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Investing in Clean Technologies

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Our climate's changing, and there's consensus among climate experts that human activity is to blame. The Intergovernmental Panel on Climate Change (IPCC) forecasts global temperatures will increase by 3.7˚C to 4.8˚C, as compared to preindustrial levels (1850–1900), by the end of the 21st century if current levels of greenhouse-gas emissions persist. Some communities are already experiencing severe—sometimes irreversible—consequences, with loss of biodiversity and more frequent and devastating natural disasters. Investors are, therefore, increasingly eager to explore how they can invest in technologies that will help curb a global climate catastrophe by transitioning to more sustainable production and consumption of natural resources. In this whitepaper, we explore how some public companies' activities help with this transition and how investors can invest in them.

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What is clean technology?

The term *clean technology* typically brings to mind fossil-fuel alternatives and renewable technologies, such as solar panels, wind turbines, or hydroelectric power. But, while fossil-fuel alternatives remain part of the solution, there are other products and services that address climate change. Here are five areas that are commonly used to categorize different types of clean technology, with associated revenue data provided by MSCI ESG Research.

Energy efficiency

Energy efficiency captures products and services that help minimize energy consumption in the production process or create energy efficiencies within labor, transportation, and power. This category entails a wide variety of activities, from cloud-computing services, such as those provided by Microsoft or Amazon, to hybrid/electric vehicle production at companies such as Toyota or Tesla. It may even apply to railway operation and construction, such as the output of Japan Railway. These activities tend to be common among large information-technology and consumer-discretionary companies. Therefore, energy efficiency revenue is a large component of the overall clean-tech revenue seen in indexes. In fact, energy efficiency accounts for more than 80% of the S&P 500® Index's clean-tech revenues and more than 45% for the MSCI EAFE.

Alternative energy

Alternative energy refers to energy that isn't derived from fossil fuels. It's the most well-known area of the clean-technology space. Alternative energy provides solutions to reduce global dependency on traditional fossil fuels. It encompasses substitutes to fossil fuels, including renewable energy, such as wind, solar, geothermal, biomass, small-scale hydro, waste-to-energy, and tidal, as well as alternative fuels, such as biodiesel, biogas, and cellulosic ethanol. Involvement captured can be anywhere along the value chain and includes products and services related to the transmission, distribution, or generation of these energy sources. The utilities and industrials sector show the greatest revenues from alternative energy, while energy companies show little to no involvement.

Green building

Green building refers to the design, construction, redevelopment, retrofitting, or acquisition of properties certified as *green,* such as the US LEED certification. Naturally, these activities are almost exclusively found within the real-estate sector, making it the most concentrated clean-tech category with regard to sector exposure. Companies with involvement are typically *green* REITs, such as Vornado Realty, which generates 92% of its revenues from green buildings. Despite being concentrated in one sector, this category has substantial environmental impact. According to the US Energy Information Administration (EIA), total energy consumption by buildings in the US (measured by residential and commercial sectors) accounted for 40% of total US energy consumption in 2020.[1]

Sustainable water

Sustainable water products and services help increase both quality and access to potable water through water treatment, smart metering, and construction and maintenance of clean-water infrastructure. These solutions are becoming more important as global water demand increases and more frequent and intense floods and droughts reduce nations' ability to access and manage water supply. The United Nations reports that 700 million people in 43 countries currently suffer from water scarcity. By 2030, half of the world's population could be living in areas of water stress.[2] Within the S&P 500®, only 28 companies offer sustainable water products and services. Involvement is minimal, with each company generating, on average, less than 2% of revenues from these solutions. One such company, Xylem, offers equipment and services that address the life cycle of water management, including disinfection and oxidation systems that treat wastewater.

1 "How Much Energy Is Consumed in US Buildings?," US Energy Information Administration, updated May 3, 2021, https://www.eia.gov/tools/faqs/faq.php?id=86&t=1.

2 "International Decade for Action 'WATER FOR LIFE' 2005–2015," United Nations Department of Economic and Social Affairs, updated November 24, 2014, https://www.un.org/waterforlifedecade/scarcity.shtml.

Pollution prevention

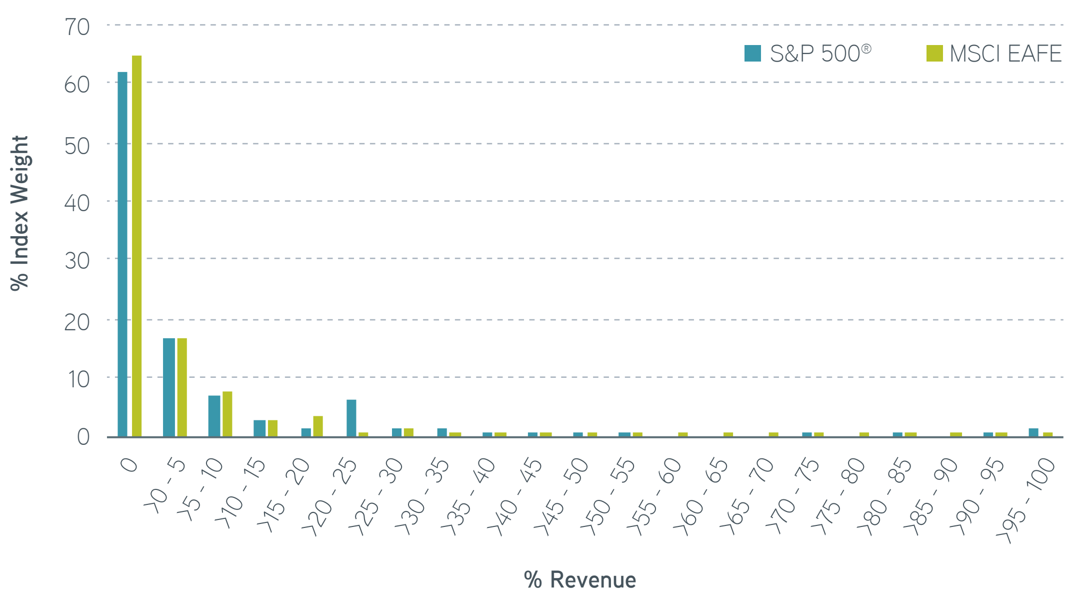
Pollution prevention consists of products, services, infrastructure, and technology that aim to address pollution and its related effects, specifically by reducing waste materials, minimizing release of toxic substances, and cleaning contaminants such as heavy metals and organic pollutants. Controlling pollutants is essential to preserving the environment and reducing climate risks. Company involvement can range from providing recycling and waste services (for example, Waste Management Services) to producing low volatile organic compounds in paints (for example, Sherwin-Williams) or carbon absorbers.

Analysis of clean-tech revenues

We now review the composition of clean-tech revenue exposure for two popular broad-market-cap indexes, the S&P 500® Index and the MSCI EAFE Index. In short, there aren't a lot of companies with clean-tech revenues available to invest in, and they tend to be found in particular sectors and not throughout the broader index.

Overall, the level of clean-tech revenues is low, with a weighted average of 5% for the S&P 500® Index and 4% for the MSCI EAFE Index. Only about one-third of companies in each index have any clean-tech revenue, as measured by market-cap weight. Figure 1 illustrates the distribution by index weight. In this distribution, we observe a steep decline in index exposure when increasing the revenue threshold. Only about 20% of each index, by market-cap weight, has clean-tech revenue above the weighted average of 5%.

Figure 1: Distribution of clean-tech revenues



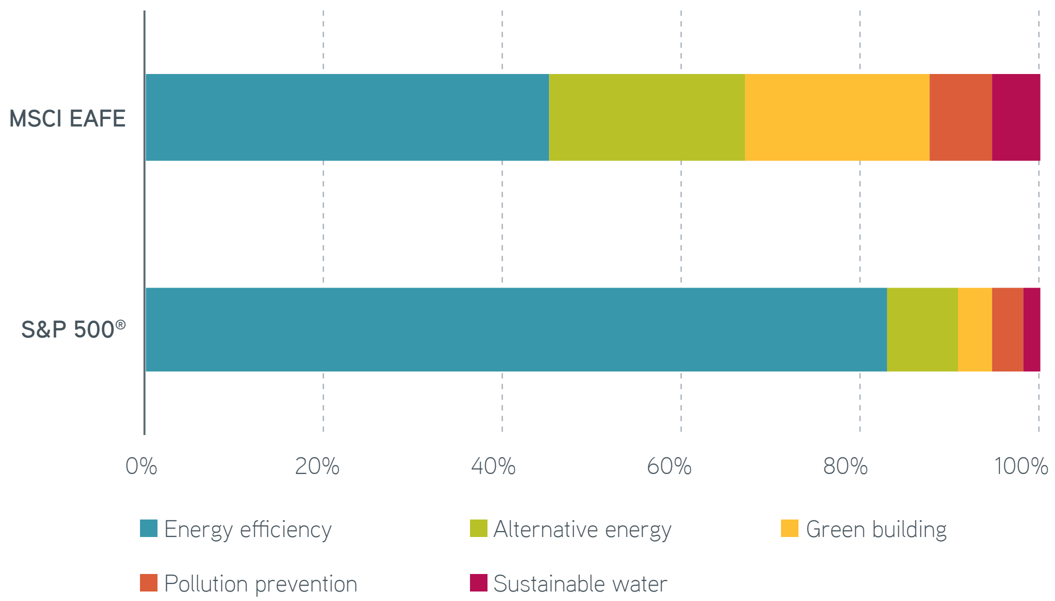
Sources: Parametric, MSCI ESG Research, 8/30/21. For illustrative purposes only. Not a recommendation to buy or sell any security. It is not possible to invest directly in an index.

In figure 2, we examine the underlying sources of clean-technology revenues within each index.

In the S&P 500® Index, clean-tech revenues are concentrated in terms of both type and company. In terms of type of revenue, more than 85% of clean-tech revenue comes from energy-efficiency-related activities. This is largely due to Microsoft and Tesla's large weights in the index and significant share of revenues associated with energy efficiency. In the case of Microsoft, the company offers cloud-computing services that are considered energy efficient and represent about a quarter of total company revenues. In the case of Tesla, all of its revenues are considered energy-efficiency related. All other clean-tech categories are significantly less represented in the S&P 500® Index. Concentration is also observed in the top contributors to the weighted average of clean-tech revenue exposure. The 10 largest contributors account for roughly 70% of total-index, clean-tech revenue, with nearly half coming from Tesla and Microsoft alone.

In the MSCI EAFE Index, energy efficiency is also the largest contributor to total weighted average revenues but not as significantly. Instead, we observe a greater share of revenues from alternative energy and green building. However, when implemented with ADRs, the availability of companies with green-building exposure drops significantly due to a lack of ADR coverage across real-estate names. Overall, there's less concentration in companies with exposure to clean-tech revenue compared to the S&P 500® Index—the 10 largest contributors account for roughly 30% of clean-tech revenue of the index.

Figure 2: Breakdown of clean-tech revenues in the S&P 500® Index and MSCI EAFE



Sources: Parametric, MSCI ESG Research, 8/30/21. For illustrative purposes only. Not a recommendation to buy or sell any security. It is not possible to invest directly in an index.

In figure 3, we show which sectors contribute the most to the weighted-average, clean-tech revenue of each respective index. As you can see, the S&P 500® Index clean-tech exposure is almost entirely found within the information-technology and consumer-discretionary sectors and, as discussed above, within a few large companies within those sectors. Although companies with clean-tech revenues can be found in other sectors, these opportunities are more limited.

In contrast, MSCI EAFE Index companies with clean-tech revenues are more evenly distributed across sectors. Industrials is the most prominent contributor to clean-tech revenues since it's the second largest sector by market cap weight and a majority of companies within the sector have any clean-tech revenues.

Figure 3: Clean-tech revenue breakdown by sector

Sector	S&P 500® Weighted-average revenue	MSCI EAFE Weighted-average revenue
Communication services	0.1%	0.0%
Consumer discretionary	**1.7%**	0.4%
Consumer staples	0.0%	0.0%
Energy	0.0%	0.1%
Financials	0.0%	0.0%
Health care	0.0%	0.0%
Industrials	0.2%	**1.6%**
Information technology	**2.5%**	0.3%
Materials	0.1%	0.3%
Real estate	0.4%	**0.7%**
Utilities	0.2%	0.5%
TOTAL	5.3%	4.0%

Sources: Parametric, FactSet, MSCI ESG Research, 8/30/21. For illustrative purposes only. Not a recommendation to buy or sell any security. It is not possible to invest directly in an index.

Constructing a clean-tech portfolio

We analyzed increasing exposure to clean-tech revenues using two common ESG incorporation techniques—screens and integration. A screen builds a portfolio out of a subset of companies in the eligible investment universe that meet specific criteria. Integration reweights the eligible investment universe with respect to that criteria. Both can enhance a portfolio's clean-technology revenue characteristics but are quite different in implementation and the final holdings.

We found that the clean-tech revenue metric didn't lend itself well to screening for investors seeking tax-efficient, diversified portfolios. The most lenient screen possible includes companies with any revenue from clean tech and excludes those with none. However, even with such a low bar, only 159 companies in the S&P 500® Index, representing 39% by weight, passed the screen. Even with optimization, the screened portfolio was very concentrated and exhibited a predicted tracking error (PTE) of 3%. The risk characteristics of the eligible constituents just weren't sufficiently similar to those of the index to build a portfolio with lower PTE.

In contrast to screening, integration provides complete flexibility with regard to which constituents are included and allows their weight to be directly influenced by their clean-tech revenues. Instead of only including companies that meet a specific clean-tech revenue threshold, integration reweights holdings based on both their clean-tech revenues and fundamental risk factors. Using optimization, we're able to specify the desired exposure to clean-tech revenues and create a portfolio with a risk-and-return characteristic more similar to that of the benchmark.

Given its flexibility, integration requires investors to determine the optimal balance between clean-tech revenue exposure and other differences between the portfolio and the benchmark that arise from reweighting, typically measured by predicted tracking error. We analyzed multiple scenarios targeting different PTE and clean-tech revenue objectives. The benchmark defined the initial eligible investment universe as well as the target-risk characteristics. For all scenarios, we managed the following risk factors: fundamental factors and sectors. For the MSCI EAFE Index scenarios, we also managed country and currency exposure and implemented them using ADRs.

We were able to comfortably double the weighted average clean-tech revenue of integrated portfolios relative to the benchmark. Further increasing clean-tech revenue resulted in disproportionately higher levels of risk and concentration. Therefore, each integrated portfolio was designed to have roughly double the weighted-average, clean-tech revenues compared to their benchmarks.

Figure 4: Comparison of screened vs. integrated clean-tech portfolios (hypothetical)

Strategy	# of holdings	Predicted tracking error	Weighted-average clean-tech revenue
S&P 500® screened	140	3.0%	10.6%
S&P 500® integrated	310	1.0%	11.3%
MSCI EAFE screened	150	2.1%	11.5%
MSCI EAFE integrated	320	1.6%	9.8%

Sources: Parametric, MSCI ESG Research, 8/30/21. The scenarios are hypothetical and are provided for illustrative purposes. They do not reflect the holdings of any investor and are not intended to estimate any investment strategy offered by Parametric. Not a recommendation to buy or sell any security. It is not possible to invest directly in an index.

Conclusion

Climate change continues to be one of the defining crises of the 21st century, and many investors are interested in understanding how they can invest in companies that are contributing to solutions in their publicly traded equity portfolio. Although there are companies with clean-tech revenues within standard US and non-US benchmarks, they tend to be concentrated in certain industries and types of clean-tech activities. At present, this makes optimized techniques using integration more effective in building diversified portfolios than techniques using screens for tax- or tracking-error-sensitive investors.

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