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INDEX INSIGHTS
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Investing in the green economy 2023

Entering the next phase of growth

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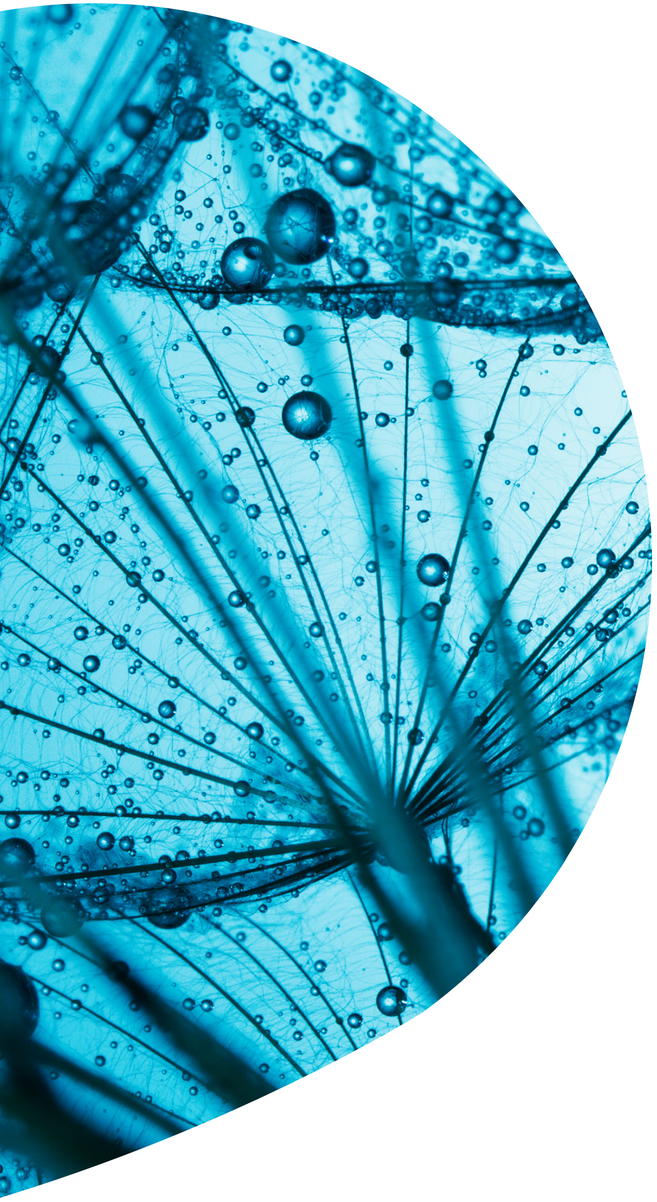


Contents

3 **Executive summary**

6 **Section 01. State of the green economy**

- 6 US$6.5 trillion market capitalisation, approaching 10% of listed equities
- 9 The green economy cuts across sectors and technologies
- 13 Green revenues across more than 50 countries
- 15 Companies with green revenues come in all shapes and sizes
- 16 Differentiating the level of ‘greenness’ by tiers

17 **Section 02. Green investment trends**

- 18 Green equity performance
- 22 Green equity investment characteristics
- 25 Green capital flows

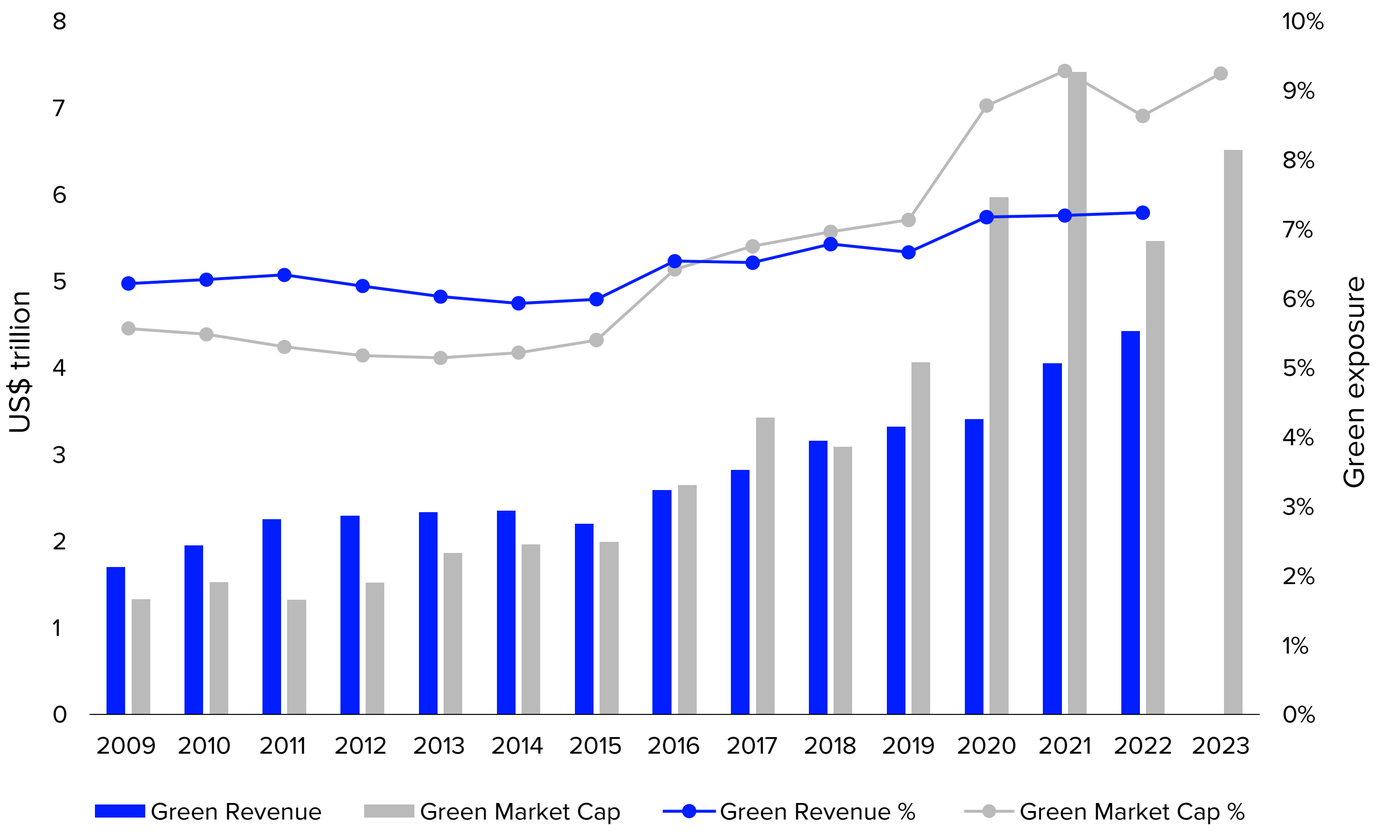
27 **Section 03. The new geopolitics of green**

31 **Appendix: Relevant research**

Executive summary

After a downturn in 2022, the global green economy has returned to form in 2023. Green revenues for listed companies are on track to exceed US$5 trillion by 2025 — doubling in size since the conclusion of the Paris Agreement in 2015 — with market capitalisation of the green economy approaching 10% of the equity market. However, to shift the global economy onto a 1.5°C trajectory, green growth would have to further substantially accelerate with green market capitalisation approximating 20% of global equity markets by 2030.[1]

Figure 1. Green Economy 2009-2023



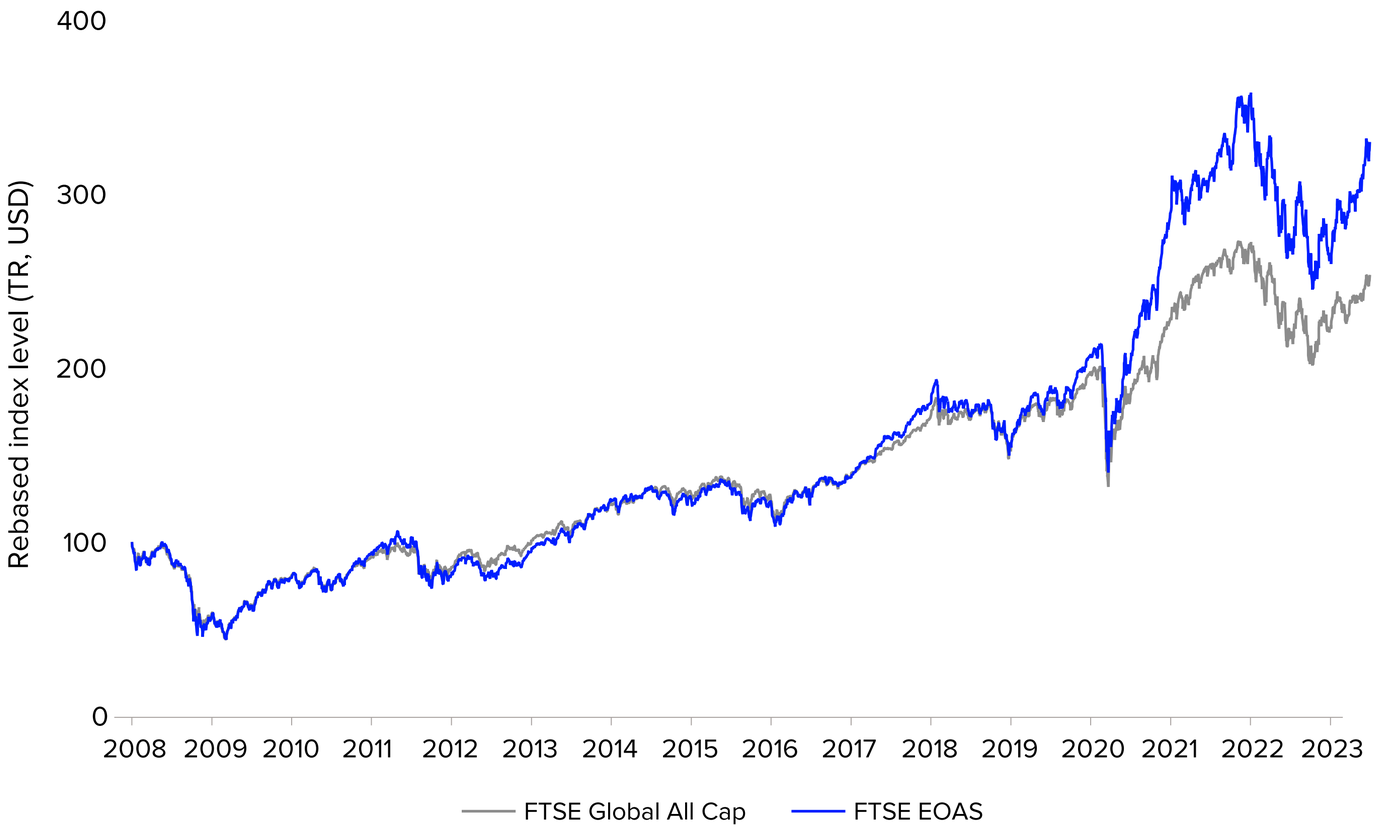
Source: FTSE Russell Green Revenues data as of July 2023. LSEG Free Float Market Capitalisation data as of June 2023. LSEG Revenue data as of December 2022. For detailed definitions see Figure 4.

[1] *FTSE Russell (2022). Green equity exposure in a 1.5°C scenario: Applying climate investment trajectories with green revenues.*

Green equities struggled in 2022 due to a combination of factors, including high inflation, rising interest rates and geopolitical tensions, exacerbated by a post-pandemic valuation premium. The green economy's performance, measured by the FTSE Environmental Opportunities All-Share Index (EOAS), underperformed the market in 2022 and was nearly 10% behind the market at its weakest point in December when green market capitalisation had dropped to US$5.5 trillion. This underperformance also partially reflected a mean reversion of stretched green valuation premiums which peaked in December 2021 (figure 24).

In 2023, the green economy has returned to form, demonstrating remarkable resilience, particularly against the backdrop of a continued high-inflation, high-interest rates environment. Market capitalisation of green companies had recovered to its 2021 average of over 9% by the end of Q2 2023 (though still below its 9.6% peak in November 2021). Over the same timeframe, the EOAS Index recovered all the underperformance from 2022, and the exceptional premium of green equities from 2020/21 had reduced, although not to the pre-pandemic level. Over the long term, EOAS has outperformed the FTSE Global All Cap by 76% on a US$ total return basis to the end of June 2023 since its inception in 2008 (figure 2).

Figure 2. Performance of green equities (EOAS) vs. global equity market (FTSE Global All Cap)



Source: FTSE Russell, FTSE Environmental Markets All Share Index vs. FTSE Global All Cap Index 02 Jan 08 to 30 Jun 23, US Dollar, Total Return

Despite financial volatility, the green economy has continued to expand steadily and as it is maturing and diversifying, green companies are becoming larger and more investable. By December 2022 (the latest available data), green revenues accounted for 7.2% of total revenues across 15,000 listed companies in the universe[2]; with the 10-year average green revenue growth rate reaching 6.6%, materially higher than the revenue growth of the broader listed equity market (5.1%). The average market capitalisation of pure plays (companies with 100% green revenues) reached over US$7 billion by June 2023 – more than a six-fold increase since 2016.

Meanwhile, policymakers have increasingly acknowledged the green economy's strategic role in addressing the climate emergency, providing energy security, and driving economic growth. There has been strong government support to accelerate clean energy development, such as the US Inflation Reduction Act and the EU Net-Zero Industry Act. However, policymakers' growing focus on the green economy comes with caveats. Attempts to decouple global supply chains and secure key raw materials may introduce structural inefficiencies that threaten to slow the growth of the global green economy.

Green companies have grown significantly faster than the broader listed equity market during 2016–2023.

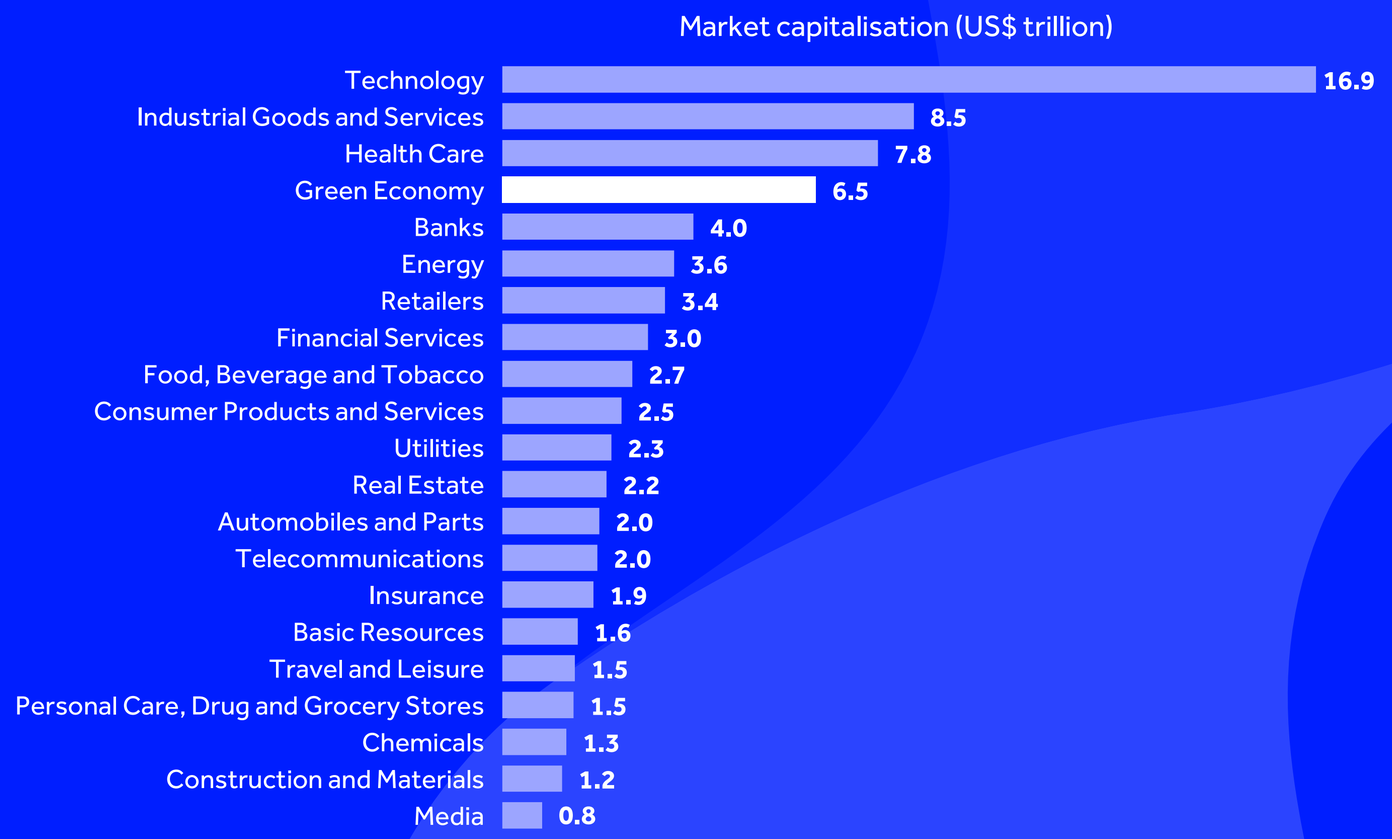
[2] *The full FTSE Russell Green Revenues data history (since 2008) covers 18,000 listed companies. The number of companies in the universe may vary every year due to, for example, listing and delisting of companies.*

State of the green economy

US$6.5 trillion market capitalisation, approaching 10% of listed equities

If considered as a standalone sector the green economy would be the fourth largest sector in the global equity markets, with a combined market capitalisation of US$6.5 trillion (figure 3). It recently surpassed Banks and is now materially bigger than Energy (including Oil & Gas) and the Retailers sectors.[3]

Figure 3. Size of the green economy 2023



Note: Based on the latest Green Revenues data (financial year 2022 or 2021) and the free-float market capitalisation at June 2023.
Source: FTSE Russell Green Revenues data as of July 2023. LSEG Free Float Market Capitalisation data at June 2023.

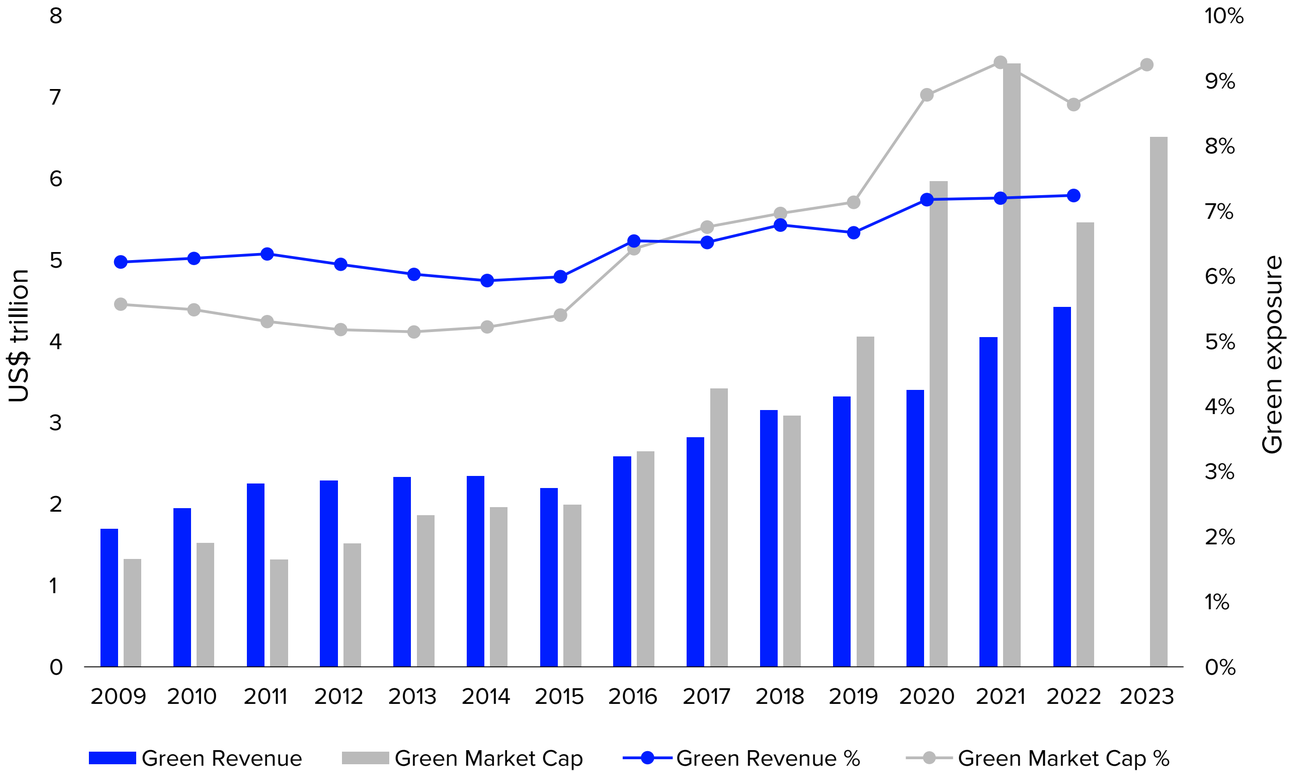
[3] *Super sectors under the FTSE Russell Industry Classification Benchmark (ICB).*

Market capitalisation of the green economy decreased significantly in 2022 in line with the broader decline of the global equity market (see figure 4). However, it recovered rapidly during the first half of 2023, reaching US$6.5 trillion — 9.2% of the market, which is slightly below the 9.6% peak in November 2021. Despite short-term volatility, long-term growth of the green economy has continued to outpace broader markets, with a 10-year CAGR of 13.3% for global green market capitalisation vs. 6.9% for global equity markets in general — putting the green economy on track to exceed 10% market capitalisation by 2025.[4]

A steady expansion of green revenues has underpinned rapid growth in green market capitalisation. We identified over US$4.4 trillion in revenues in 2022 generated from 133 green products and services covered by the FTSE Russell Green Revenue Classification System. The findings are based on our bottom-up assessment of revenues of over 18,000 listed companies globally. (For more info see Green Revenues data model).

By the end of Q2, green revenues account for 7.2% of the total revenue that these companies generate. Over the past decade, green revenues have grown at a 6.8% CAGR, almost two percentage points higher than the rate of overall revenues for companies in the universe (5.1%). With green revenues growing on average over US$300 billion per annum in the last five years, we project green revenues will exceed US$5 trillion by 2025.

Figure 4. Green economy 2009–2023



Note: Green Revenues data for 2009 to 2015 is extrapolated using Green Revenues 2.0 available from 2016, and minimum and maximum green revenues available from 2009. Green Revenue is calculated by aggregating all the green revenues from companies in the universe. Green Revenue% is calculated by dividing Green Revenue by total revenues from companies in the universe. Green Market Cap is the Green Revenue weighted market capitalisation, calculated by aggregating market capitalisation multiplied by company green revenues. Green Market Cap% is calculated by dividing Green Market Cap by total market capitalisation of companies in the universe. 2023 Green Market Cap and Green Market Cap% data is based on the latest Green Revenues data available (financial year 2022 or 2021) and the free float market capitalisation as of June 2023.

Source: FTSE Russell Green Revenues data as of July 2023. LSEG Free Float Market Capitalisation data as of June 2023. LSEG Revenue data as of December 2022.

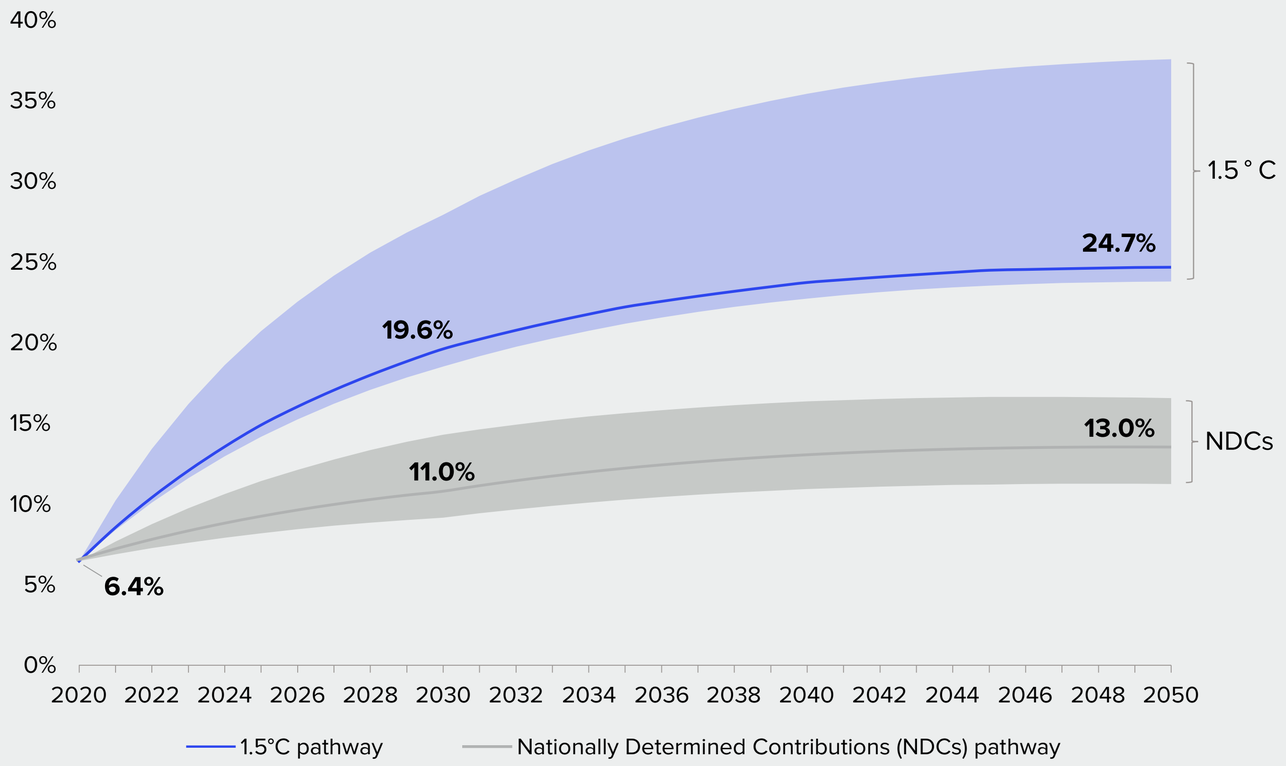
[4] Global market capitalisation is calculated by summing free-float market capitalisation of companies in the universe. Green market capitalisation is calculated as per notes to figure 4.10-year time period from 2013 to 2023.

Box 01.

Green economy exposure under 1.5°C scenario

Achieving net zero is estimated to require US$109–275 trillion of investment by 2050. In a recent paper, we estimated that this investment means approximately 20% of revenue from listed equities globally would be 'green' (figure 5).[5] This is likely to result in the green economy becoming the largest single sector in the global economy. However, the current growth of the green economy suggests that it is far away from the 1.5°C trajectory, with the green revenue of listed equities around 7% in 2022.

Figure 5. Estimated green economy exposure under different climate scenarios



Source: FTSE Russell, September 2022. FTSE All World was used as the reference portfolio.

[5] *See more details on the green economy under 1.5°C: FTSE Russell (2022). Green equity exposure in a 1.5°C scenario: Applying climate investment trajectories with green revenues.*

The green economy cuts across sectors and technologies

Overall, the green economy is fairly diversified across traditional industry categories[6], almost all sectors have at least some exposures, and eight sectors have green exposure of more than 10% by market capitalisation (see figures 6 and 7).

In terms of penetration rates, rapid electrification of cars in recent years means that the Automobiles and Parts sector has by far the highest green exposure (48%), having tripled since 2018. The Utilities (34%) sector follows, reflecting the increased adoption of renewable energy generation, particularly solar and wind.

However, given the differences in the combination of size of sectors and penetration rates, four ICB sectors stand out which together account for over 70% of the green economy (figure 8). The sectors comprise

- **Technology** (e.g., cloud computing),
- **Industrial Goods & Services** (e.g., smart grids),
- **Autos** (e.g., EVs and batteries) and
- **Utilities** (e.g., electricity generation from renewables).

Using our dataset, we can also map revenues to the type of green products and services across different value chains (figure 9). From this perspective, Energy Management & Efficiency is the largest green sector (38%), which is critical in decarbonising carbon-intensive industries such as steel and buildings. This sector has more than doubled in size to US$2.5 trillion in 2023 from US$1 trillion in 2018 (figure 10). Transport Equipment (such as EVs and railways), although a much smaller sector, is growing even faster. It has more than quadrupled from US$288 billion to US$1.2trillion over the last five years.

[6] *Supersector under the FTSE Russell Industry Classification Benchmark (ICB).*

Figure 6. Green economy across ICB sectors

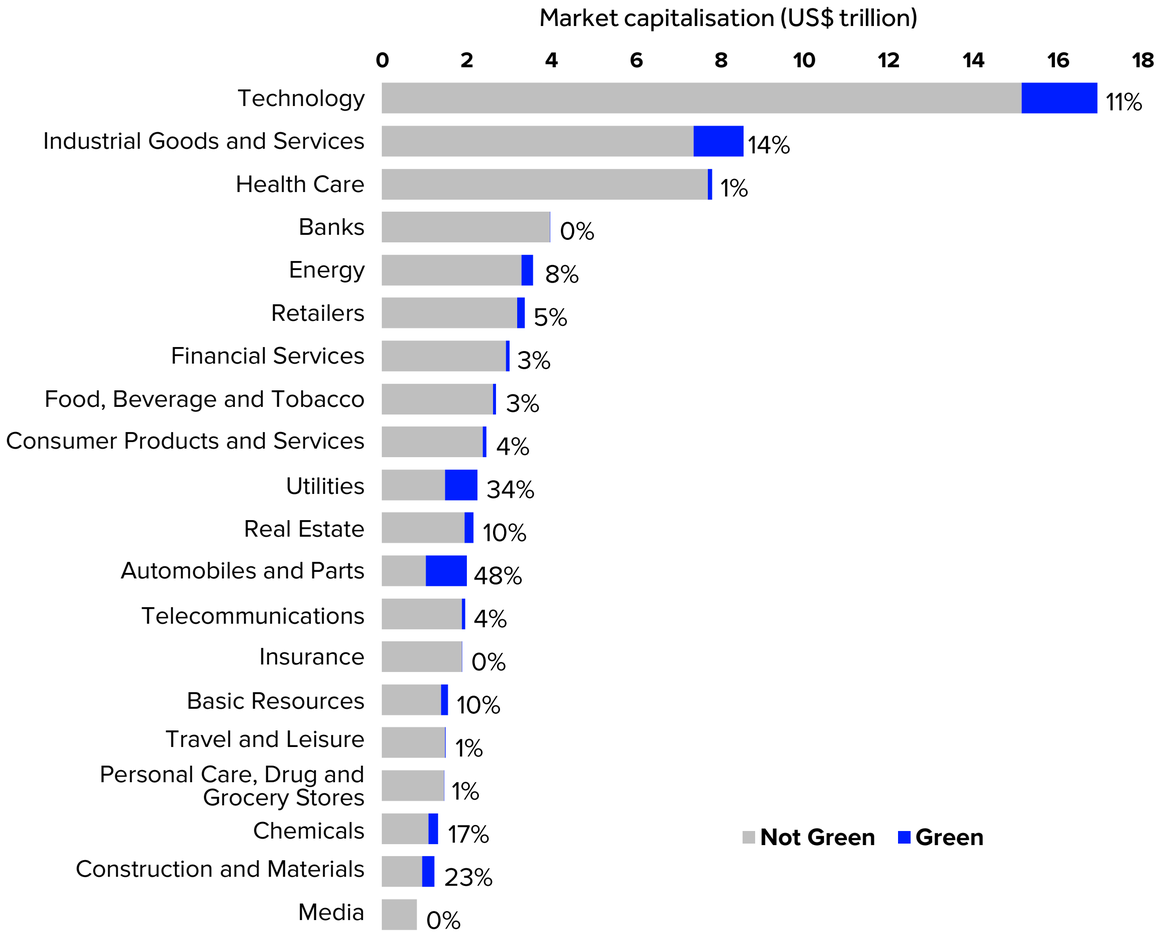
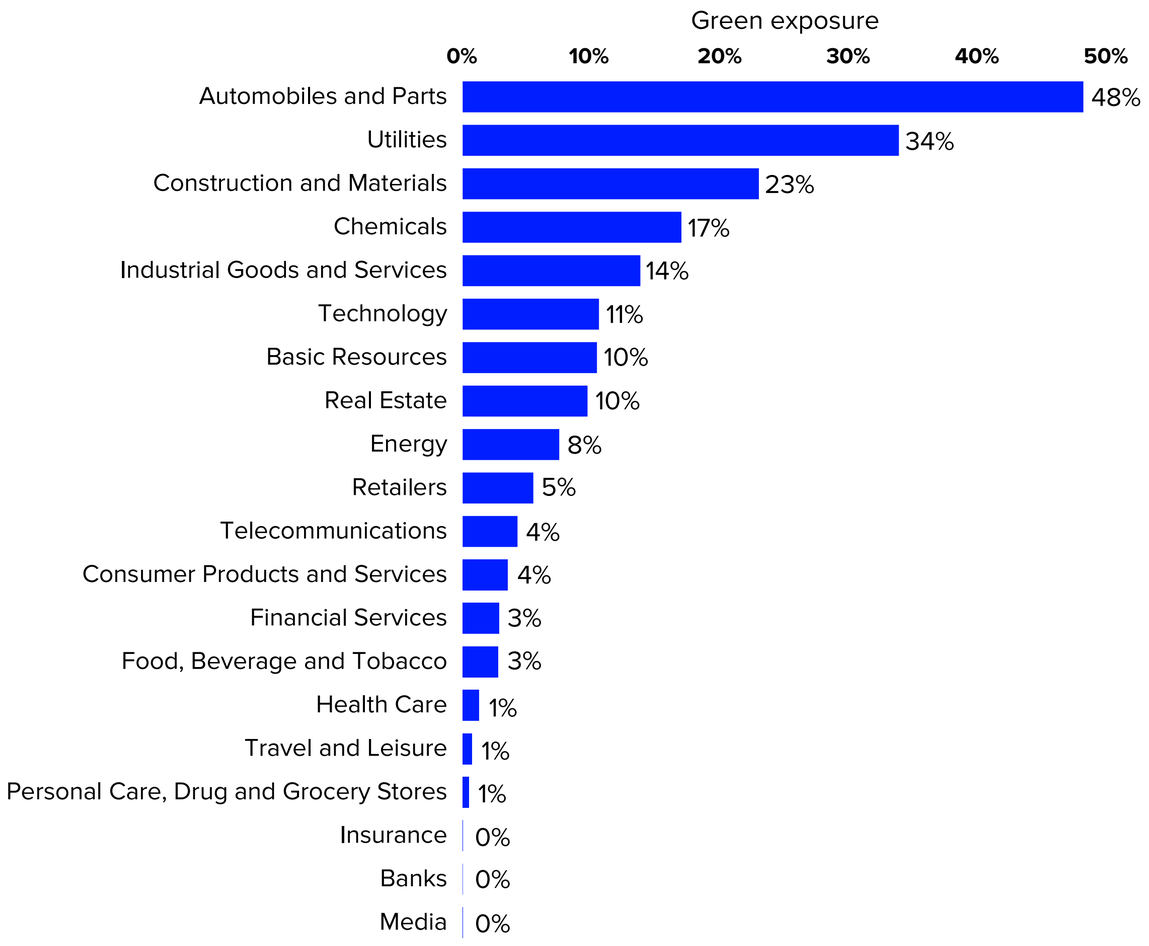
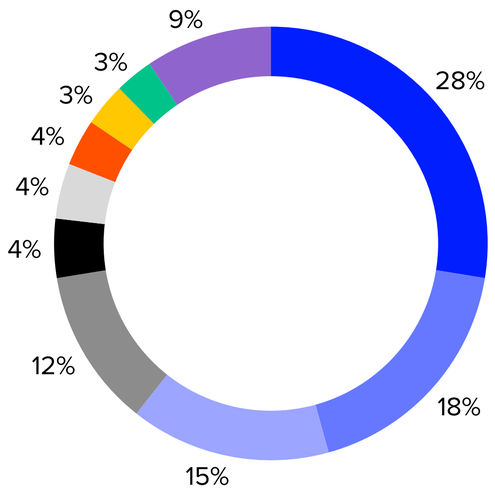


Figure 7. Sectorial green exposure



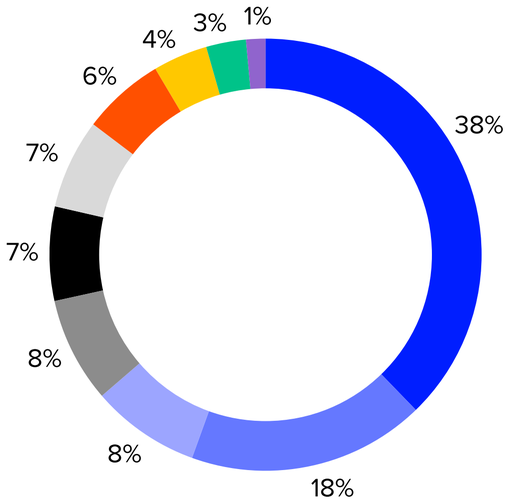
Note: Based on the latest Green Revenues data available (financial year 2022 or 2021) and the free float market capitalisation as of June 2023. Green exposure % is calculated by dividing green revenue weighted market capitalisation by total m arket capitalisation of companies.
Source: FTSE Russell Green Revenues data as of July 2023. LSEG Free Float Market Capitalisation data as of June 2023.

Figure 8. Composition of the green economy by ICB sectors



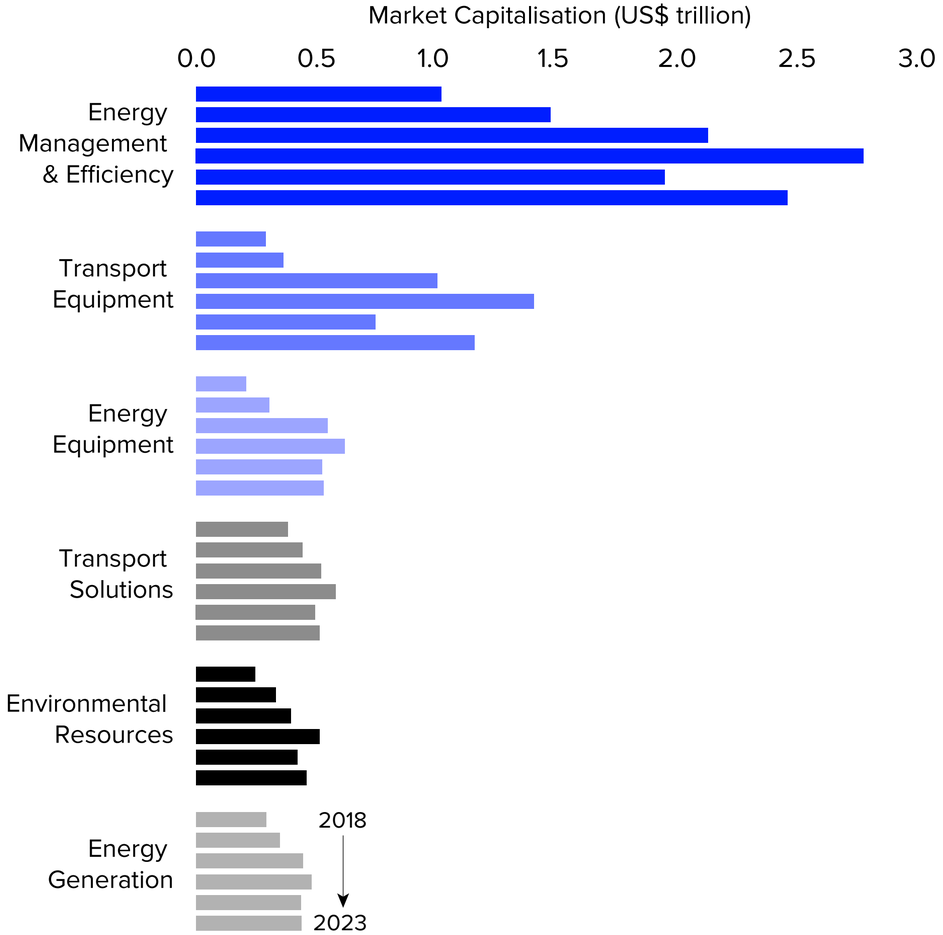
- Technology
- Industrial Goods and Services
- Automobile and Parts
- Utilities
- Construction and Materials
- Energy
- Chemicals
- Real Estate
- Retailers
- Others

Figure 9. Composition of the green economy by green sector



- Energy Management & Efficiency
- Transport Equipment
- Energy Equipment
- Transport Solutions
- Environmental Resources
- Energy Generation
- Waste & Pollution Control
- Water Infrastructure & Technologies
- Food & Agriculture
- Environmental Support & Services

Figure 10. Growth of selected green sectors 2018–2023



Note: Based on the latest Green Revenues data available (financial year 2022 or 2021) and the free float market capitalisation as of June 2023. Green exposure % is calculated by dividing green revenue weighted market capitalisation by total m arket capitalisation of companies.
Source: FTSE Russell Green Revenues data as of July 2023. LSEG Free Float Market Capitalisation data as of June 2023.

Box 02.

FTSE Russell Green Revenue Classification System (GRCS)[7]

The GRCS identifies green products and services covering 10 sectors, 64 subsectors and 133 microsectors. When any green revenues are identified in a company's activity, it is mapped to one or more microsectors and then aggregated at the company level. The dataset is compiled with a thorough research process, including semantic screening, business segment identification, and green microsector breakdown.

ENERGY GENERATION [EG] 19	ENERGY MANAGEMENT & EFFICIENCY [EM] 13	ENERGY EQUIPMENT [EQ] 22	ENVIRONMENTAL RESOURCES [ER] 11	ENVIRONMENTAL SUPPORT SERVICES [ES] 5
Bio Fuels	Buildings & Property (Integrated)	Bio Fuels	Advanced & Light Materials	Environmental Consultancies
Cogeneration	Controls	Cogeneration Equipment	Key Raw Minerals & Metals	Finance & Investment
Clean Fossil Fuels	Energy Management Logistics & Support	Clean Fossil Fuels	Recyclable Products & Materials	Smart City Design & Engineering
Geothermal	Industrial Processes	Fuel Cells		
Hydro	IT Processes	Geothermal		
Nuclear	Lighting	Hydro		
Ocean & Tidal	Power Storage	Nuclear		
Solar	Smart & Efficient Grids	Ocean & Tidal		
Waste to Energy	Sustainable Property Operator	Solar		
Wind		Waste to Energy		
		Wind		

FOOD & AGRICULTURE [FA] 17	TRANSPORT EQUIPMENT [TE] 12	TRANSPORT SOLUTIONS [TS] 9	WASTE & POLLUTION CONTROL [WP] 15	WATER INFRASTRUCTURE & TECHNOLOGY [WI] 10
Agriculture	Aviation	Railways Operator	Cleaner Power	Advanced Irrigation Systems & Devices
Aquaculture	Railways	Road Vehicles	Decontamination Services & Devices	Desalination
Land Erosion	Road Vehicles	Video Conferencing	Environmental Testing & Gas Sensing	Flood Control
Logistics	Shipping		Particles & Emission Reduction Devices	Meteorological Solutions
Food Safety, Efficient Processing & Sustainable Packaging			Recycling Equipment	Natural Disaster Response
Sustainable Plantations			Recycling Services	Water Infrastructure
			Waste Management	Water Treatment
				Water Utilities

See the full GRCS sectors, subsectors and microsectors here:
Green Revenues Classification System

[7] *The roots of the GRCS stretch as far as 2008, when FTSE Russell and the Impax Asset Management launched the FTSE Environmental Markets Index Series.*

Green revenues across more than 50 countries

Considering more than 50 developed and emerging markets in the green economy, we find that by market capitalisation, the US still makes up the largest share of the green economy. China comes in second, mirroring the global listed equity market. For the first time, South Korea entered the top 10, superseding Sweden by a small margin (figure 11).

Green exposure by jurisdiction looks different. A large green economy does not necessarily equal high green exposure (figures 12 and 13). For example, despite the US green economy's size in absolute terms, in relative terms its green exposure is roughly in line with the global average of 9%. By contrast, China's green exposure (13%) is above the world average given its important role in renewables and battery manufacturing supply chains. Taiwan has the highest green exposure (28%) thanks to its semiconductor industry. On average over the last five years, green exposures of the top-10 jurisdictions have grown by three percentage points.

Figure 11. Composition of the green economy by market

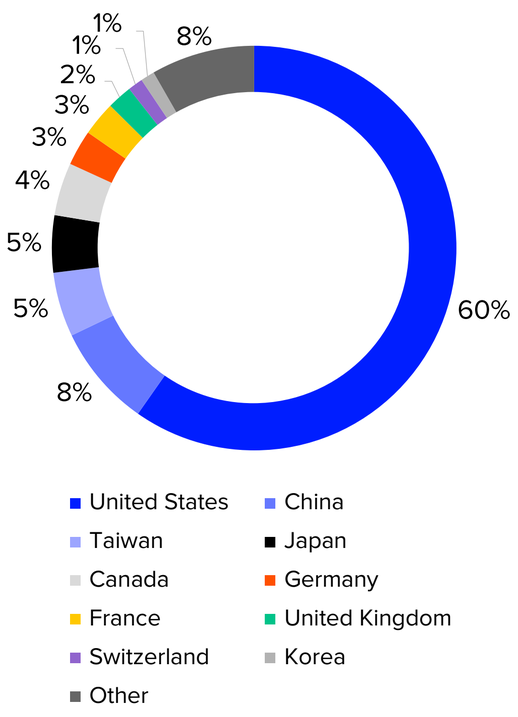
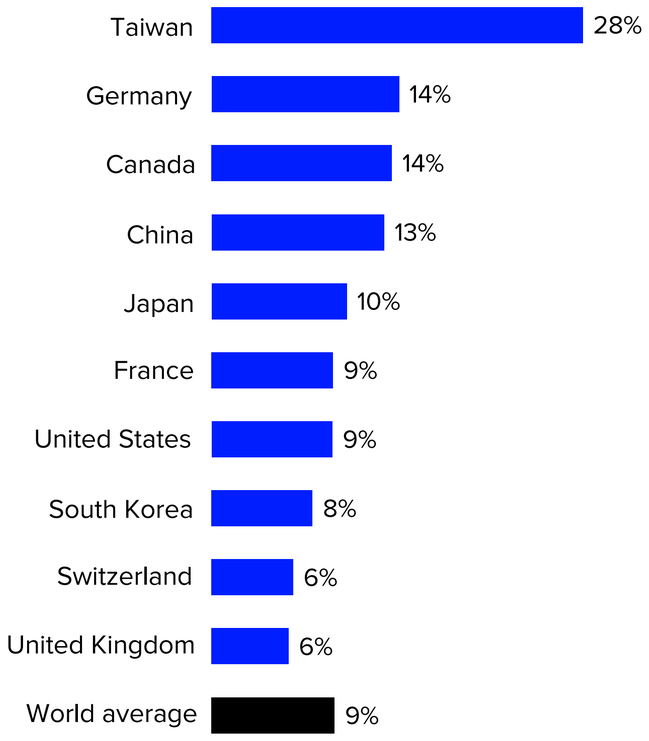
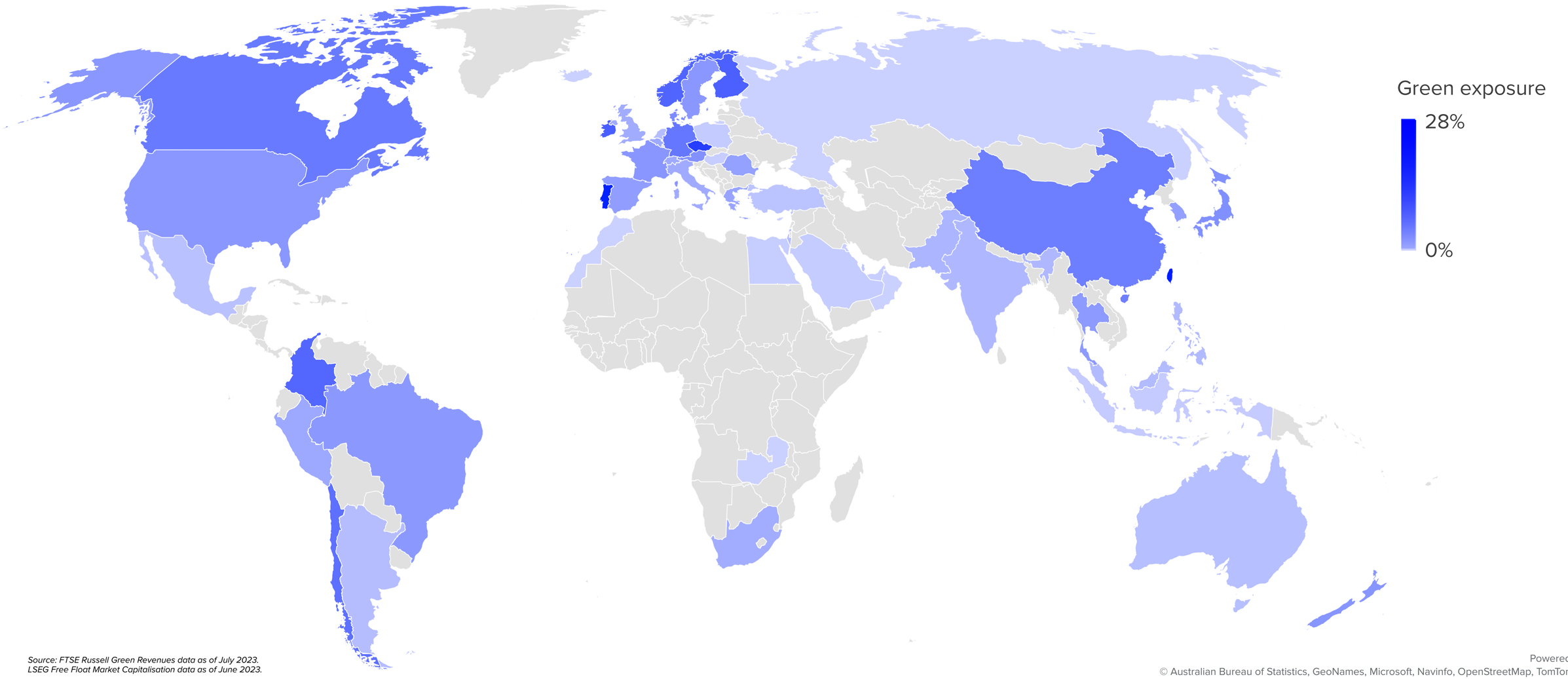


Figure 12. Green economy by market exposure



Note: Based on the latest Green Revenues data available (financial year 2022 or 2021) and the free float market capitalisation as of June 2023. By country of domicile of listed companies. Green exposure % is calculated by dividing green revenue weighted market capitalisation by total market capitalisation of companies.
Source: FTSE Russell Green Revenues data as of July 2023. LSEG Free Float Market Capitalisation data as of June 2023.

Figure 13. Green economy: A global perspective



Source: FTSE Russell Green Revenues data as of July 2023.
LSEG Free Float Market Capitalisation data as of June 2023.

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Companies with green revenues come in all shapes and sizes

Considering company size through the lens of market capitalisation, the green economy is dominated by large-cap companies such as Tesla (figure 14), which account for approximately three-quarters of the green economy's total market capitalisation.

The green economy is diverse with more than 3,500 listed companies of various sizes, 75% of which are medium- and small-cap. Average green exposures of companies for different size groups are relatively similar (figure 15).

Rapid growth of green companies also makes the green economy more investable for mainstream investors. The average market capitalisation for the over 150 pure plays — companies with 100% green revenues — in our coverage has increased by more than 6 times, from US$1.1 billion in 2016 to US$7.3 billion in 2023. For companies with more than 50% green revenues, the average size has more than doubled, from US$2.1 billion to US$5.5 billion over the same period (figure 16). In comparison, the average market capitalisation of all companies in the universe has grown by 54%, from US$3.1 billion in 2016 to US$4.7 billion in 2023.

Figure 14. Composition of the green economy by company size

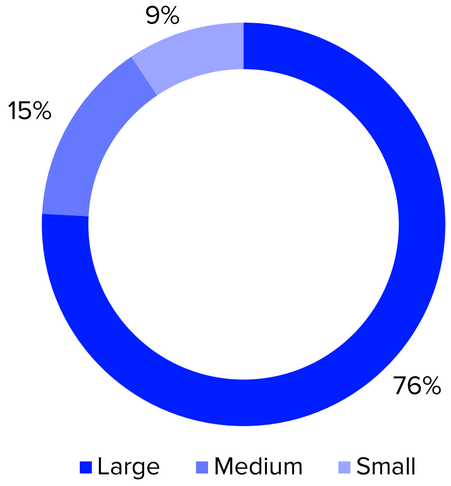


Figure 15. Green exposure of companies

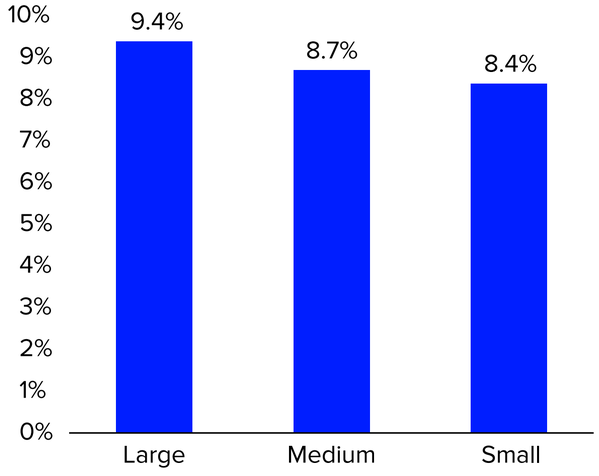
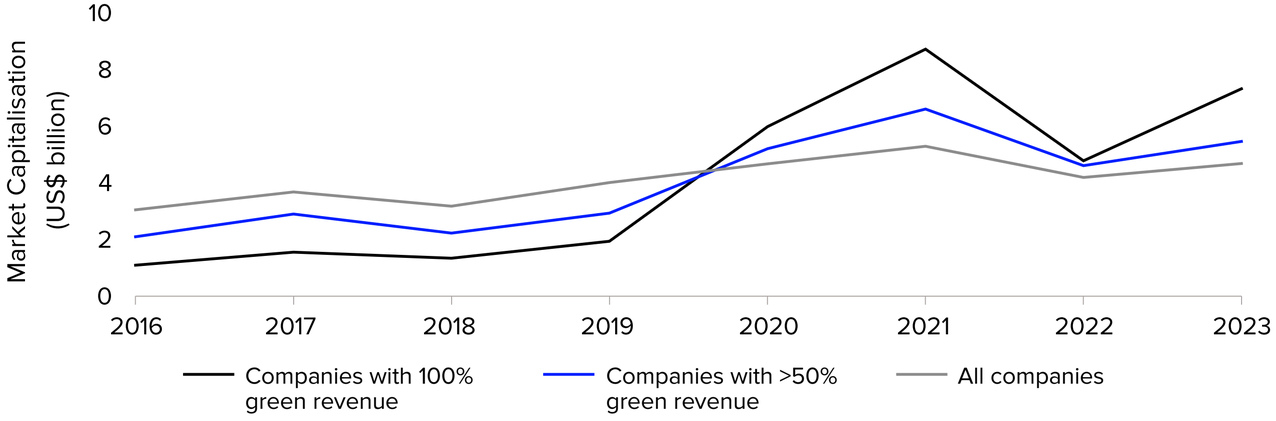


Figure 16. Average market capitalisation of green companies vs. market



Source: FTSE Russell Green Revenues data as of July 2023. LSEG Free Float Market Capitalisation data as of June 2023.

Differentiating the level of ‘greenness’ by tiers

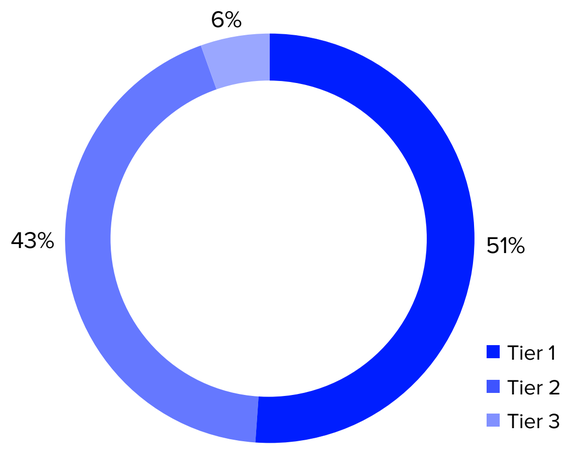
Green products or services may have both positive and negative environmental impact. Nuclear power, for example, is a relatively low-carbon energy source albeit with potential issues around the management and disposal of radioactive waste.

The FTSE Russell Green Revenues Classification System (GRCS), therefore, provides a tiering system to differentiate the ‘greenness’ of business activities.[8]

- **Tier 1** covers green products and services with significant and clear environmental benefits. Example: electric vehicles
- **Tier 2** covers green products and services with more limited but net positive environmental benefits. Example: large hydropower
- **Tier 3** covers green products and services which have some environmental benefits but are overall net neutral or negative. Example: nuclear power generation

Nearly all (94%) of the green economy comprises Tier 1 and Tier 2 activities, while Tier 3 activities account for only 6% by market capitalisation (figure 17). A significant proportion of Tier 1 activities are related to EV manufacturing (27%). Building energy efficiency, solar equipment, recyclable products, and industrial energy efficiency also make meaningful contributions, comprising over 28% combined. For Tier 2 activities, cloud computing accounts for 42%. Railway operations, efficient energy control systems, sustainable building operations, and waste management together represent another 30%. Nuclear power generation and lithium mining account for almost half (46%) of Tier 3 activities.

Figure 17. Composition of the green economy by tier



Note: Based on the latest Green Revenues data available (financial year 2022 or 2021) and the free-float market capitalisation at, June 2023.
Source: FTSE Russell Green Revenues data as of July 2023. LSEG Free Float Market Capitalisation data as of June 2023.

[8]*To determine the overall environmental impact and the tier, each green product and service is assessed against seven environmental objectives: climate change mitigation, climate change adaptation, pollution prevention and control, protection of healthy ecosystems, sustainable use and protection of water and marine resources, transition to a circular economy, waste prevention and recycling, and sustainable and efficient agriculture.*

Green investment trends

There are numerous ways that green revenues data can be used to gain investment exposure to the green economy.

In broad market portfolios investors can tilt company weights to increase the overall Weighted Average Green Revenues — as discussed in Weighted Average Green Revenue (WAGR): Integrating climate solutions into portfolio construction.[9] Investors looking for more focused exposure to green economy equities can use green thematic portfolios that only include these companies — typically only companies with green revenues above a specific threshold.

Green thematic indices are perhaps the best proxy to capture the performance of the green economy as they only contain 'green' stocks. The FTSE Environmental Opportunities All Share Index (EOAS), the key FTSE Russell green thematic index, has been running since 2008 (see FTSE Environmental Markets Index Series). Based on the FTSE Global All Cap Index, this global index includes only companies with at least 20% green revenues.

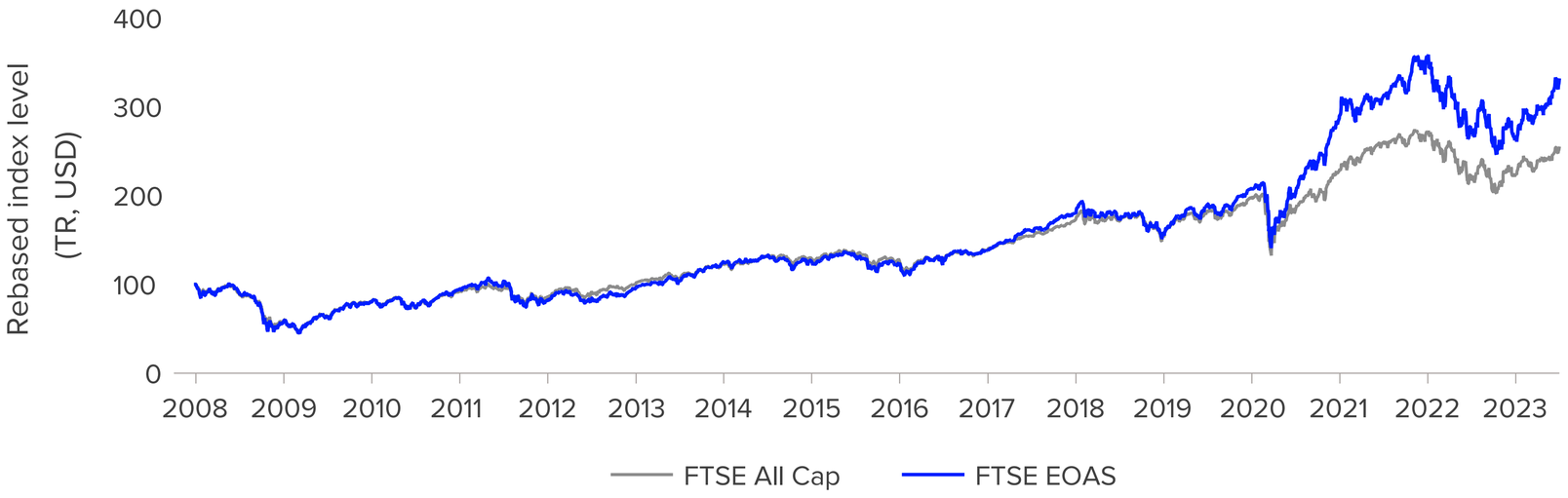
[9] *WAGR calculates the green revenue percentage (GR%) of a portfolio by multiplying company level GR% by the company's portfolio weight and then summing the result across all companies. Investors can set portfolio-level targets for climate solutions using WAGR, such as a minimum level, an improvement relative to the benchmark, or to track specific WAGR pathways such as decarbonisation trajectories.*

Green equity performance

LONG-TERM PERFORMANCE

Over the long term, the green economy measured by EOAS has outperformed broader equity markets. Since inception in January 2008 to the end of June 2023, EOAS outperformed the FTSE Global All Cap by 76% on a USD total return basis. Over the last five years, EOAS has also been the best performer of all our key sustainable investment equity indices.[10] However, we note that compared to these indices, EOAS is more concentrated with key exposures in certain industries, therefore it has the highest volatility and tracking error.

Figure 18. Long-term performance of green equities (EOAS) vs. global equity market (FTSE Global All Cap)



Source: FTSE Russell, FTSE Environmental Markets All Share Index vs. FTSE Global All Cap Index 2/1/08 to 30/6/23. US Dollar, Total Return. All data as of January of the year.

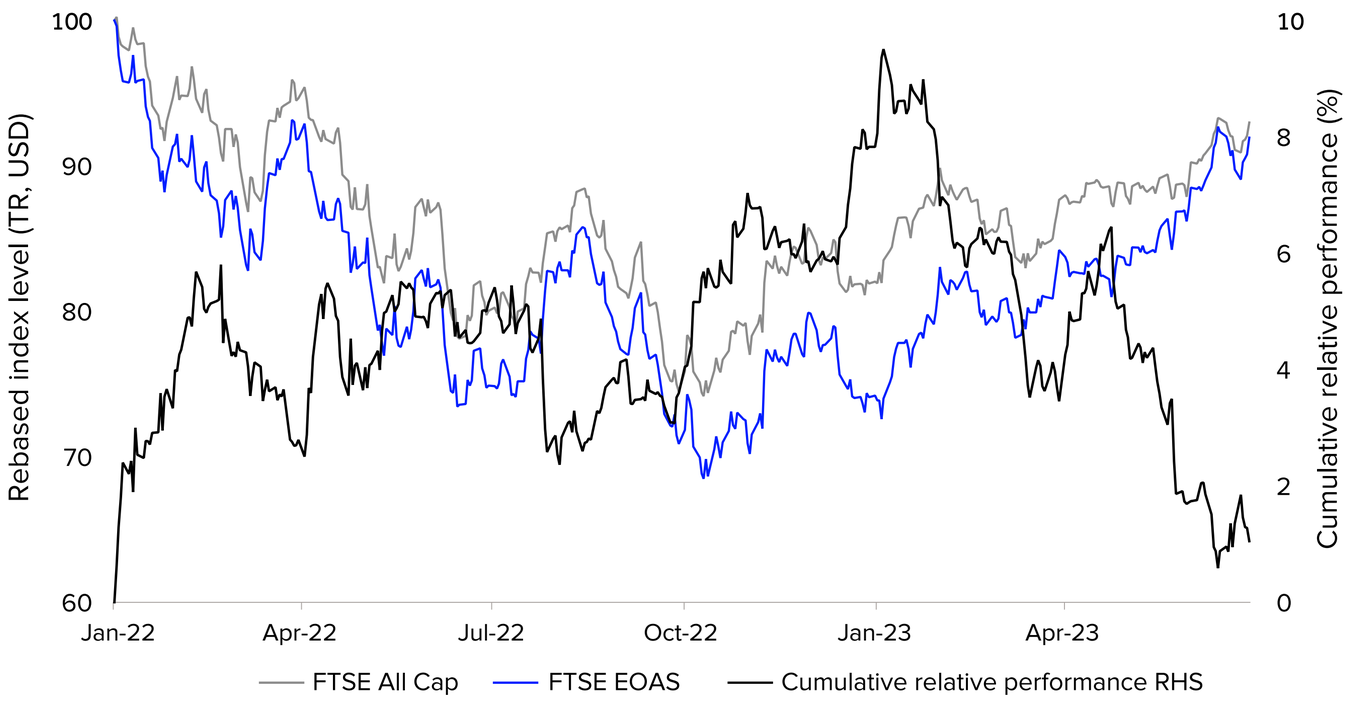
[10] Over the 5 years to end June 2023, FTSE Environmental Opportunities All Share Index outperformed FTSE4Good All World Index, FTSE Paris Aligned (PAB) All World Index, FTSE Global Choice Index and FTSE All World TPI ex Fossil Fuels Index.

2022-2023 PERFORMANCE

There was higher market volatility in 2022 that resulted in a weak year for green equities as inflation ignited, interest rates rose, and the Ukraine war inflamed geopolitical tensions. Investors became more cautious, which was particularly negative for growth equities. As green equities typically have a positive beta to the market with overweight of cyclical sectors like Technology and Industrials, they underperformed the market throughout 2022. EOAS trailed market returns by nearly 10% at its weakest point at the end of December 2022 (figure 19).

However, there has been a marked recovery in 2023 in the relative performance of green equities as the broader markets recovered and green industries benefitted from new considerable support packages for the clean energy sector. Indeed, by the end of June 2023 EOAS recovered all the underperformance from 2022 (figure 19).

Figure 19. Recent performance EOAS vs. all cap

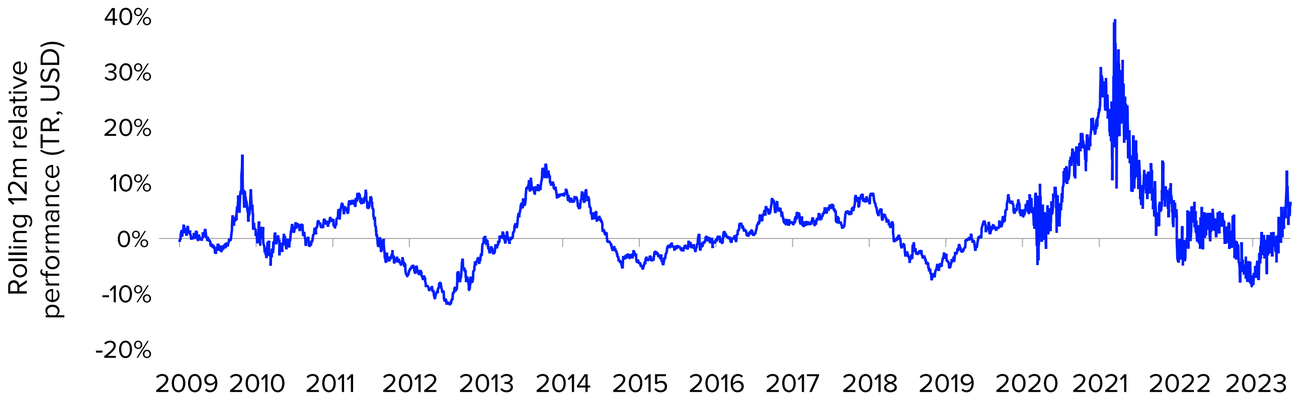


Source: FTSE Russell, FTSE Environmental Markets All Share Index vs. FTSE Global All Cap Index 1/1/22 to 30/6/23. US Dollar, Total Return

GREEN EQUITY RELATIVE PERFORMANCE CYCLES

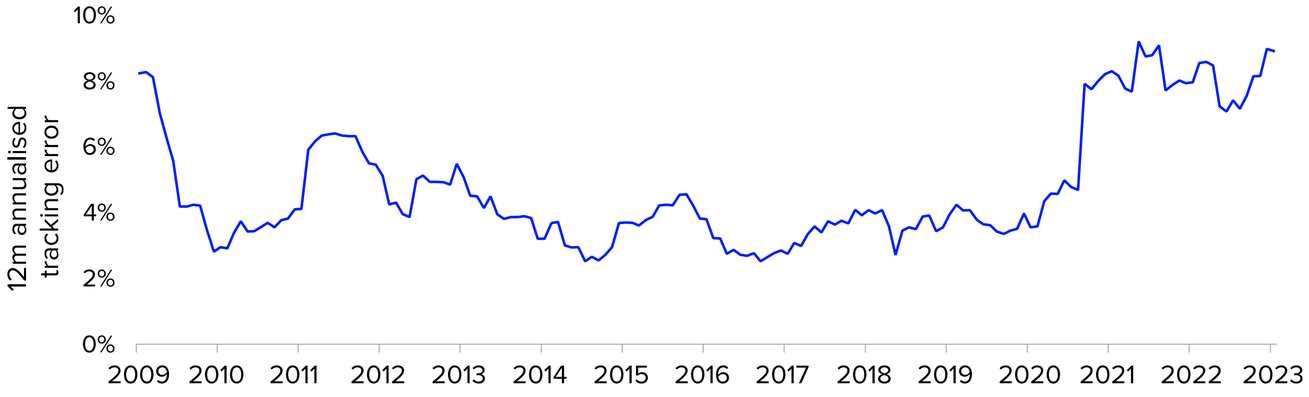
There has been a series of cycles in the 12-month performance of green equities relative to the market, which have mostly ranged between +10% and -10% (figure 20). The exception was the 2020/2021 post-pandemic period where the relative performance well exceeded the normal +10% peak, recording almost +40%. This period was quite exceptional for green equity performance as investors focused on the energy transition and capital flowed into sustainable investment funds. However, these inflows arguably created an overvaluation in green equities, with the underperformance in 2022 being one of the consequences (discussed in our 2022 report Investing in the green economy). The combination of a very strong upcycle and then a rapid downcycle and recovery has created a sustained increase in the tracking error of green equities versus the market (figure 21).

Figure 20. 12m relative performance EOAS vs. all cap



Source: FTSE Russell, FTSE Environmental Markets All Share Index vs. FTSE Global All Cap Index 2/1/08 to 30/6/23. US Dollar, Total Return. All data as of January of the year.

Figure 21. 12-month rolling monthly tracking error EOAS vs. all cap



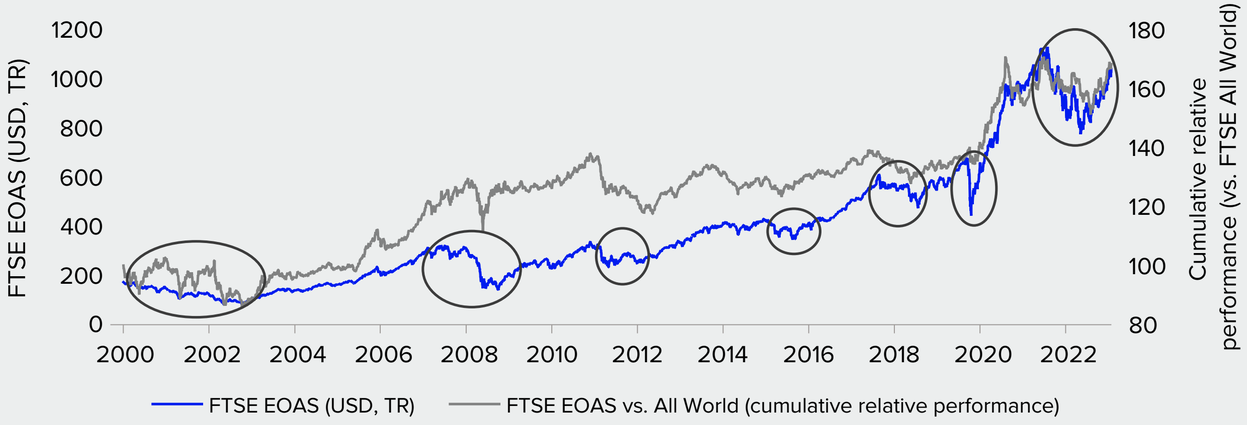
Source: FTSE Russell, FTSE Environmental Markets All Share Index vs. FTSE Global All Cap Index 2/1/08 to 30/6/23. US Dollar, Total Return. All data as of June of the year.

Box 03.

Green equity performance in market downturns

Was the underperformance of green equities in 2022 unusual and does it represent a change in attitudes towards green investment? The year 2022 was a tough market for equities. Surging inflation and interest rate rises led to the FTSE All World Index closing 17.7% down. Our research shows that, in this type of weak equity market, green equities typically underperform. They have a higher beta, greater growth exposure and a lower yield than the broader market. Analysing all seven of the periods that had >15% downturns in the EOAS since 2000, we find that it underperformed the broader equity market in all but one of these periods. However, the good news is that it also outperformed the broader market in the six months following the downturn in all but one of the periods.

Figure 22. Historic downturns in the green equity market



Period	Length	Absolute performance	Relative performance	
High to low of EOAS	Days	USD, TR	To FTSE All World	6 months after low
06 Jun 00 to 12 Mar 03	1,009	-52.1%	-13.4%	8.6%
06 Nov 07 to 09 Mar 09	489	-56.6%	2.1%	0.5%
02 May 11 to 04 Oct 11	155	-30.8%	-9.7%	-1.0%
21 May 15 to 21 Jan 16	245	-19.8%	-2.5%	3.3%
26 Jan 18 to 25 Dec 18	333	-22.5%	-4.3%	2.5%
12 Feb 20 to 23 Mar 20	40	-34.5%	-1.5%	12.4%
19 Nov 21 to 12 Oct 22	327	-31.2%	-7.3%	1.5%

Source: FTSE Russell, FTSE Environmental Markets All Share Index vs. FTSE All World Index 1/1/00 to 30/6/23. US Dollar, Total Return, backcast historic data beyond 2008. All data as of June of the year.

Green equity investment characteristics

GREEN SECTOR PERFORMANCE

While the green economy is often viewed as a single, homogenous sector, it is far from this. As discussed in the previous section, green revenues divide activities into multiple sectors and subsectors, however for investment purposes they can be divided in four separate subsector indices.

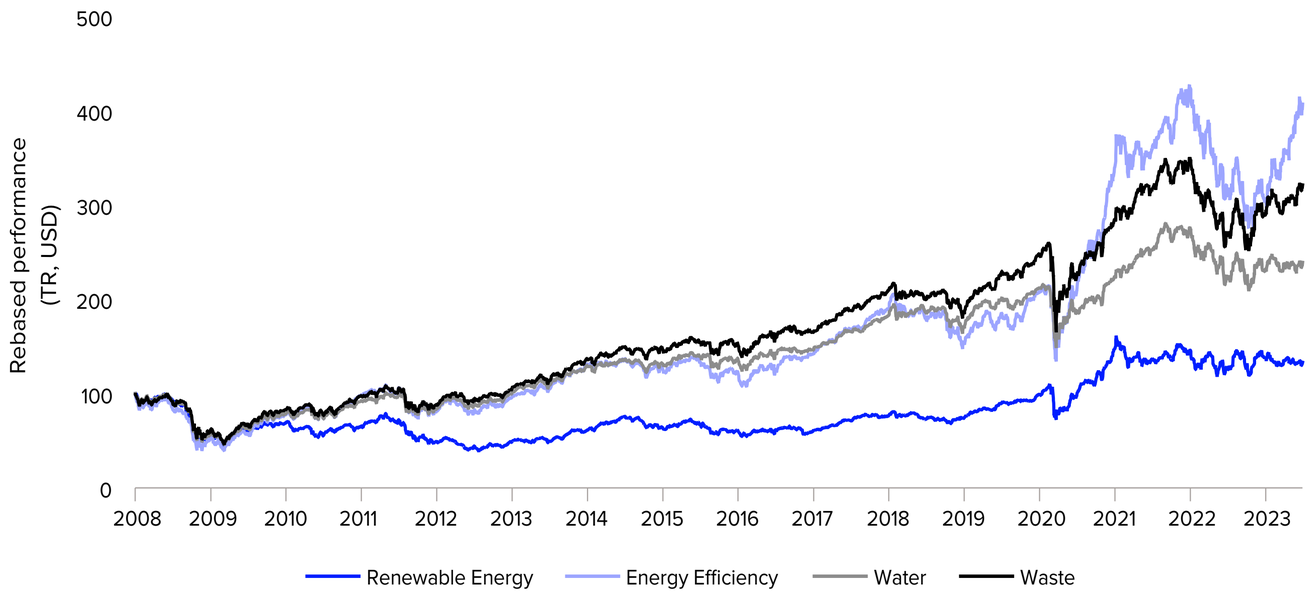
Energy efficiency
By far the largest subsector index is the FTSE Energy Efficiency index, which is also typically the most leveraged to economically cyclical activities, such as technology, automotives, housing or industrial. Figure 23 shows that the subsector performed strongest in 2020/21, weakest in 2022, and has had the strongest recovery in the first half of 2023.

Renewable energy
FTSE Renewable and Alternative Energy Index contains activities like manufacturing renewables equipment, such as solar panels or wind turbines and the generation of renewable power. This subsector is often impacted by idiosyncratic aspects of the renewable energy market, particularly government subsidies and support. It performed well in 2020 but has traded broadly sideways since then. The announcement of the US Inflation Reduction Act in 2022 boosted the subsector, resulting in it being the best-performing subsector in that year.

Water
FTSE Water Technologies Index contains both steady water utilities and more cyclical industrial companies involved in the provision, use, and treatment of water. It is much less volatile than other subsectors and has outperformed the FTSE Global All Cap Index over the last 10 years with a similar level of volatility.

Waste
FTSE Waste and Pollution Control Index contains companies involved in the waste management sector, particularly recycling and the use of recycled material; and companies involved in detection, management and reduction of air, water and soil pollution. The relatively diverse aspects of the subsector mean it is typically less volatile, although the recycling element does make it sensitive to commodity prices.

Figure 23. EOAS sector performance



Source: FTSE Russell, FTSE Environmental Markets All Share Index vs. FTSE Global All Cap Index 2/1/08 to 30/6/23. US dollar, total return. All data as of January of the year.

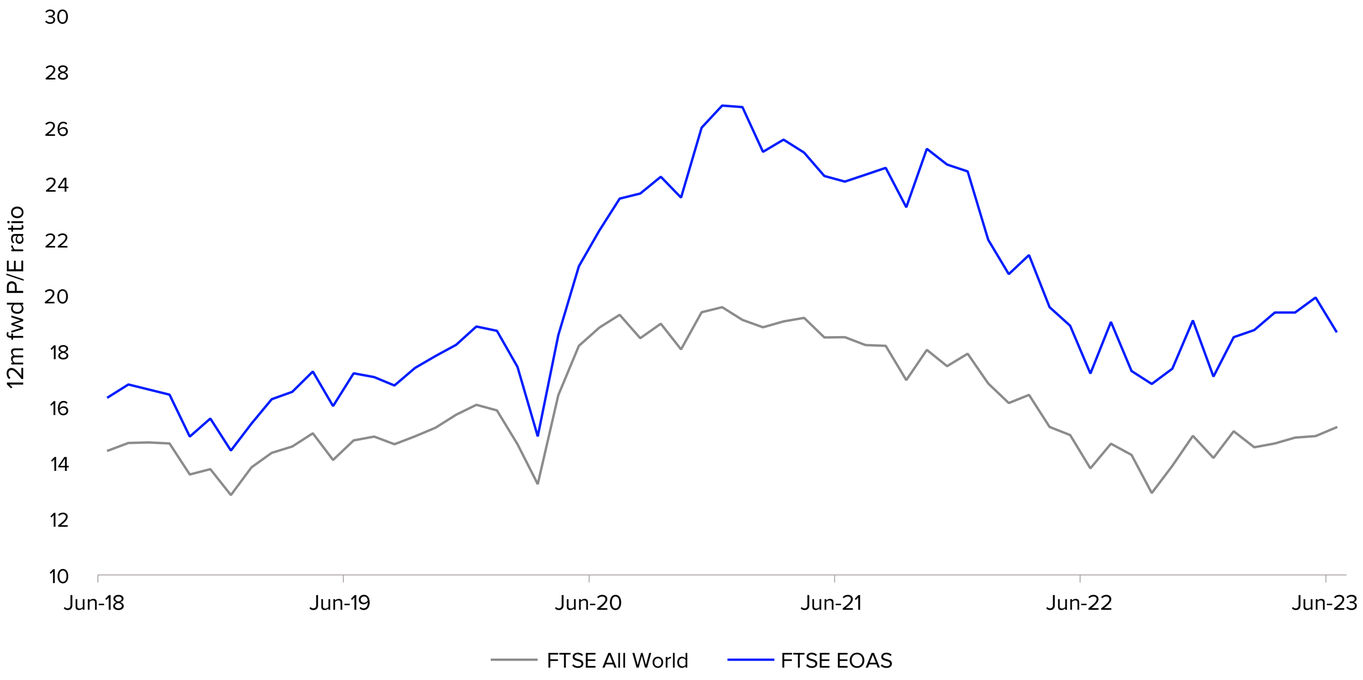
GREEN VALUATIONS

In 2020, after the initial pandemic shock, green equities were in the eye of a perfect storm with rising stock markets, soaring investor interest in green and sustainable investment and rapidly rising inflows to sustainable investment funds. As broader stock market valuations rose, green equity valuations rose even faster as investors sought out green investment opportunities.

P/E valuation

Figure 24 shows that green equities opened a substantial price-to-earnings ratio (P/E) premium, as investor interest in the sector (and hence stock market valuations) rose faster than green companies' ability to grow revenues and profits.

Figure 24. Index P/E ratio

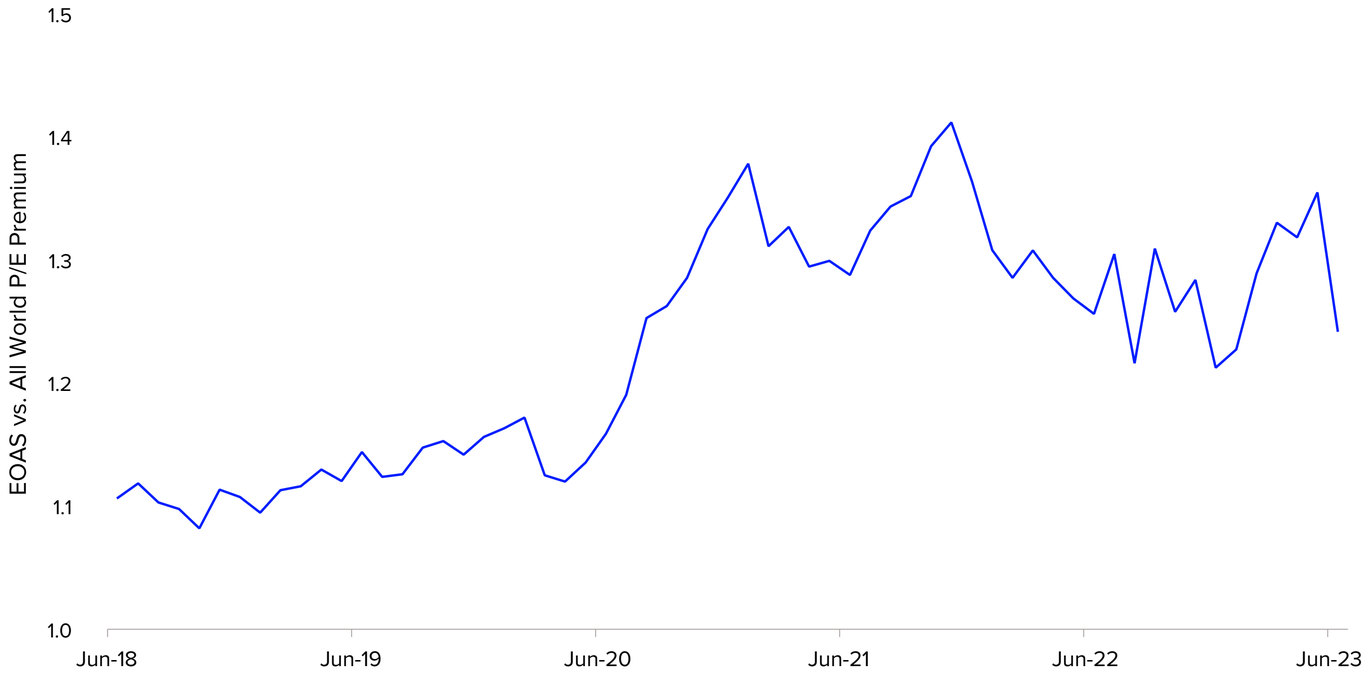


Source: FTSE Russell / LSEG

P/E premium evolution

As mentioned previously, green equities generally have tended to trade at a premium to the market. However, in 2020/21 this typical premium of ~10% rose to as much as 40%. The premium subsequently reduced in 2022, but not as far as the pre-pandemic level. The 2023 rally has caused it to increase again. Ongoing analysis of the performance of EOAS and other sustainable investment indices can be found in the quarterly reports: Sustainable Investments Insights.

Figure 25. EOAS P/E premium



Source: FTSE Russell / LSEG

Green capital flows

Increasing capital flows into the green economy has always been a key aspect of the energy transition. Getting anywhere near to a net-zero trajectory or solving any of the other environmental issues addressed by the green economy, such as clean water or air pollution, will take considerable amounts of capital.[11]

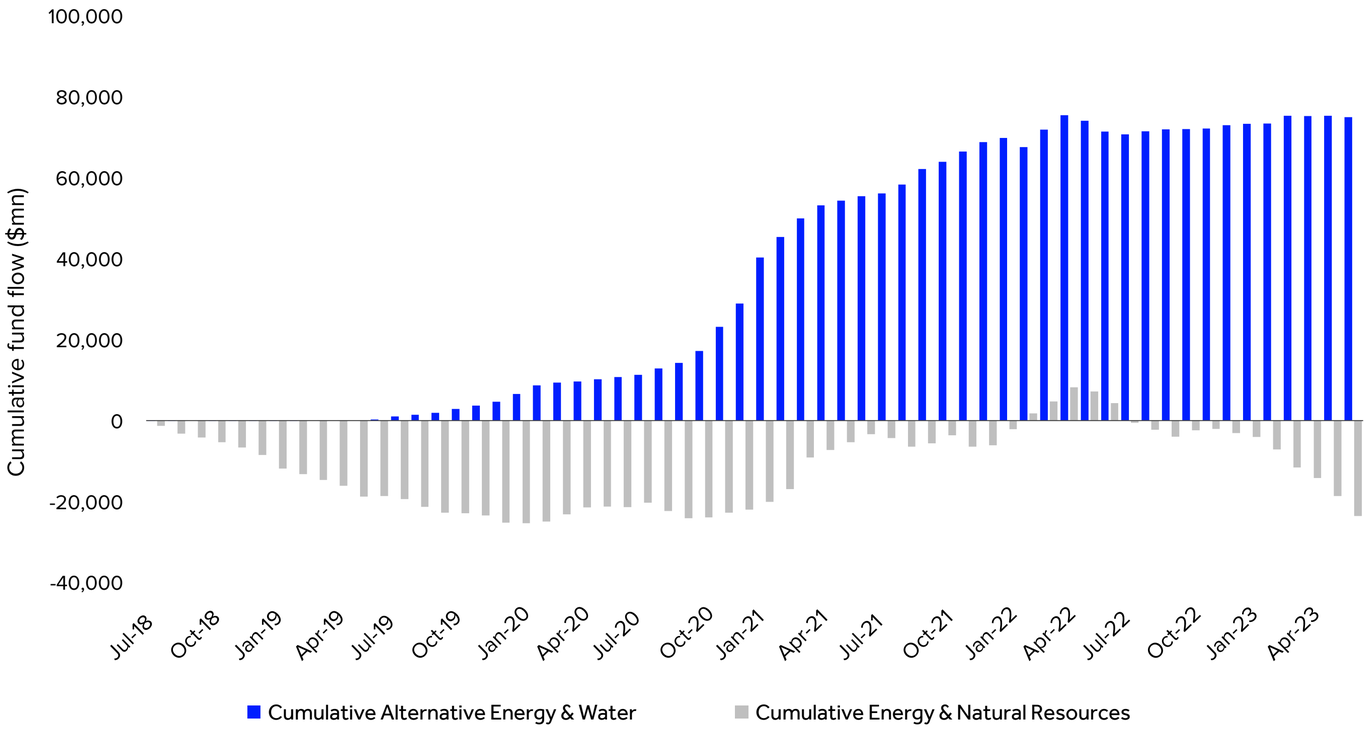
These capital flows will need to cover the direct capital needed to buy green products and infrastructure, such as solar panels or electric vehicles, the products from green economy companies. However, there will also need to be 'financial' capital flows (both equity and debt) directly into the securities of green economy companies to support the capacity to grow and service the demand. The strong capital flows into green economy equities in 2020/21 and subsequent rise in valuation premiums suggests that financial flows into the companies in that period were larger and faster than the direct flows into their products.

GREEN THEMATIC FUND FLOWS

Using LSEG Lipper data, we looked at investment flows into funds in the equity thematic Alternative Energy & Water segments. These best capture dedicated green thematic funds. Cumulative flows rose considerably during 2021, reaching almost US$80 billion. Despite the market downturn in 2022, the cumulative flows were broadly sideways for that period, seeing very little outflows. This illustrates sustained investor interest in the space. This will be vital over the long term for investor capital to have an impact in the energy transition, rather than short-term moves in and out of the space.

By way of contrast, fund flows in the Lipper equity sector Energy and Natural Resources segments, which typically cover a lot of oil and gas funds and had significant outflows pre-pandemic, saw inflows from mid 2020 as the oil price began to rise. However, the direction turned to outflows again from mid 2022 when the oil price began to fall.

Figure 26. Alternative Energy & Water vs. Energy & Natural Resources fund flow



Source: Lipper, cumulative monthly fund flow in Lipper global classification equity thematic alternative energy & waters funds vs. equity sector energy and equity thematic natural resources funds

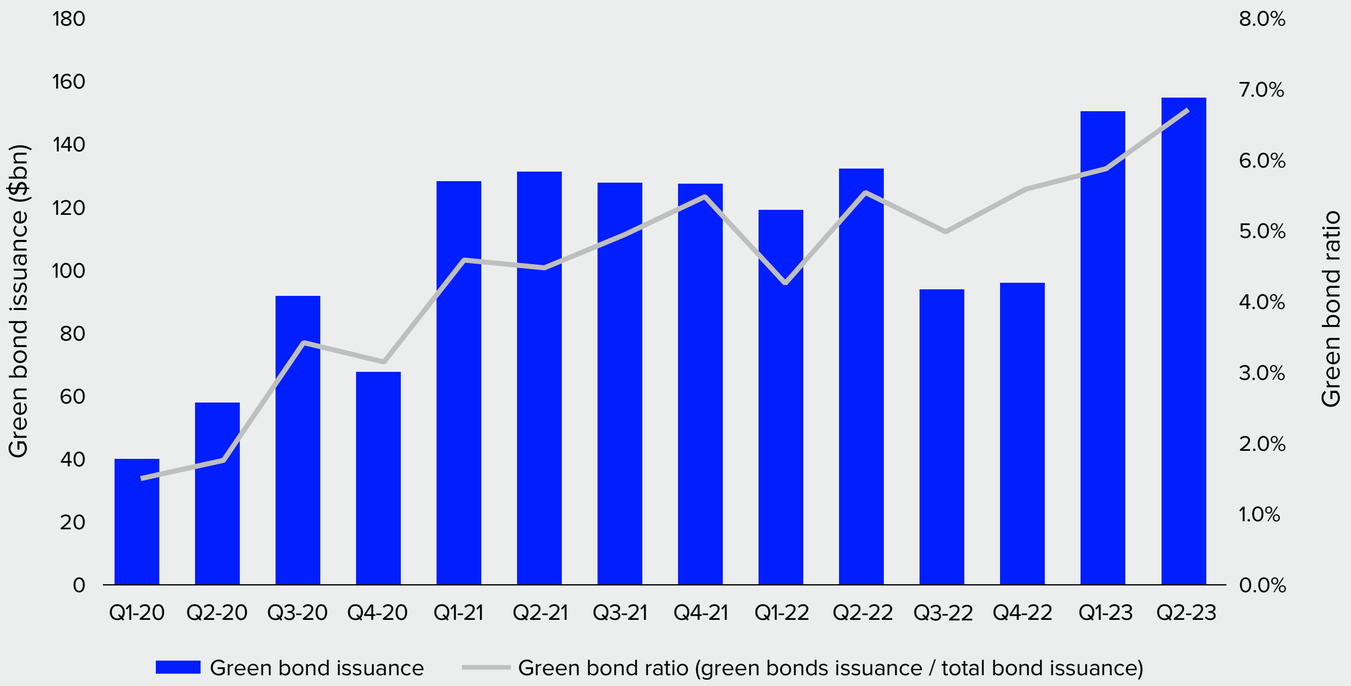
[11] *Green equity exposure in a 1.5°C scenario: Applying climate investment trajectories with green revenues*

Box 04.

Green bond issuance

In addition to green thematic funds, capital can also flow from the green bond market. This showed weakness in H2 2022 as rising interest rates weighed on issuance. However, it recovered strongly in 2023 when Q1 and Q2 both set sequential issuance records and green bonds accounted for almost 7% of total bond issuance. The funds that governments and corporates raised with these bonds will be spent on the goods and services provided by green economy companies. Have green bonds staged a comeback? The growth dynamics in Q1

Figure 27. Green bond issuance



Source: LSEG as of June 2023.

The new geopolitics of green

As the green economy continues to expand and diversify, it is becoming an important source of economic growth, jobs and energy supply. Also, it has emerged as a critical geopolitical consideration. Governments increasingly acknowledged the role of the green economy in combating climate change and other environmental challenges. They view it as a down payment on future energy security so they can escape from old energy dependencies like fossil fuels.

Meanwhile, the green economy is emerging as a key vector of industrial policy in the 21st century. Policymakers consider green technologies as a critical advantage in driving export industries, such as autos and semiconductors. These form the industrial backbone in countries such as Germany, Japan, the US and China.

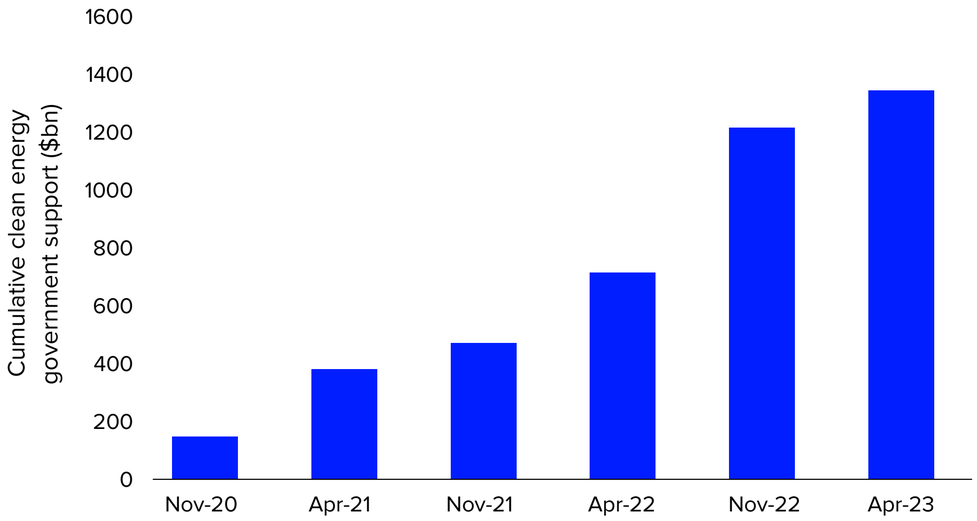
In response, governments are mobilising ever-larger levels of funding as well as deploying further policy instruments to onshore green industries and supply chains. These instruments include extensive subsidies and an array of trade measures from import restrictions to carbon border adjustment mechanisms.

Such government support has been a long-time feature of growth in the green economy — across German solar feed-in tariffs, US renewables tax credits, and Chinese EV quotas. Since the start of this decade such measures scaled up considerably as government programmes around the world have poured hundreds of billions of dollars into supporting clean energy. The most high-profile of these include the US Inflation Reduction Act in August 2022 and the EU Net Zero Industry Act in March 2023.

Moreover, green subsidies have been setting records. IEA research found record levels of new clean energy government support in 2022. Approximately US$1.3 trillion of new support was measured from the start of the Covid-19 pandemic in 2020 to the end April 2023 (figure 28). This finding has assuaged concerns in 2022 that a combination of interventions to combat a global pandemic, decades high inflation, and energy security measures would derail clean energy investment and divert government and business attention. It is notable that over the same timeframe investment in fossil fuels is materially lower than a decade ago, albeit with a noticeable increase over the last two years (figure 29).

Continued government stimulus is critical in contributing to a virtuous cycle of technological innovation, expanding scale economies that drive price declines and further demand growth.[12] As such, the rapid expansion of government support for green industries is likely to further accelerate the growth of the global green economy over coming years.

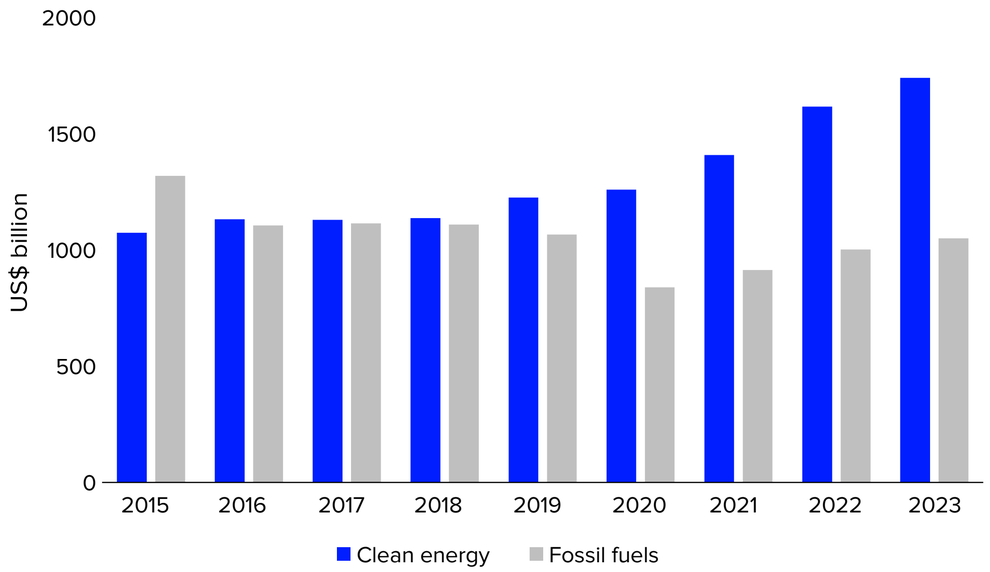
Figure 28. Clean energy government support



Source: IEA, Government spending for clean energy investment support and crisis-related short-term consumer energy affordability measures, Q2 2023, IEA, Paris https://www.iea.org/data-and-statistics/charts/government-spending-for-clean-energy-investment-support-and-crisis-related-short-term-consumer-energy-affordability-measures-q2-2023, IEA. Licence: CC BY 4.0

[12] The Low Carbon Economy, Kooroshy et al 2015 https://www.goldmansachs.com/intelligence/pages/new-energy-landscape-folder/report-the-low-carbon-economy/report.pdf

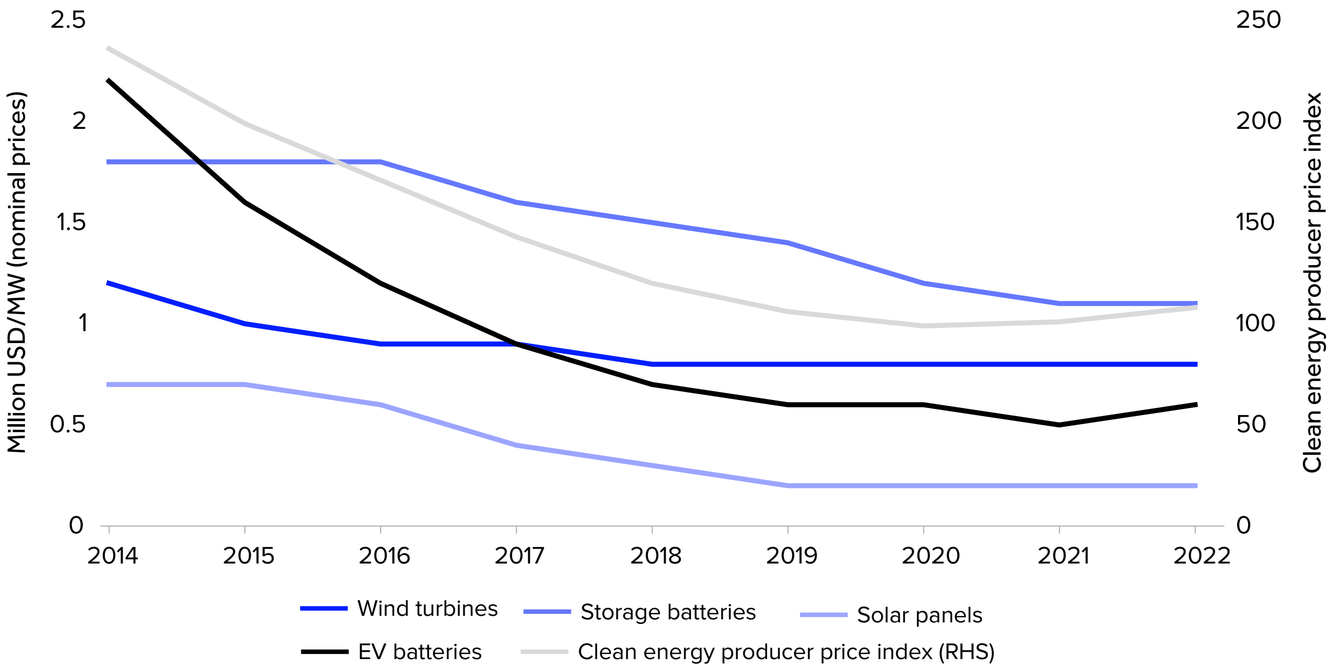
Figure 29. Clean energy vs. fossil fuels investment



Source: IEA (2023), World Energy Investment 2023, IEA, Paris https://www.iea.org/reports/world-energy-investment-2023, License: CC BY 4.0

At the same time, new geopolitical fault lines are starting to emerge as governments recognise how crucial green products and services are in shaping the economic competitive landscape in the 21st century. While mostly pioneered in advanced economies, much manufacturing of green products and services has been offshored to China over the past two decades[13], with economies of scale helping to drive falling prices of green goods from solar panels to EV batteries (figure 30).

Figure 30. Clean energy equipment prices



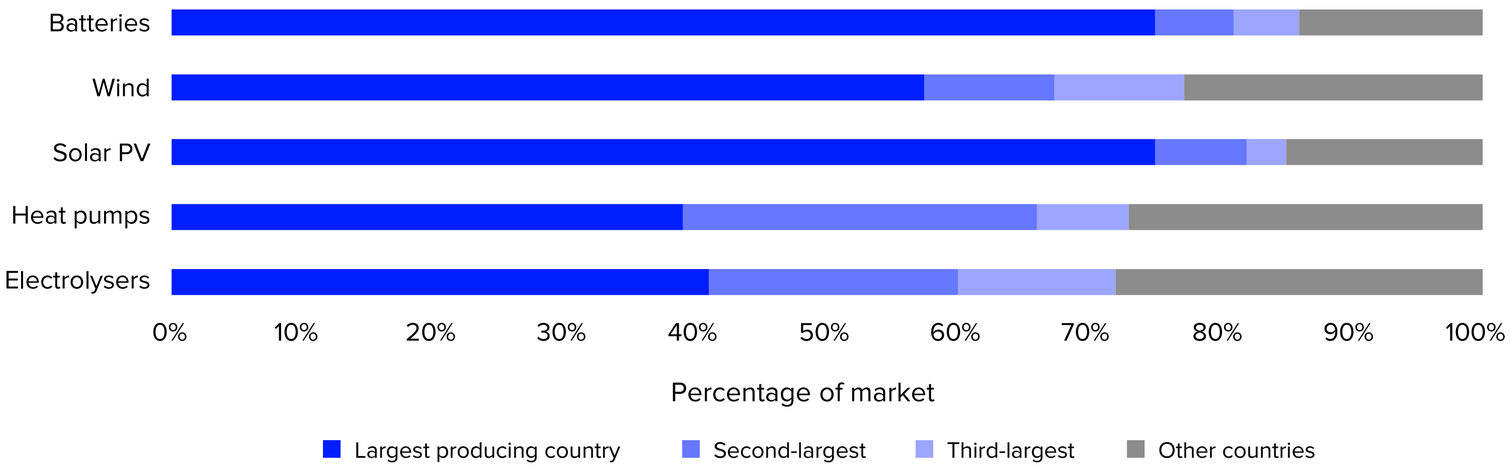
Source: IEA (2023), World Energy Investment 2023, Paris https://www.iea.org/reports/world-energy-investment-2023, License: CC BY 4.0

[13] *China is a major net exporter of most clean energy technologies, providing a large share of the global supply. Europe and the United States are net importers for most clean energy technologies. Energy Technology Perspectives 2023 — Analysis , IEA*

The latest generation of government support measures have, in many cases, embraced a protectionist approach. Often, they explicitly aim to reshore green industries and decouple supply chains. Critical raw materials, such as lithium cobalt or rare earths, which are used across both EV and renewable energy as well as semiconductor chip supply chains, are of particular concern because they are highly concentrated geographically (figure 31).

While increased government investment and support is vital for the green transition, this decoupling of global supply-chain risks introducing potential structural inefficiencies and costly duplication in the global green economy. This outcome could contribute to slowing cost reductions in green technologies, which have already been eroded due to inflationary pressures in inputs across capital cost, raw materials and labour cost (figure 30). While still too early to tell, there is a risk that such geopolitical headwinds might delay the energy transition or at least make it more expensive.

Figure 31. Geographic concentration of key green products manufacturing (2021)



Source: IEA (2023), Energy Technology Perspectives 2023, IEA, Paris https://www.iea.org/reports/energy-technology-perspectives-2023, License: CC BY 4.0

Appendix: Relevant research

Weighted Average Green Revenue (WAGR): Integrating climate solutions into portfolio construction (June 2023).
https://www.ftserussell.com/research/weighted-average-green-revenue-wagr-integrating-climate-solutions-portfolio-construction

Green equity exposure in a 1.5°C scenario: Applying climate investment trajectories with green revenues (September 2022).
https://www.ftserussell.com/research/green-equity-exposure-15degc-scenario-applying-climate-investment-trajectories-green

Investing in the green economy: Tracking growth and performance in green equities (May 2022).
https://www.ftserussell.com/research/investing-green-economy

'Do no significant harm' and 'minimum safeguards' in practice: Navigating the EU taxonomy regulation. (December 2021)
https://www.ftserussell.com/research/do-no-significant-harm-and-minimum-safeguards-practice-navigating-eu-taxonomy-regulation

Investing in the green economy: Sizing the opportunity (December 2020).
https://www.ftserussell.com/research/investing-green-economy-sizing-opportunity

Sizing the green economy: Green Revenues and the EU taxonomy (September 2020).
https://www.ftserussell.com/research/sizing-green-economy-green-revenues-and-eu-taxonomy

Investing in the global green economy: Busting common myths (May 2018).
https://www.ftserussell.com/research/investing-global-green-economy-busting-common-myths

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