

The Three “E’s” Energizing Investment in Climate Technology, Tracked by the Nasdaq CTA Global Climate Technology™ Index

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The International Renewable Energy Agency estimates that global investment in transition technologies must reach [\\$35 trillion by 2030](#) to meet policy targets established in the Paris Agreement on climate change. That includes limiting temperature increases to 2.7 degrees Fahrenheit (1.5 degrees Celsius) above pre-industrial levels. To achieve this goal, the use of renewable energy around the globe must increase from approximately 3,000 gigawatts (GW) annually to over 10,000 GW by 2030.

Despite [record global investment in renewables \(including \\$1.3 trillion in 2022\)](#), solar and wind power generation together account for about [10% of total production](#), compared to nearly 60% generated by coal (36%) and gas (23%). At the same time, the International Energy Agency (IEA) reports global energy-related carbon dioxide emissions reached [36.8 Gt in 2022](#), with wind and solar offsetting just 465 Mt of emissions. For perspective, one gigaton is roughly equivalent to the [mass of 200 million elephants](#).

Now for some good news: advances in climate technology, powered by the influx of strategic investments from businesses and governments, promise to deliver the solutions necessary for limiting temperature increases while meeting consumer and business demand. In recent years, we have seen innovations transform various climate technologies, from renewable sources for powering buildings and vehicles to optimized agricultural, building, industrial, and manufacturing practices and materials.

The recently launched [Nasdaq CTA Global Climate Technology™ Index \(CLMTCH™\)](#) tracks companies developing technology that reduces atmospheric emissions and powers the global economy’s transition toward a net zero future. Three market forces accelerating this transition include electrification, experimentation, and expediting.

Electrification

Electrification encompasses the development of renewable power generation sources, including solar, wind, and energy storage, to deliver emission-free energy to homes and businesses.

Public policy is already driving innovation in this sector. Through the European Green Deal, the EU adopted plans in 2020 to [allocate at least €1 trillion](#) in sustainable investments over the next decade as a part of the [NextGenerationEU \(NGEU\) initiative](#). In the United States, the [Inflation Reduction Act](#) delivers a nearly \$400 billion investment intending to lower energy costs, increase cleaner production, and reduce carbon emissions

by roughly 40% by 2030. The IRA provides funding for priority areas, including power grid modernization, electric vehicle charging infrastructure, building retrofits (such as HVAC, insulation, doors and windows, etc.), and renewable power generation.

While these are just two examples, public investment in energy security and climate change mitigation is global, with the IEA estimating that global spending on clean energy will [reach \\$1.7 trillion in 2023](#).

Experimentation

We're seeing unprecedented creativity and experimentation in new technologies to scale and deploy sustainable energy generation and storage. New innovations generate investment in green hydrogen, battery development, and battery recycling.

Green hydrogen is scarce today, with [only 1% of current hydrogen production](#) originating from renewable sources. That's about to change dramatically as a major U.S. utility and renewable energy developer is making a big bet on green hydrogen, announcing plans [to invest over \\$20 billion](#) and develop more than 15GW of renewable energy projects to support hydrogen-production facilities.

Battery and energy storage technologies are also advancing at a rapid pace. Developers are experimenting with improving energy density (driving range) and reducing costs to produce electric vehicle (EV) batteries as EVs command an increasing market share. Leading solutions include solid-state batteries and their promise of [higher energy density](#), reduced space, improved safety, and the potential to reduce the carbon footprint of current lithium-ion batteries by [up to 39%](#). While mass production of solid-state batteries [may be several years away](#), progress continues with a [Massachusetts-based battery developer](#) recently receiving UN certification to ship a solid-state electric vehicle battery.

At the same time, reclaiming materials and repurposing EV batteries can reduce reliance on limited critical minerals and improve the environmental footprint of battery production. A leading U.S. battery recycling firm [recently announced a \\$3.5B plant in South Carolina](#) that will be powered entirely by renewables, potentially reducing CO2 emissions by "about 80% compared to the current Asia-based supply chain."

Expediting

Expediting approvals for new renewable energy projects remains critical to transitioning from conventional fossil fuel-based power generation.

The issue is especially pressing in the U.S., where the backlog of wind and solar [projects actively seeking grid connection totals 1,250 GW](#) (an additional 680 GW of storage). That's equivalent to the installed capacity of the entire U.S. power plant fleet. According to the [Berkeley Lab](#), the typical project built in 2022 took five years from interconnection request to commercial operations. As recently as 2008, the same process took less than two years. Within the EU, solar projects require up to [four years for approval and up to ten years](#) for wind projects.

Efforts to improve the permitting and approval process are underway. These include the U.S. Department of Energy's [Interconnection Innovation Exchange \(i2X\)](#), designed to reform the grid connection process and allow for grid infrastructure (including transmission lines) upgrades and add renewable generation projects. Similarly, the EU is close to [revising its 2018 EU Renewable Energy Directive](#) to accelerate the approval process for renewables.

Investing in Climate Tech

The Nasdaq CTA Global Climate Technology™ Index (CLMTCH™) was launched on January 16, 2023 and tracks the performance of a diversified basket of companies developing and deploying climate technology

solutions. The index is designed to expose investors to the growth potential of this rapidly expanding industry. Stocks within the index are selected based on classifications determined by the Consumer Technology Association (CTA), making the index well-positioned to capture the growth of the climate technology theme. The index is diversified across sectors, countries, and company sizes, and it is reconstituted semi-annually to ensure that it remains representative of the underlying market.

Index Methodology

To be eligible for inclusion in the Nasdaq CTA Global Climate Technology Index, securities must be listed on a Nasdaq eligible exchange. Additionally, they must have a minimum free float market capitalization of \$300 million and a three-month average daily dollar trading volume (ADDTV) of at least \$1 million (USD).

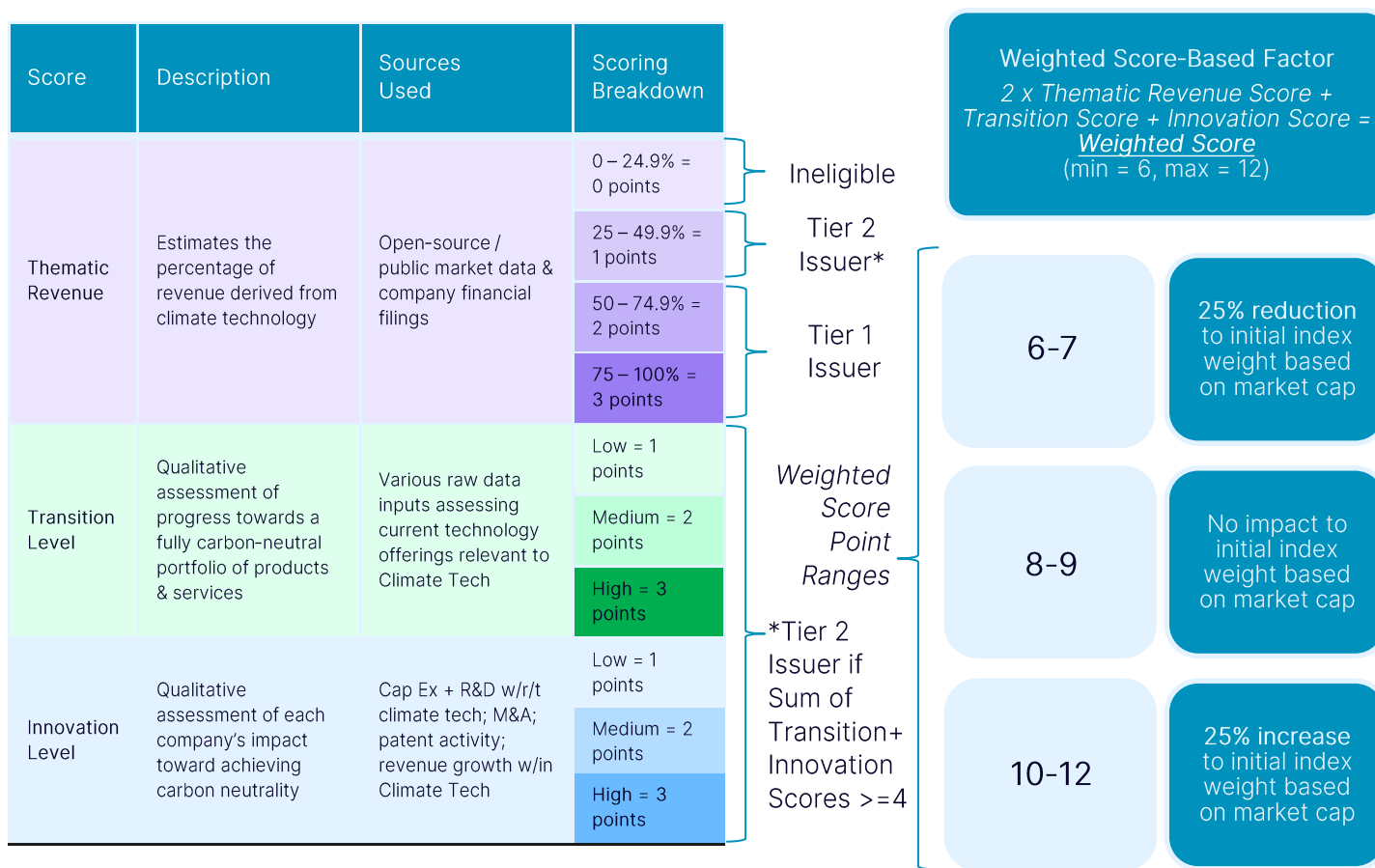
Sustainalytics must not positively identify potential holdings as exhibiting specific environmental, social, and governance (ESG) metrics including non-compliance with the principles of the United Nations Global Compact, a Sustainalytics Controversy Rating of five (5) and product/industry involvement to certain degrees in controversial weapons, thermal coal, oil & gas, or recreational cannabis.

Furthermore, securities must also be classified by CTA as Climate Technology companies, specifically Enablers (Power Sources & Storage), Engagers (Climate Infrastructure), or Enhancers (AgTech & FoodTech, Adaptation, Transportation). CTA defines Climate Technology companies as "providing products, services, and technologies that enable the transition to a net-zero emissions economy." The CTA sub-classifications, also defined as thematic taxonomy, of Engagers, Enhancers, and Enablers are as follows:

- **Enablers**
 - **Power Sources & Storage** – Companies classified as Power Sources and Power Storage enable the transition toward cleaner energy sources across the economy, including within industry, buildings (e.g., residential and commercial), and transportation. Power Sources and Power Storage include biofuels, battery technology, fuel cells, green hydrogen, power management (including power-focused semiconductors), and renewable power generation (e.g., hydroelectric, solar, and wind power).
- **Engagers**
 - **Climate Infrastructure** – Companies engaged in technologies focused on reducing the carbon impact of commercial, industrial, and residential buildings, including advanced building materials and mechanical systems (e.g., heating, cooling, ventilation, plumbing, and electric), electric vehicle charging infrastructure (e.g., public and private charging solutions), process improvements (e.g., agricultural, electrical and material technologies that improve the carbon impact of existing construction methods) and smart cities/grid (e.g., grid communication and intelligence, load control, smart metering).
- **Enhancers**
 - **AgTech & FoodTech** – Companies principally engaged in technology related to reducing carbon and methane emissions through the development of products intended to displace conventional meat consumption (e.g., alternative/plant-based proteins and cellular agriculture to displace beef, chicken, pork, turkey, etc.) as well as technologies designed to reduce the intensity of traditional farming methods and their related logistical/transportation impacts through engagement in indoor and vertical farming methods.
 - **Adaptation** – Companies providing consulting, engineering, and software solutions to clients to design, construct and retrofit projects within industry, buildings, and transportation, including advancements in renewable power delivery, power generation, and power use.

- **Transportation** – Companies enhancing the development of less carbon-intensive transportation products, including air mobility (air taxis and vertical take-off and landing planes), electric vehicles (e.g., passenger and commercial/industrial cars, motorcycles, and trucks), macro-mobility (e.g., buses, trains, and other mass transit) and micro-mobility (e.g., last-mile delivery drones and vehicles).

Once CTA defines a company as a Climate Technology Enabler, Engager, or Enhancer, it then assigns each potential index constituent with a score across three dimensions, including thematic revenue, transition level, and innovation level. The thematic revenue score measures the percentage of a company's revenue derived from climate technology, determined via open-source and public market data and financial filings to compute thematic revenues relative to total annual revenues. The transition level score qualitatively measures how far along a company is in transitioning to a carbon-neutral portfolio using raw data inputs. The innovation level score measures the company's innovation in climate technology via numerous data points and sources, including the company's capital investment/R&D in climate technologies, M&A and patent activity, and revenue growth within the theme. Once each score is determined, they're combined to create an overall score for each company.



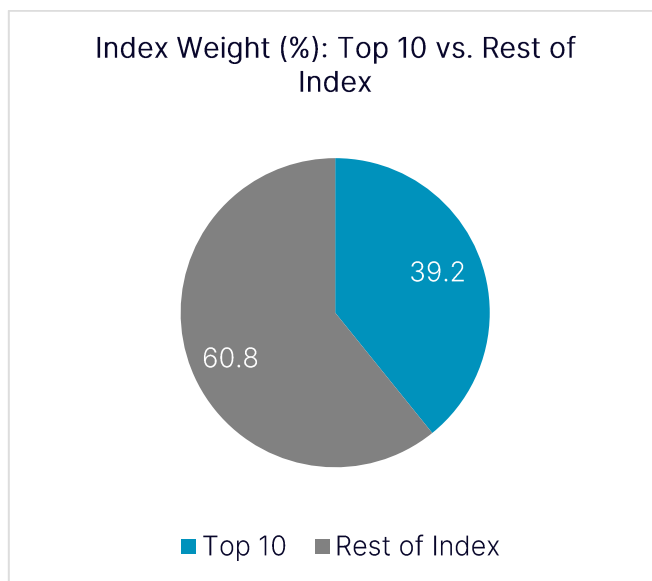
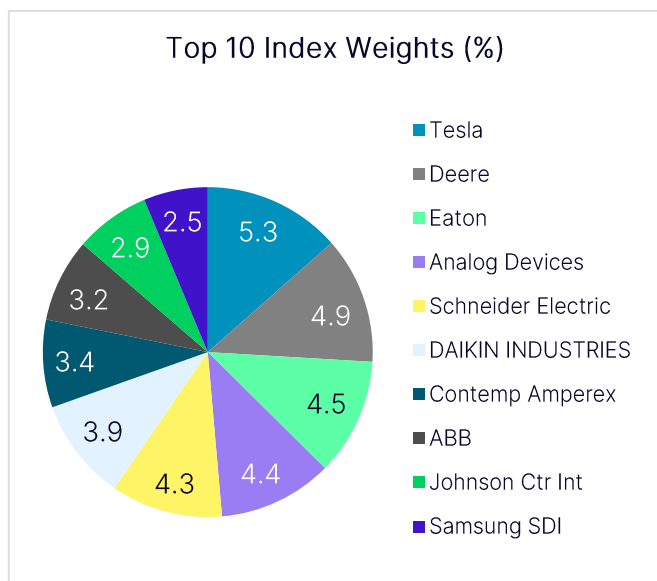
Next, all companies are categorized as Tier 1, Tier 2, or neither. All securities that meet the applicable Security Eligibility Criteria (including passing the ESG screens) and are categorized as either Tier 1 or Tier 2 issuers are then included in the Nasdaq CTA Global Climate Technology Index.

- A Tier 1 issuer generates at least 50% of its revenue from climate technology, as defined by the thematic taxonomy (Thematic Revenue Score ≥ 2).
- A Tier 2 issuer generates 25 - 50% of its revenue from climate technology (2 > Thematic Revenue Score ≥ 1), and the sum of its Transition Score and Innovation Score equals four or higher.

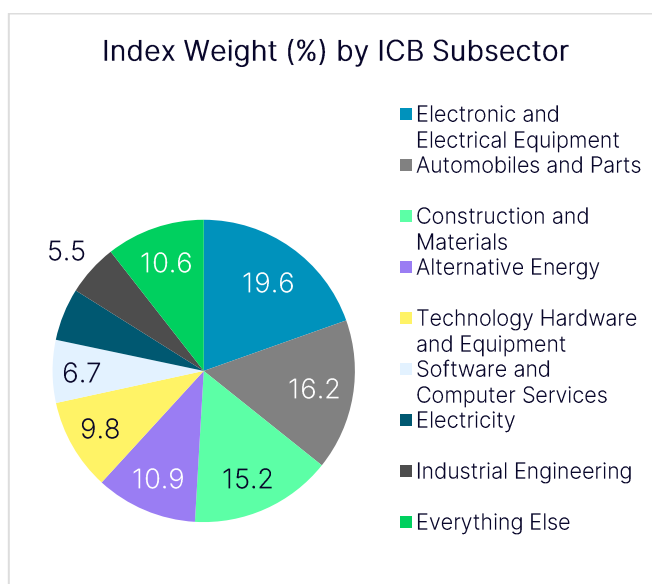
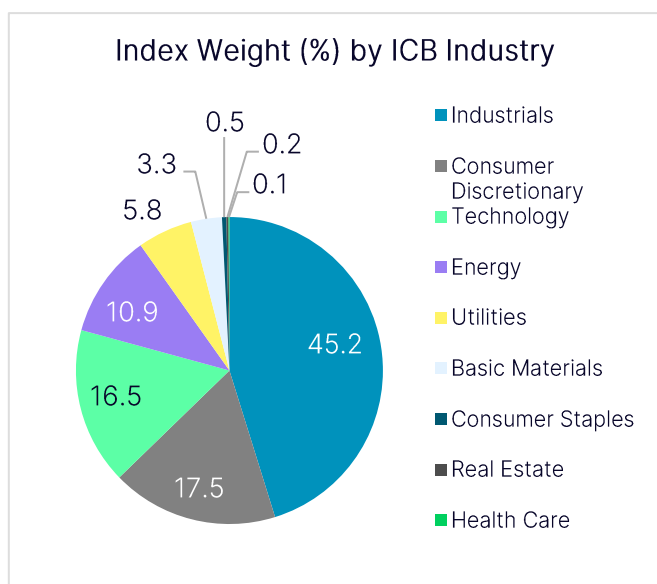
The weighting of each constituent is initially based on market cap, subject to a 25% increase or decrease based on the combined scoring of its revenue from Climate Technology, its transition to a carbon-neutral portfolio, and its level of innovation (Weighted Score). All constituent weights are capped at 4.5%.

Index Composition

As of the most recent reconstitution on June 19, 2023, the Nasdaq CTA Global Climate Tech Index is comprised of 139 stocks involved in the Climate Tech industry across a wide array of sectors and countries. The top 10 names by market cap account for over 39% of the total index weight. Tesla holds the top single weighting at 5.29%, followed by Deere (4.88%) and Eaton (4.50%).



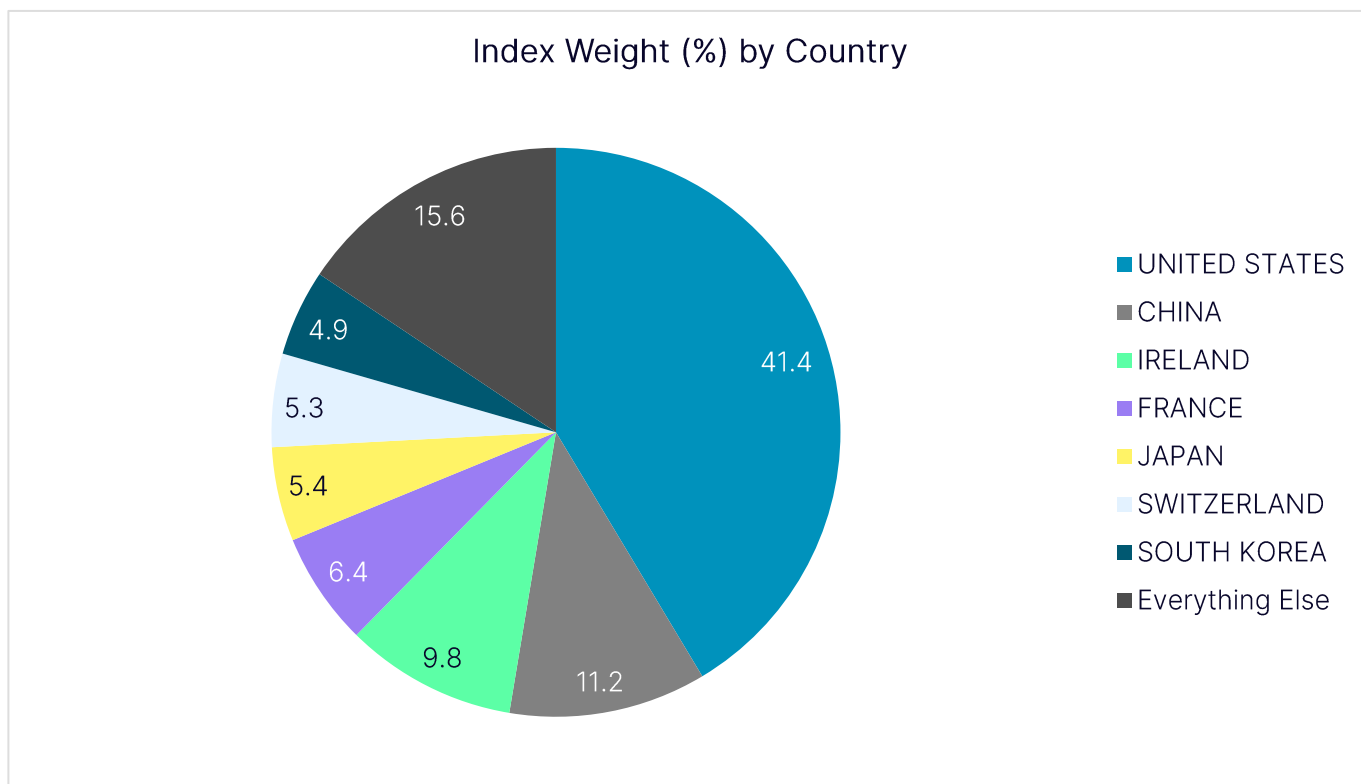
The index is diversified across nine of 11 broad ICB Industry groups, with the top four groups accounting for over 90% of the index weighting. The remaining 10% is allocated across Utilities, Basic Materials, Consumer Staples, Real Estate, and Health Care.



From an ICB Subsector perspective, the index has the largest allocation to Electronic and Electrical Equipment, followed by Automobiles and Parts, Construction and Materials, and Alternative Energy. These top four subsector groups account for over 61% of the index weighting.

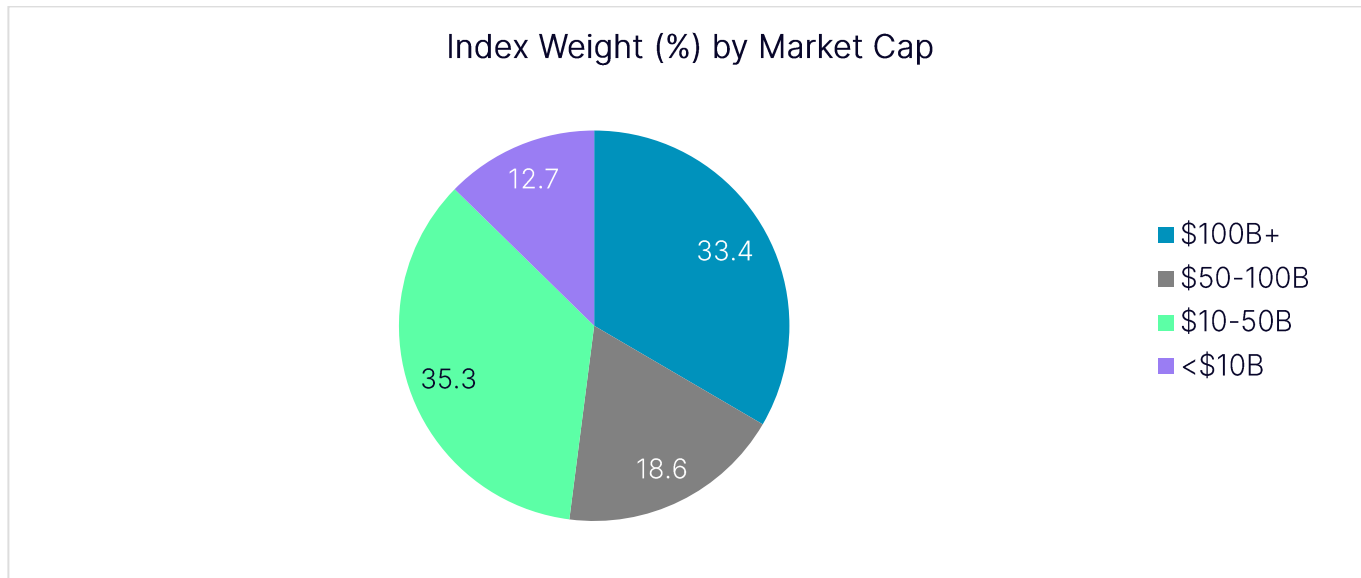
Country Exposure

As the name infers, the Nasdaq CTA Global Climate Technology Index is designed to provide global exposure to companies involved in developing Climate Technology, as defined by CTA. While the United States is the largest country by weight at 41.40%, the index has exposure to a total of 23 countries. The second largest country weighting is China (11.22%) followed by Ireland (9.75%), France (6.43%), Japan (5.35%), Switzerland (5.30%), and South Korea (4.92%). Although there are many countries represented, these top seven countries by weight account for over 84% of the total index weighting.



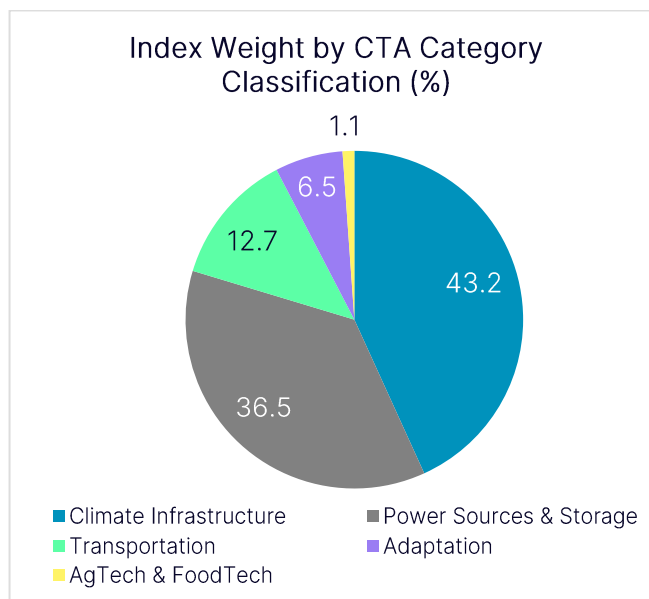
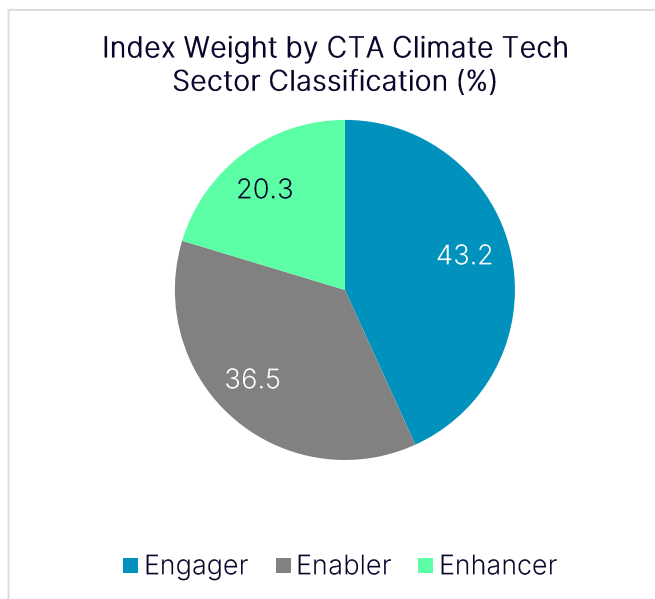
Market Capitalization

Regarding size factor exposure, one-third of CLMTCH is allocated to mega-cap stocks involved in Climate Technology, with market caps exceeding \$100 billion. A little over one-third is also allocated to smaller large-cap names with market caps between \$10-50 billion, while about 13% of index weight is true small and midcaps with market caps under \$10 billion. This exposes investors to a wide range of companies in the space, from larger, more established companies to smaller, more growth-oriented ones.



Enablers, Engagers, & Enhancers

Each constituent is classified by CTA as a Climate Technology company, specifically as an Enabler (Power Sources & Storage), Engager (Climate Infrastructure), or Enhancer (AgTech & FoodTech, Adaptation, Transportation). Engagers account for 43.21% of the total index weight, while Enhancers and Enablers represent 20.33% and 36.46% of the index, respectively.



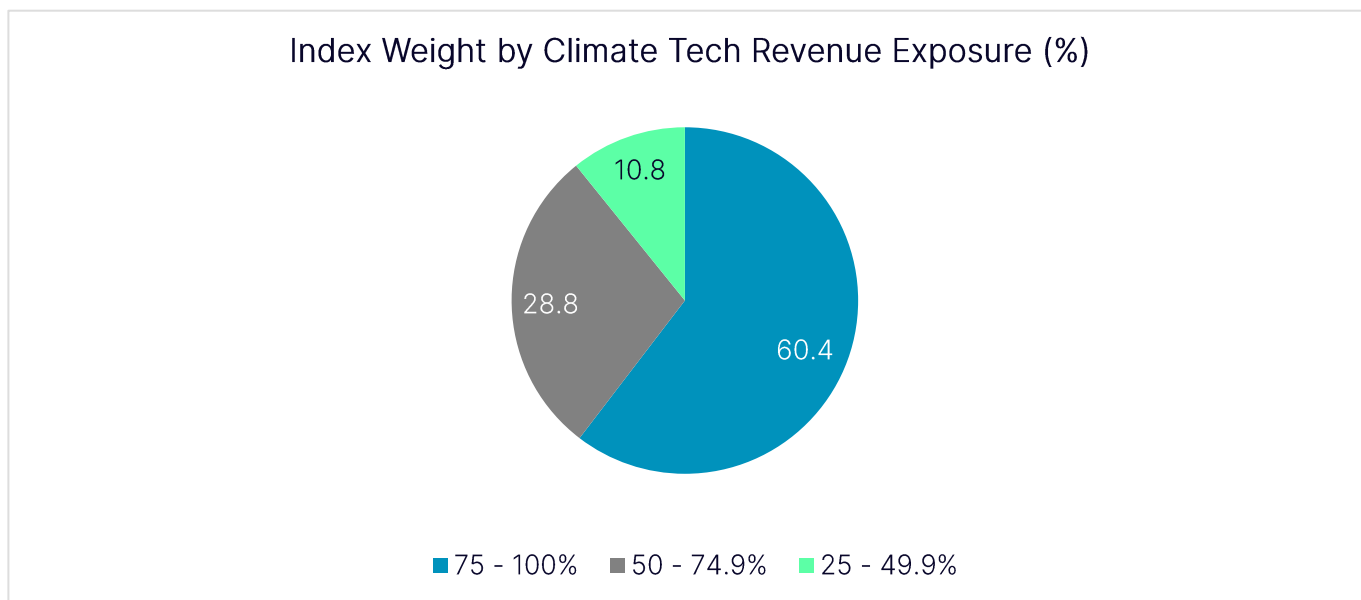
Regarding the CTA category breakdown, we can see the overlap of Climate Infrastructure companies with Engagers at 1-for-1 with a weighting of 43.20%, while Power Sources & Storage represents 36.46% of the total index weight, equalling Enablers. CLMTCH also has exposure to Transportation, Adaptation, AgTech, and FoodTech which round out the Enhancers bucket.

Because the Climate Technology theme is relatively new, an approach that relies solely on thematic revenue exposure could fail to capture the full range of companies driving innovation in the Climate Tech industry today, especially those outside the traditional Utilities and Energy sectors. Instead, the Nasdaq CTA Global Climate Tech methodology combines qualitative and quantitative metrics, resulting in a basket of Climate

Tech Enablers, Engagers, and Enhancers, some of which may surprise at first glance. One example is John Deere, the second largest holding by index weight (4.88%) and an Engager involved in climate infrastructure and process improvements. Deere, a major player in the agricultural sector since its invention of the steel plow in 1837, has established itself as a significant leader around Climate Tech innovation. Since 2017, John Deere reports that it has reduced its operational Global Greenhouse Gas (GHG) emissions by nearly 29%, driven by various initiatives such as introducing global LED lighting, revamping the painting process, and implementing the usage of renewable energy in partnership with Mesquite Sky Wind. Deere has also developed carbon reducing technologies available in its product lineup such as a hybrid electric powertrain in its wheel loader machines, which reduces fuel consumption and emissions by more than 40%. The company is also pushing to develop alternative fuel technologies to power electric motors for hydraulic pumps and construction equipment. The company aims to offer a range of electric construction equipment to its customers by 2026, including offering 20-plus electric and hybrid models.¹

Ansys is another example of a holding in CLMTCH categorized as an Engager that may not necessarily sound like a classic Climate Tech company. Like Deere, Ansys has a relatively low thematic revenue score yet is scoring high in its transition and innovation levels. Specifically, Ansys is classified as a process improvements company by CTA, meaning it produces agricultural, electrical and material technologies that improve the carbon impact of existing construction methods. Ansys, a Technology company per ICB, produces engineering simulation software, which plays a critical role in electric mobility and streamlining the overall design process for products around electric vehicles and sustainable aviation. The company reports that its simulations reduce overall development time by as much as 50%, eliminating wasted effort by engineers. These new products developed using Ansys software are directly impacting carbon use and reduction.²

When broken down by Climate Tech Revenue Exposure (i.e., Thematic Revenue Score), most of the index (60.40% by total weight) has between 75% - 100% thematic revenue exposure, while 28.80% has 50% - 74.9%. The remaining 10.80% of the index weight has a thematic revenue exposure range between 25% - 49.9%. CLMTCH's unique set of rules captures many pure-play companies with most of their revenue attributed to Climate Tech, while also including some nontraditional names such as Deere and Ansys that are well-positioned to drive the growth of the theme.



¹ <https://www.deere.com/en/our-company/sustainability/emissions/>

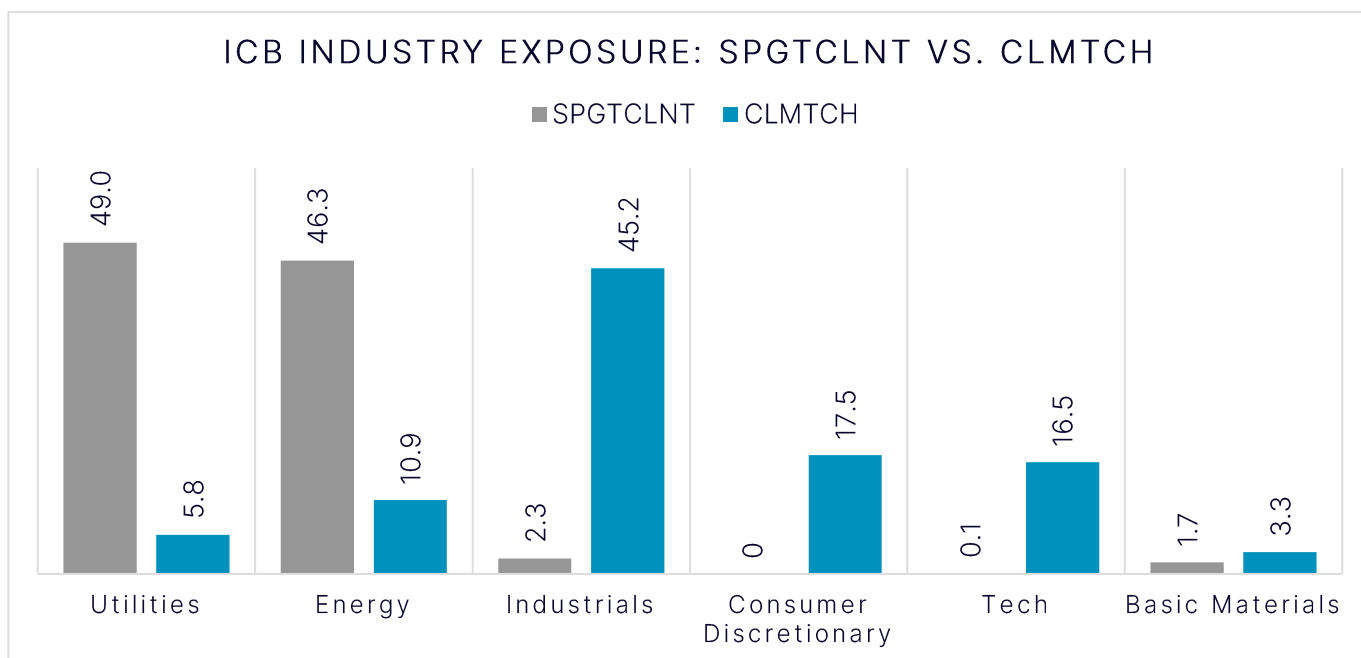
² <https://www.ansys.com/technology-trends/electrification>

Competitor Analysis

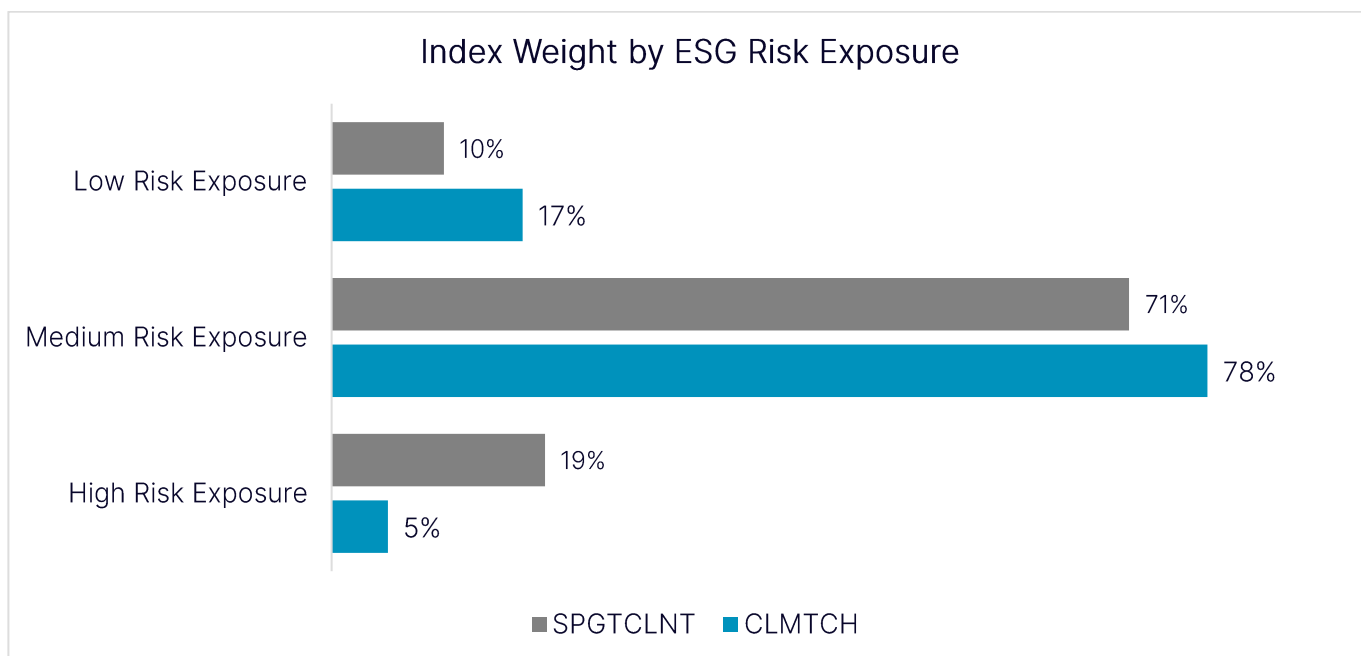
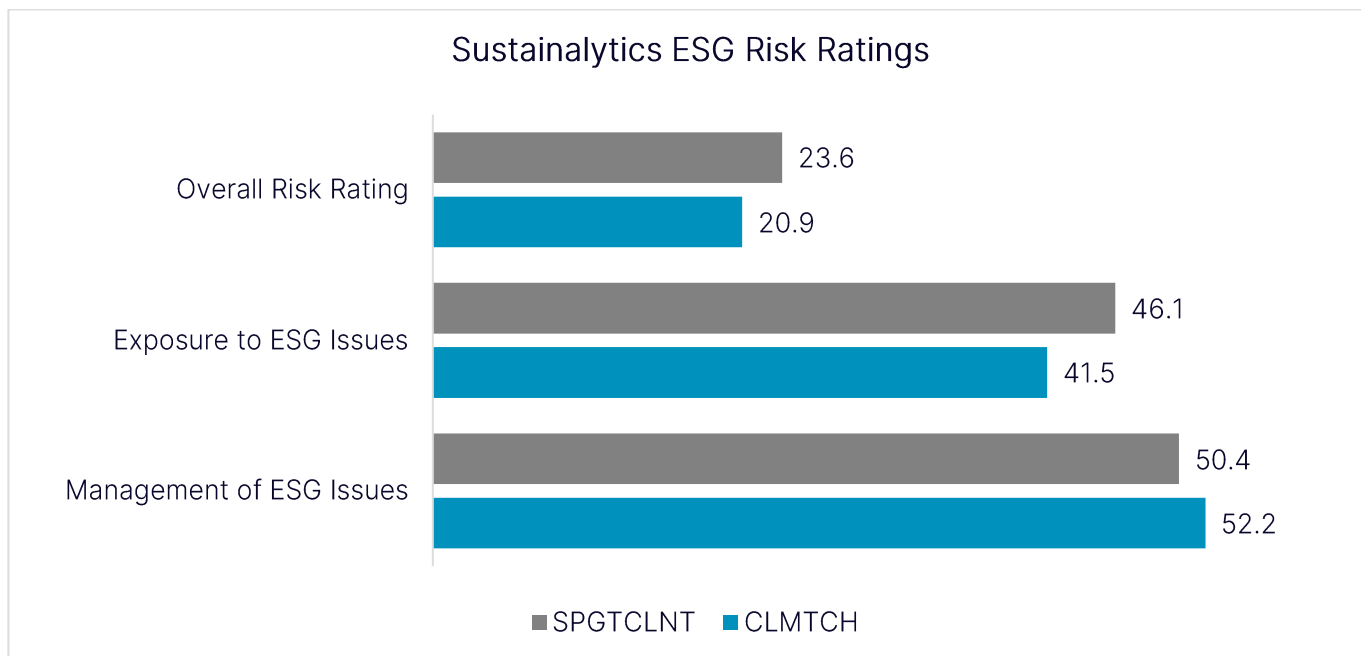
The Nasdaq CTA Global Climate Tech Index is a unique strategy compared to other indexes focusing on the clean energy and climate transition themes. One competitor product worth noting is the S&P Global Clean Energy Index (SPGTCE/SPGTCLNT), which is tracked by the iShares Global Clean Energy ETF (ICLN) and the iShares Global Clean Energy UCITS ETF in Europe (INRG). CLMTCH’s thematic approach to Climate Technology focuses on companies developing and deploying new technologies, many of which are still in the early stages of development, that are central to the climate transition. On the other hand, SPGTCLNT targets companies that are – in theory – actively selling clean energy products and services, namely power.

While both indexes are rooted in the broader clean energy space, CLMTCH and SPGTCLNT are driven by different rulesets, resulting in notably different portfolios. There are 45 stocks in CLMTCH that overlap with SPGTCLNT as of the most recent reconstitution, accounting for just 14% of CLMTCH’s total portfolio weight. In other words, 86% of its total index weight, representing 94 stocks, is unique to CLMTCH. Only five of SPGTCLNT’s top 10 constituents by index weight overlap with CLMTCH. In this case, the five stocks unique to SPGTCLNT prove that not all clean energy strategies are alike. Consolidated Edison Inc., the 5th largest holding in SPGTCLNT by weight, highlights some of the cracks in SPGTCLNT’s “clean energy” methodology. Con Ed is a diversified utility serving the New York area. The company reported a recent revenue split of 71% from electric utility operations, 21% from natural gas activities, and just 8% from clean energy construction and operation. In October 2022, Con Ed announced the sale of its Clean Energy Businesses to RWE for \$6.8B. Furthermore, only about 25% of Con Eds energy mix comes from renewables, mostly hydropower. The methodology of CLMTCH filters out names such as Con Ed, which are not truly representative of the clean energy transition and climate tech theme.

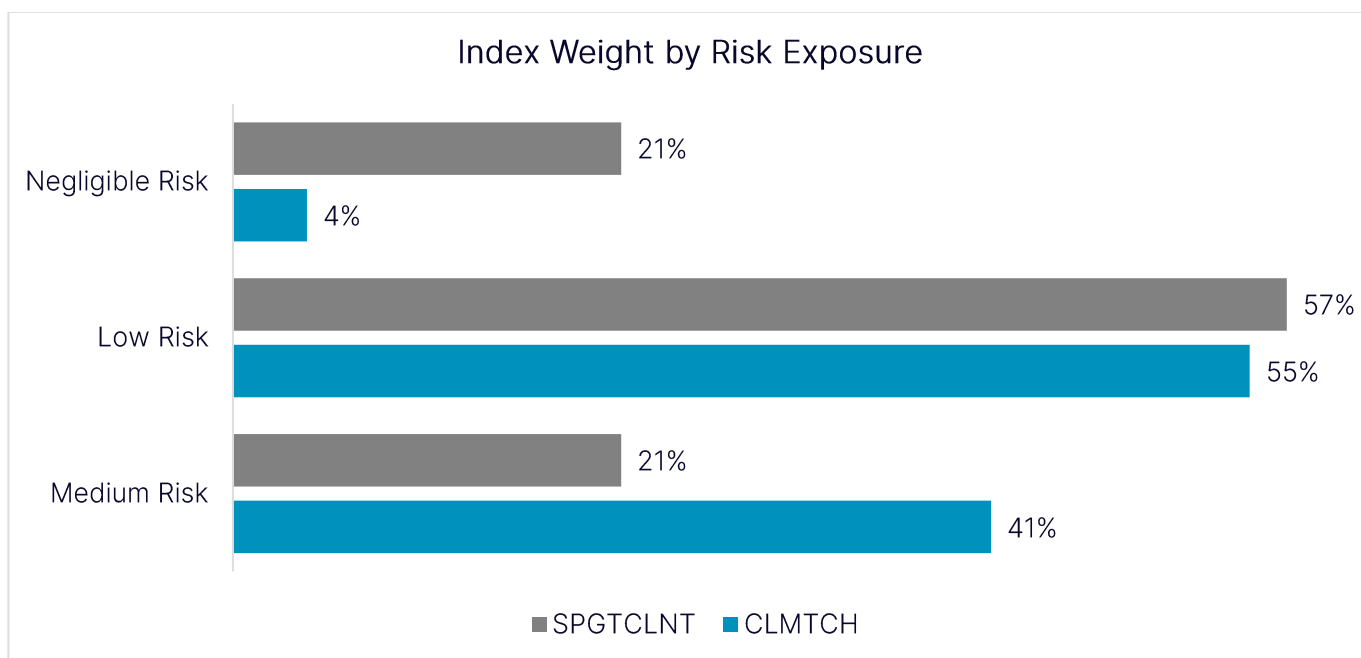
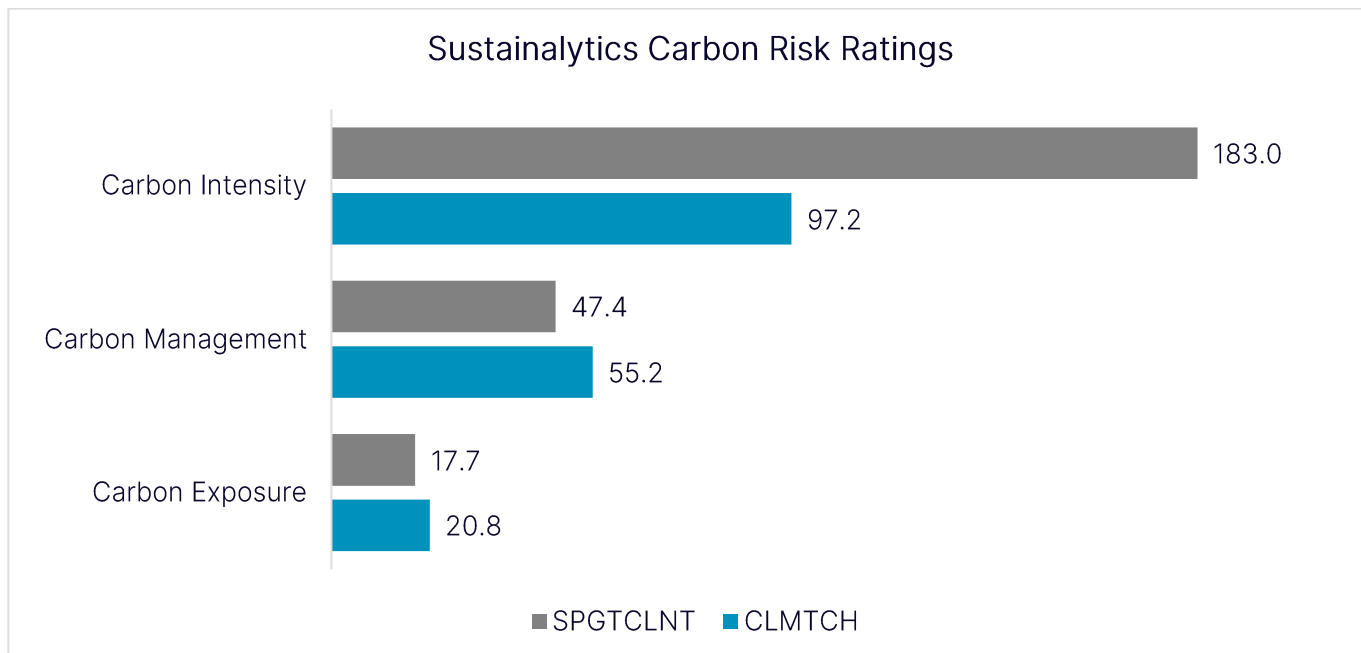
There are major differences in the broad sector exposures of the Nasdaq CTA Global Climate Tech Index vs. the S&P Global Clean Energy Index as well. SPGTCLNT’s largest sector allocation is Utilities at 49%, while it makes up only 5.8% of CLMTCH. Similarly, Energy accounts for 46.3% of SPGTCLNT and just 10.9% of CLMTCH. Utilities and Energy alone account for over 95% of SPGTCLNT, with the remaining 5% allocated across Industrials, Basic Materials, Technology, and Consumer Staples.



Compared to its main competitor product, CLMTCH displays lower levels of ESG Risk based on data from Sustainalytics, driven by lower exposure to ESG issues and slightly stronger management of ESG issues (higher score = better), on average. Despite having significantly more constituents, CLMTCH has exposure to fewer companies with high or severe ESG risk issues. SPGTCLNT has exposure to three companies with Severe ESG Risk ratings, none overlapping with CLMTCH. Additionally, SPGTCLNT has exposure to seven companies with high ESG Risk Ratings, of which only one overlaps with CLMTCH. Overall, 19% of SPGTCLNT’s total index weight is considered High Risk exposure versus just 5% for CLMTCH (as of June 19, 2023).

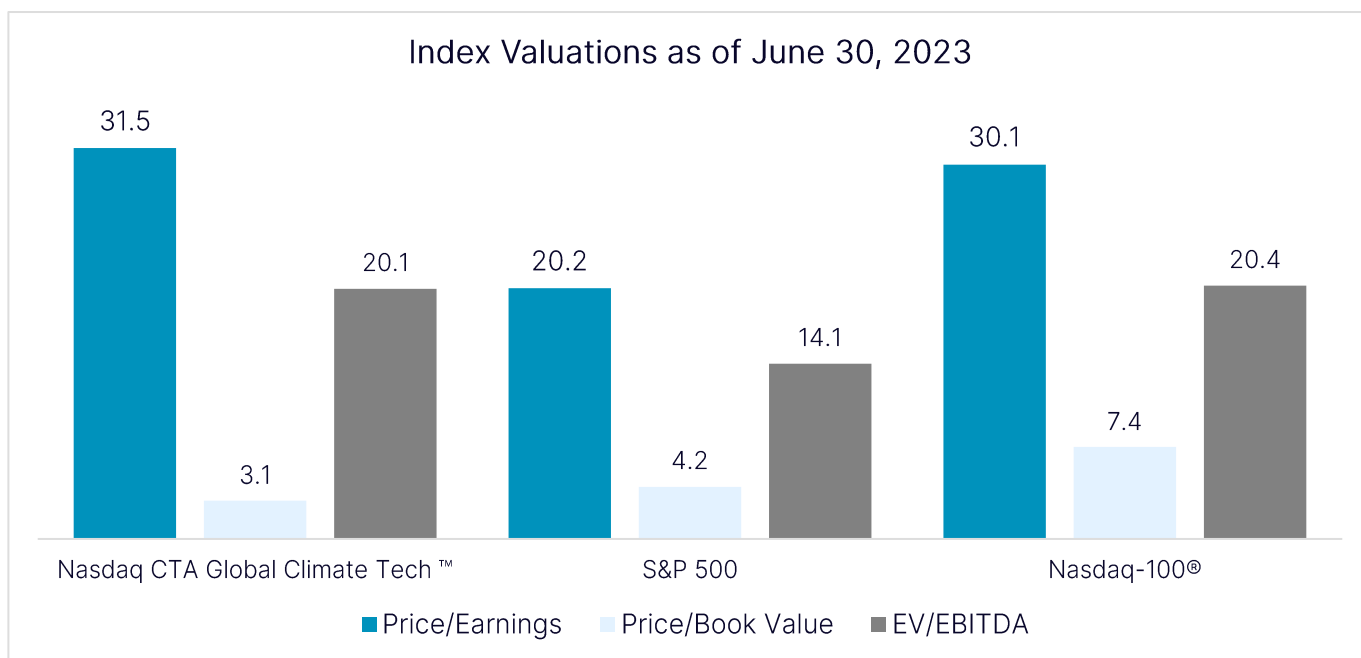


CLMTCH also displays much lower levels of Carbon Intensity when compared to SPGTCLNT, and scores better on Carbon Risk Management. Despite this, SPGTCLNT has an overall Carbon Risk Rating of 7.3, 21% lower than CLMTCH’s score of 9.3, driven by lower levels of Carbon Exposure and, specifically, higher exposure to constituents with negligible risk as well as lower exposure to medium risk constituents. SPGTCLNT’s portfolio is 88% more carbon-intensive, though, with 183 tonnes of CO2 equivalent per million USD of total revenue vs. only 97.2 for CLMTCH. SPGTCLNT tracks 20 constituents with involvement in Fossil Fuels, driving an overall 27.4% weighted percentage of involvement. CLMTCH has only 10 such constituents and an overall 3.1% weighted percentage of involvement (89% lower than SPGTCLNT). Both portfolios have similar exposure to Low Carbon Risk companies at 55-57% each. It is worth noting that while CLMTCH scores better on Carbon Risk Management, SPGTCLNT scores better on Carbon Solutions Involvement.



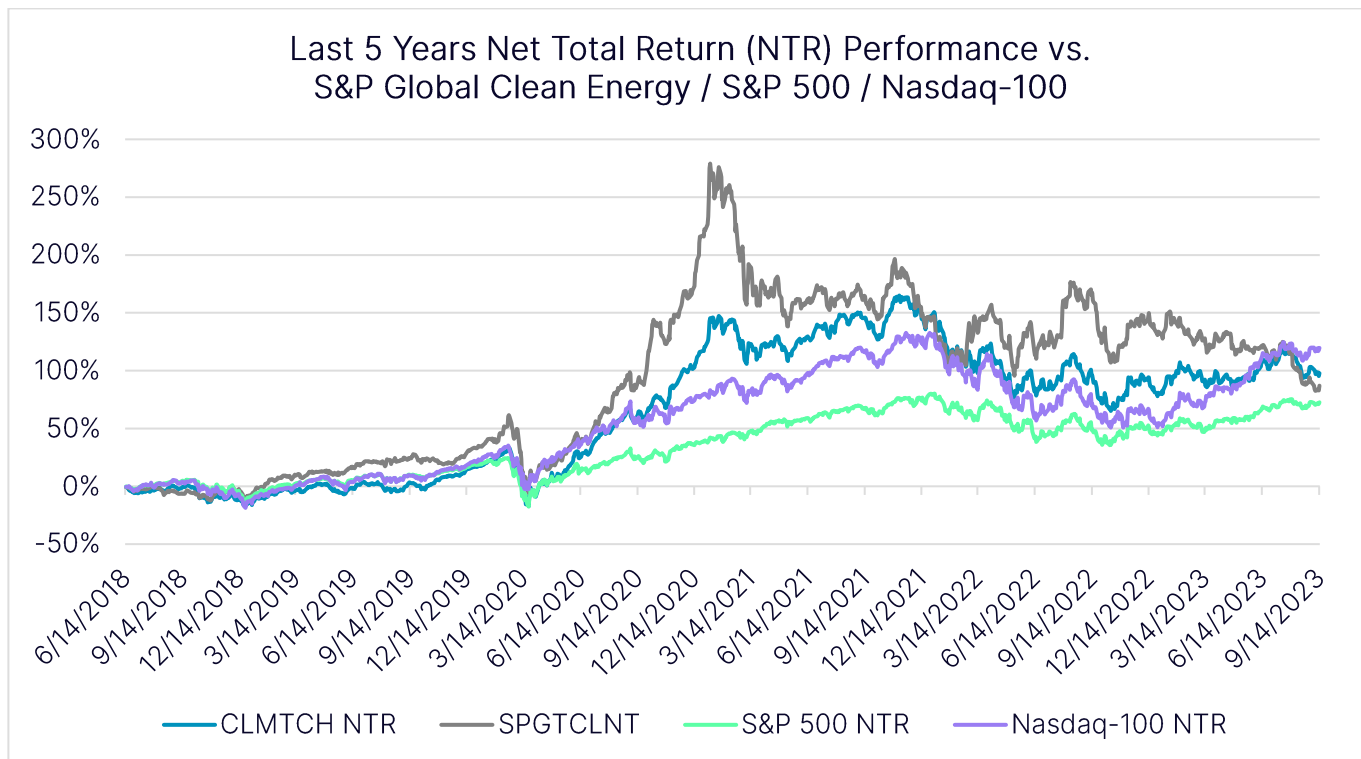
Index Valuation

As of June 30, 2023, the Nasdaq Global Climate Tech Index traded at an earnings multiple of 31.46 while the S&P 500 and the Nasdaq-100® traded at 20.17 and 30.13, respectively, suggesting that investors expect high growth rates in the future. CLMTCH’s price-to-book ratio was 3.07, lower than that of the SPX and NDX®, while the EV/EBITDA ratio was in line with that of the Nasdaq-100 at 20.13. These metrics suggest that CLMTCH truly does resemble something closer to a technology index in more ways than one, supporting the notion that it is a portfolio of “innovation makers” as opposed to the “innovation takers” more commonly seen in sectors like Utilities and Energy.



Index Performance through September 14, 2023

Since June 14, 2018, the Nasdaq CTA Global Climate Tech Index has gained 97.8% on a net total return basis, based on a backcast prior to index launch in January 2023. Despite a much higher allocation to Utilities – a lower-volatility, defensive sector – the S&P Global Clean Energy Index has displayed substantially higher overall volatility over the same period (28% annualized) vs. CLMTCH (23%), and a lower net total return of 87.0%. On an annualized basis, CLMTCH gained 13.9%, while SPGTCLNT gained 12.6% through September 14, 2023. While not as impressive as the Nasdaq-100’s gain of 119.6%, CLMTCH did manage to substantially outperform the S&P 500, which had a net total return of only 72.6% over the period.



Conclusion

As highlighted in this research report, advances in Climate Technology, powered by the influx of strategic investments from businesses and governments, promise to deliver the solutions necessary for limiting temperature increases while meeting consumer and business demand. In recent years, we have seen innovations transform various climate technologies, from renewable sources for powering buildings and vehicles to optimized agricultural, building, industrial, and manufacturing practices and materials, driven particularly by the following trends:

- **Electrification:** Electrification encompasses the development of renewable power generation sources, including solar, wind, and energy storage, to deliver emission-free energy to homes and businesses.
- **Experimentation:** We're seeing unprecedented creativity and experimentation in new technologies to scale and deploy sustainable energy generation and storage. New innovations generate investment in green hydrogen, battery development, and battery recycling.
- **Expediting:** Expediting approvals for new renewable energy projects remains critical to transitioning from conventional fossil fuel-based power generation.

These developments and continued innovation in this sector create unique opportunities for investing in Climate Technology. The Nasdaq CTA Global Climate Technology™ Index (CLMTCH™) is a new index that tracks the performance of a diversified basket of companies developing and deploying climate technology solutions. The index is designed to expose investors to the growth potential of this rapidly expanding industry. Stocks within the index are selected based on classifications determined by the Consumer Technology Association (CTA), making the index well-positioned to capture the growth of the climate technology theme. The index is diversified across sectors, countries, and company sizes, and it is reconstituted semi-annually to ensure that it remains representative of the underlying market.

The Nasdaq CTA Global Climate Technology Index is tracked by the HSBC Nasdaq Global Climate Tech UCITS ETF (London: HNCT).

Sources: Nasdaq, Bloomberg, Factset, Morningstar Sustainalytics.

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