ emissions in their sectors as calculated by Trucost. It therefore combines carbon optimization with a “best-in-class” approach.

“To get this new reality to come to pass, the first movers will have an advantage... and you are in a position to direct the flows of capital that will make that happen.”

Al Gore, former Vice President, speaking at the UN Investor Summit on Climate Risk⁶

Carbon efficiency in the S&P 500

The index provider Standard & Poor's launched the first in a series of global low-carbon indices in March 2009 to meet growing investor demands for environmentally-focused indices. The S&P U.S. Carbon Efficient Index is based on a carbon optimized version of the S&P 500. However, it is composed of a subset of constituents that have a relatively low carbon footprint, as calculated by Trucost.

The index seeks to closely track the returns of the S&P 500, while excluding companies that have the largest carbon footprints. At each quarterly rebalancing, the stocks in the S&P 500 are ranked by their carbon intensity. The 100 equities with the highest carbon footprints, whose aggregate exclusion does not reduce any sector weightings of the S&P 500 by more than 50%, are excluded.

The Index is comprised of no more than 375 constituents, and their weights are modified at each rebalancing to reflect an optimization process seeking to track the S&P 500. Through 2008, the average annual carbon footprint of the S&P U.S. Carbon Efficient Index was 48% lower than that of the underlying benchmark, with a tracking error of around 1%.

David Blitzer, Managing Director and Chairman of S&P's Index Committee, said: "Organizations around the world are paying greater attention to the impact of greenhouse gases on our climate, as increasingly more investors consider carbon efficiency as an important investment theme."

Deutsche Bank, which contributed to the development of the S&P U.S. Carbon Efficient Index, plans to launch an exchange traded fund tracking the index.

"Increasingly more investors consider carbon efficiency as an important investment theme."

David Blitzer, Managing Director and Chairman of S&P's Index Committee, March 2009

Carbon footprints in practice

Investors who consider carbon emissions associated with holdings can position funds to gain from opportunities during the shift to a low-carbon economy.

Audit risks: Carbon footprints of equity holdings are being used to monitor potential carbon liabilities in funds. Attribution analysis indicates the effects of sector weightings and stock selections on carbon risk to the value of investments in equity funds.

Manage carbon performance: Investment managers are using analysis of carbon data to target holdings with the greatest contribution to carbon exposure in a fund to prepare for future costs of climate legislation.

Compare asset managers: Institutional investors have begun to assess the carbon footprints of funds managed by different managers. For example, the UK Environment Agency Pension Fund has worked with Trucost to monitor the carbon performance of different fund managers.

Demand from institutional investors for more systematic ways to assess climate-related risks and opportunities prompted Mercer to become the first global investment consultancy to measure the carbon footprints of client funds last year. Mercer uses data on greenhouse gas emissions provided by Trucost.

APPENDICES

Appendix 1: Methodology

Trucost has analyzed the environmental performance of over 4,500 companies worldwide. Trucost has the world's largest database of standardized GHG emissions, which provides a proxy for carbon performance. To calculate the carbon intensity of selected companies included in the study, Trucost reviewed company annual reports and accounts, environmental/sustainability reports, public disclosures and corporate websites.

However, many companies do not disclose their environmental or carbon impacts. Where there was no public disclosure, Trucost employed its environmental profiling system. This proprietary Input-Output model maps the environmental impacts of business activities in 464 sectors. Trucost's extensive database provides analysis on over 720 different types of environmental impacts. Trucost's academic advisory panel oversees this work, which makes it possible to calculate levels of environmental resource use and non-product output resulting from the activities of any company in a given sub-sector. Trucost's comprehensive coverage ensures that all companies in an index or fund are included, not just those that disclose environmental information.

Carbon dioxide-equivalents

Nine greenhouse gases (GHGs) are included in the analysis, including six defined by the UN Kyoto Protocol. The GHGs have been calculated for each company and converted into metric tons of carbon dioxide-equivalents (CO₂-e) based on the appropriate Global Warming Potential factors. The Global Warming Potential (GWP) index published by the Intergovernmental Panel on Climate Change (IPCC) assesses the effect of the emissions of different gases over a 100-year time period relative to the emission of an equal mass of CO₂. For example, one metric ton of the man-made greenhouse gas sulphur hexafluoride (SF₆) has a global warming potential equivalent to 23,900 metric tons of CO₂ (tCO₂-e). Measuring quantities of emissions relative to revenue indicates the extent to which a company is dependent on fuels and processes that emit CO₂-e to generate income.

Direct and first-tier indirect emissions

To limit any issues associated with double counting GHG emissions, Trucost analyzed only the direct and first-tier indirect emissions for each company in a fund. First-tier GHGs are emitted by direct suppliers to a company, such as electricity and logistics providers. These emissions are generated from the production of goods and services purchased by a company. Where adequate data is not disclosed, indirect impacts are estimated by employing Trucost's input-output methodology to present a supply chain model for a company. Most companies are not major emitters of direct GHGs and adopting this method prevents companies effectively outsourcing harmful emissions. In a number of sectors indirect GHG emissions are greater than their direct emissions.

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Appendix 2: Carbon footprints by investment style

Sector funds

Sector funds invest specifically in stocks that represent a particular business activity. The combined value of holdings for the four Sector funds researched is over \$45 billion. The aggregated carbon footprint of the funds is 233 tCO₂-e per \$ million — over 39% more carbon efficient than the S&P 500. However, carbon intensity varies widely depending on the sector focus of each fund. Sector funds have the greatest difference (15-fold) between the highest and lowest carbon intensities compared to other investment styles. This reflects the difference in the carbon intensities of particular sectors that are invested within this category, from the more carbon-intensive Oil & Gas, Utilities, and Basic Resources sectors, to the relatively low-carbon Healthcare and Financial sectors. The Sector and Growth funds with the highest carbon

footprints are listed in table 6.

Growth funds

Nineteen funds analyzed have a Growth investment style, which favors stocks that have rapid earnings growth. These funds typically include pharmaceutical, technology and smaller companies, as well as recovery stocks. Trucost analyzed 1,164 companies held in the Growth funds,¹⁰ which are associated with almost 54.8 million tCO₂-e emissions. The combined Growth fund holdings have the third-lowest carbon intensity of the investment styles. Their relatively low carbon intensity reflects the service-based and light

manufacturing characteristics of most Growth stocks. Low-carbon technology stocks account for the largest share of the value of Growth fund holdings (21%), compared with 6% of Income and 9% of the Value funds analyzed. The aggregated Growth funds are 23% more carbon efficient than the S&P 500, partly due to relatively carbon-efficient Utilities stocks.

Value funds

Value funds tend to focus on traditionally high-yielding stocks, which are likely to have stable rather than rapid growth in sales and earnings. The value of holdings in 15 funds invested in the Value style is \$397 billion. Trucost analyzed Value fund holdings in 1,753 companies, which are associated with a total of over 182 million metric tons of CO₂-e emissions. Their aggregated carbon footprint of 305 tCO₂-e/\$ million is ranked fourth out of the eight investment styles and is 11% less carbon intensive than the Core funds, aggregated in table 7 on page 17. Compared with Growth funds, a larger proportion of the value of holdings is invested in the Automobiles & Parts and Banks sectors, which are relatively

Table 6: Lowest/highest carbon footprints

Fund	Fund value (\$ million)	Carbon footprint (tCO ₂ -e/\$ million)	Rank in investment style grouping	Rank overall (total = 91)
Sector funds				
Financial Select Sector SPD	7,751.79	40	1	1
Aggregated Sector funds		233		
S&P 500		384		
Energy Select Sector SPDR	4,477.92	613	4	87
Growth funds				
PowerShares QQQ Trust	12,165.71	69	1	3
Aggregated Growth funds		294		
S&P 500		384		
Fidelity Capital Appreciation	3,853.76	758	19	90

¹⁰ The number of unique companies, which more than one fund may invest in

Table 7: Lowest/highest fund carbon footprints by style

Fund	Fund value (\$ million)	Carbon footprint (tCO ₂ -e/\$ million)	Rank in investment style grouping	Rank overall (total = 91)
Value funds				
Dodge & Cox Stock	44,125.23	119	1	6
Aggregated Value funds		305		
S&P 500	37,210.73	384		
Van Kampen Growth & Income	7,574.63	532	15	83
Core funds				
Fidelity Growth & Income Portfo.	6,660.11	178	1	16
Aggregated Core funds		342		
S&P 500		384		
Fidelity Disciplined Equity	9,040.56	563	22	86
Equity Income funds				
Fidelity Equity-Income II	5,343.93	337	1	50
S&P 500		384		
Aggregated Equity Income		408		
T Rowe Price Equity Income	17,940.50	454	3	77
Country/Regional funds				
Vanguard European Stock Index	21,389.69	326	1	48
S&P 500		384		
Agg. Country/Regional		460		
iShares FTSE/Xinhua China 25	5,938.99	1,549	5	91

low-carbon. A larger share of Value fund holdings is also invested in the carbon-intensive Utilities and Oil & Gas sectors, although the Utilities stocks selected have a lighter footprint than sector peers held in the Growth funds, as well as those in the S&P 500.

Core funds

Core investment strategies often reflect a traditional index such as the S&P 500 or Russell 1000 and avoid overweighting deep-value and high-growth stocks. A Core investment style is the most frequently employed in this analysis. The 22 funds have a total value of over US\$426 billion – the largest asset allocation to an investment style. The aggregated carbon footprint for the Core funds is 342 tCO₂-e/\$ million. This is 11% more carbon efficient than the S&P 500 due largely to the lower value of total holdings in Utilities, compared to similar securities in the In-

dex. Variations in carbon intensity among Core funds reflect the range of indices used as benchmarks, as well as the actively managed components of the funds.

Equity Income funds

Three funds analyzed employ an Equity Income investment strategy, which generally seeks to achieve high levels of current income primarily from dividend-paying stocks. Holdings in 278 companies are associated with over 21 million tCO₂-e emissions. With a carbon footprint of 408 tCO₂-e/\$ million, the combined Equity Income fund holdings are ranked seventh out of the categories. Compared with Growth and Value funds, Equity Income funds are overweight in the Banks and Oil & Gas sectors. Utilities companies in the Equity Income funds are more carbon intensive than those in the Value and Growth funds. There is a 26% difference in carbon efficiency between the highest and lowest-carbon Equity Income funds due to both sector allocation and stock selection effects.

Country/Regional funds

Combined Country/Regional funds are 11% more carbon intensive than the aggregated Equity Income funds. Five funds analyzed employ this investment style, with combined assets of over \$77 billion. Their aggregated carbon footprint is 460 tCO₂-e/\$ million. The iShares FTSE/Xinhua China 25 Index Fund has the largest carbon footprint of all funds analyzed, at 1,549 tCO₂-e/\$ million. This is more than double the carbon intensity of the Fidelity Capital Appreciation Fund, ranked 90th. The iShares fund's markedly heavy carbon footprint is primarily driven by the significant allocation of assets in coal-fired utilities in China.

Appendix 3: Listing of funds analyzed

Fund data is provided by Lipper.

AllianceBern SanC.Bern Tax-Mgd Intl Ptf	Fidelity International Discovery Fund	Sentinel Sustainable Core Opportunities Fund
American Century Ultra Fund	Fidelity Magellan Fund	SPDR Trust
American Funds Capital World Gro & Inc Fd	Fidelity Overseas Fund	T Rowe Price Blue Chip Growth Fund
American Funds Washington Mutual Inv Fund	Fidelity Spartan 500 Index Fund	T Rowe Price Equity Income Fund
Ariel Appreciation Fund	Fidelity Spartan US Equity Index Fund	T Rowe Price Equity Index 500 Fund
Artisan International Fund	Financial Select Sector SPDR Fund	T Rowe Price Growth Stock Fund
CALAMOS Growth Fund	GMO US Quality Equity Fund	T Rowe Price Mid-Cap Growth Fund
Calvert Capital Accumulation Fund	Harbor Capital Appreciation Fund	T Rowe Price Value Fund
Calvert Equity Portfolio	Harbor International Fund	Templeton Foreign Equity Series
Calvert International Equity Fund	Hartford Capital Appreciation Fund	Templeton Growth Fund
Calvert Large Cap Growth Fund	iShares FTSE/Xinhua China 25 Index Fund	Templeton World Fund
Calvert Social Index Fund	iShares MSCI EAFE Index Fund	TIAA-CREF Social Choice Equity Fund
CNI AHA Diversified Equity Fund	iShares MSCI Japan Index Fund	Van Kampen Comstock Fund
Columbia Value & Restructuring Fund	iShares Russell 1000 Growth Index Fund	Van Kampen Growth & Income Fund
Davis New York Venture Fund	iShares Russell 1000 Value Index Fund	Vanguard 500 Index Fund
DIAMONDS Trust	iShares S&P 500 Growth Index Fund	Vanguard Emerging Markets Stock Index Fund
Dodge & Cox International Stock Fund	iShares S&P 500 Index Fund	Vanguard Energy Fund
Dodge & Cox Stock Fund	Janus Fund	Vanguard European Stock Index Fund
Domini Social Equity Fund	Janus Mid Cap Value Fund	Vanguard FTSE Social Index Fund
Eaton Vance Large-Cap Value Fund	Janus Twenty Fund	Vanguard Health Care Fund
Energy Select Sector SPDR Fund	Longleaf Partners Fund	Vanguard Inst Total Stock Mkt Index Fund
Fidelity 100 Index Fund	Lord Abbett Affiliated Fund	Vanguard Institutional Index Fund
Fidelity Blue Chip Growth Fund	MMA Praxis Core Stock Fund	Vanguard International Growth Fund
Fidelity Capital Appreciation Fund	Neuberger Berman Socially Responsive Fund	Vanguard International Value Fund
Fidelity Contrafund	New Covenant Growth Fund	Vanguard Mid-Cap Index Fund
Fidelity Disciplined Equity Fund	Oppenheimer Global Fund	Vanguard Pacific Stock Index Fund
Fidelity Diversified International Fund	Parnassus Equity Income Fund	Vanguard PRIMECAP Fund
Fidelity Equity-Income Fund	Pax World Growth Fund	Vanguard Total Stock Market Index Fund
Fidelity Equity-Income II Fund	PowerShares QQQ Trust	Vanguard Windsor Fund
Fidelity Fund	Selected American Shares	Vanguard Windsor II Fund
Fidelity Growth & Income Portfolio		

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TRUCOST RESEARCH

Trucost regularly publishes research on the financial implications of environmental issues for companies, fund managers and asset owners. The following reports are available to download for free at www.trucost.com/publishedresearch.

- Eurosif/Trucost Shipping Sector Report (2009)
- The VicSuper Carbon Count 2008: Trucost carbon analysis of companies in the S&P ASX200
- Carbon Counts 2008: The Carbon Footprints of Australian Superannuation Investment Managers
- Carbon Audits of Henderson Industries of the Future fund and Henderson Global Care UK Income fund (2005-2008)
- Research Notes: Manufacturers' exposure to carbon costs, Oil sands exposure to carbon and energy costs; Vehicle Manufacturers' carbon risk exposure (2008)
- Carbon Counts Asia 2007: Carbon Footprints of Asian Investment Funds
- Environmental disclosures - The Second Major Review of Environmental Reporting in the Annual Reports & Accounts of the FTSE All-Share – UK Environment Agency (2007)
- Carbon Disclosure Project 2007 – FTSE 350
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- Carbon Counts: The Trucost Carbon Footprint Ranking of UK Investment Funds (2006)¹¹
- Environmental Key Performance Indicators: Reporting Guidelines for UK Business – UK Department for Environment, Food and Rural Affairs (2006)
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- Emissions Trading and European Aviation (2004)
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- Climate Change and the S&P 500 (2004)

¹¹ Winner of the City of London Corporation's Sustainable City Awards 2006/7; Trucost won the Sustainable and Ethical Investment and Asset Management Category for its report: *Carbon Counts - The Trucost Carbon Footprint Ranking of UK Investment Funds*

TRUCOST INVESTOR SERVICES

Trucost helps the investment community understand how corporate environmental impacts, such as greenhouse gas emissions, could affect fund performance.

Managing exposure to environmental costs

With the world's largest and most comprehensive database of environmental impacts covering most major international indices, Trucost provides a robust analysis of corporate environmental performance, in financial as well as quantity terms.

Optimizing investment performance

Investors use Trucost data to understand how different companies in the same sector may have varied exposure to environmental costs. By rebalancing holdings to favor companies with greater environmental efficiency relative to sector peers, investors can reduce exposure to environmental costs, while maintaining financial returns and diversification.

Creating new products

Trucost's data underpins funds including the S&P U.S. Carbon Efficient Index, Deutsche Bank's CROCI Carbon 100 and Carbon Alpha, GLG Partners' GLG Environment Fund, Virgin Money's Virgin Climate Change Fund, Merrill Lynch's Carbon Leaders Europe Index, UBS's Europe Carbon Optimized Index and NYSE Euronext's Low Carbon 100 Europe Index.

Engaging with companies to reduce environmental impacts

Trucost's data and analysis supports engagement programs to help target companies where improvements in environmental performance could reduce financial risks to returns.

Trucost data options

Trucost can provide fund managers and asset owners with:

- Company data
- Fund data
- Online subscription to Trucost's comprehensive database covering environmental impacts associated with companies in indices including the S&P 500, Russell 1000, MSCI World, FTSE All-Share, Nikkei 225, DJ STOXX 600, MSCI Europe, MSCI Asia ex-Japan and ASX 200.

Acknowledgements

Trucost would like to thank Lipper, a Thomson Reuters company, for providing fund data. Our thanks also go to the managers of funds covered in this report.



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