InfluenceMap

# Who Owns the World's Fossil Fuels?

## A forensic look at the operators and shareholders of fossil fuel companies

December 2018

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*Updated January 4th, 2019*

# Executive Summary

- In its October 2018 Special Report on Global Warming the IPCC recommended drastic cuts in the use of thermal coal to avert catastrophic climate change. However, the world's 15 largest asset management groups (with a combined $40 trillion in capital market assets) have increased holdings of thermal coal reserves in their funds by 20% since the Paris Agreement.

- While the reasons behind this 20% increase are not entirely clear, the total thermal coal reserves controlled by the listed companies considered in this research increased by only 6% in the period following the Paris Agreement. This 6% is largely accounted for by two US thermal coal companies – Peabody Energy and Arch Coal – which re-entered the publicly listed company universe in the same period as they emerged from bankruptcy.

- Leading in absolute terms are US giants BlackRock and Vanguard who between them hold companies controlling disclosed thermal coal reserves with the potential for over 8 gigatons (Gt) of $CO_2$ emissions. This represents close to 2% of the remaining carbon budget to stay within $1.5^0$C of warming, based on the latest IPCC estimates. This 9.5 Gt figure is also equivalent to 30% of total global energy-related carbon emissions for 2017, according to the International Energy Agency.

- The research introduces the thermal coal intensity (TCI) metric, expressed in tons/$mn assets under management (AUM), which allows like-for-like comparison. BlackRock again leads with the most coal dense portfolios among the ten largest managers of listed funds. It scores a TCI of 571 in its $2.3 trillion of funds - 50% higher than the benchmark average for the 60,000 listed funds with $36 trillion aggregate AUM tracked by the research. However, BlackRock's actively managed funds maintain roughly half the TCI of its passively managed funds.

- German fund manager Allianz, which introduced a thermal coal divestment policy just before the Paris Agreement in 2015, registers the lowest TCI with just 80 tons/$mn AUM - about 80% lower than the benchmark, likely indicative of a proactive push to go underweight in thermal coal assets over the last three years.

- French giant AXA, which also has a policy on thermal coal, actually more than doubled the thermal coal holdings within its $350 billion portfolio of funds in the time period 03/2016-06/2018, adjusted for inflows. Most of this increase stems from AXA's majority-owned subsidiary AllianceBernstein acquiring stakes in Peabody Energy and Arch Coal.

- It is likely that a significant portion of the allocation of listed fund portfolios is driven by passive management based on indices provided by financial data companies such as MSCI, S&P and FTSE Russell. For example, both Peabody Energy and Arch Coal appear to have re-entered the popular Russell 2000 index of small cap US companies during 2016-18, which would have resulted in their acquisition by numerous funds linked to this index.

- The trend towards passive trading by index tracking has increased dramatically in the last decade for a range of reasons, including the demand for lower cost investment strategies. Given this trend, any approach to addressing thermal coal and other commodities at climate risk within mainstream portfolios will require the involvement of major financial index providers.

- Incredibly, US fund manager State Street sells two funds marketed as fossil fuel free - constructed using MSCI indices - with TCI figures of over 200 tons/$mn AUM. These funds are actually 100 times as thermal coal intense as State Street's flagship $250 bn SPY ETF, which is based on the S&P 500 index of the largest US companies.

- The research also tracked the 10 largest asset owners globally who appear to have sold all direct holdings of thermal coal producers in the last two years, with combined assets of $1.4 trillion. The list is headed by the wealth funds of oil states Kuwait and Qatar and includes IBM's pension fund and the Ontario Teachers' Pension Plan. None of them appear to have any publicly disclosed policy on thermal coal holdings - i.e. the decrease seems to be "silent divestment".

- This research considers 300 publicly listed companies who control the largest amounts of fossil fuel (thermal coal, oil and gas) reserves and production. It links these assets to the world's largest 4,000 asset owners, 4,000 asset managers and almost 60,000 listed funds. The methodology traces physical assets independent of market price fluctuations and accounts for fund in/out flows. Categorization of the method of listed fund management is taken from the Thomson Reuters Lipper financial database.

- The research kicks off the *FinanceMap*, a multi-year project by InfluenceMap to generate and make public climate metrics for key portfolios in the investment management sector.

# Introduction

If combusted, the world's proven fossil fuel reserves will consume the remaining carbon budget for the Paris Agreement's target of well below $2^0$C global warming and many times the budget of achieving below $1.5^0$C based on IPCC estimates released in October 2018. Despite this, there are currently no significant government regulatory restrictions on either the use or exploitation of these reserves in place globally. Attention has therefore turned to the shareholders of listed fossil fuel companies and the potential influence they wield over these companies' activities, including the management of the reserves they control.

To understand fossil fuel ownership patterns, this research considered a group of roughly 300 publicly listed companies who control the largest amounts of fossil fuel (thermal coal, oil and gas) reserves and production. These assets were then linked to the world's largest 4,000 asset owners, 4,000 asset managers and almost 60,000 listed funds. The methodology traces physical assets independent of market price fluctuations and accounts for fund in/outflows. The research produced a range of metrics and analysis designed to better inform the climate campaign community and the strategies of climate-concerned financial institutions.

This report is part of a wider project to examine the robustness of portfolios within the world's investment management system for adjusting to a low carbon transition. The project – the *FinanceMap* – is being conducted in collaboration with the 2 Degrees Investing Initiative and the WWF European Policy Office and is due to be launched in phases starting in 2019.

This work is made possible by the support of the KR Foundation.

*Full details of the data and methodology deployed in this research and report are available in Appendix B and at this online FAQs & Methodology page. InfluenceMap looks forward to engaging with asset owners, asset managers and other interested parties with regard to portfolios, our analysis, or any of the topics covered within this report.*

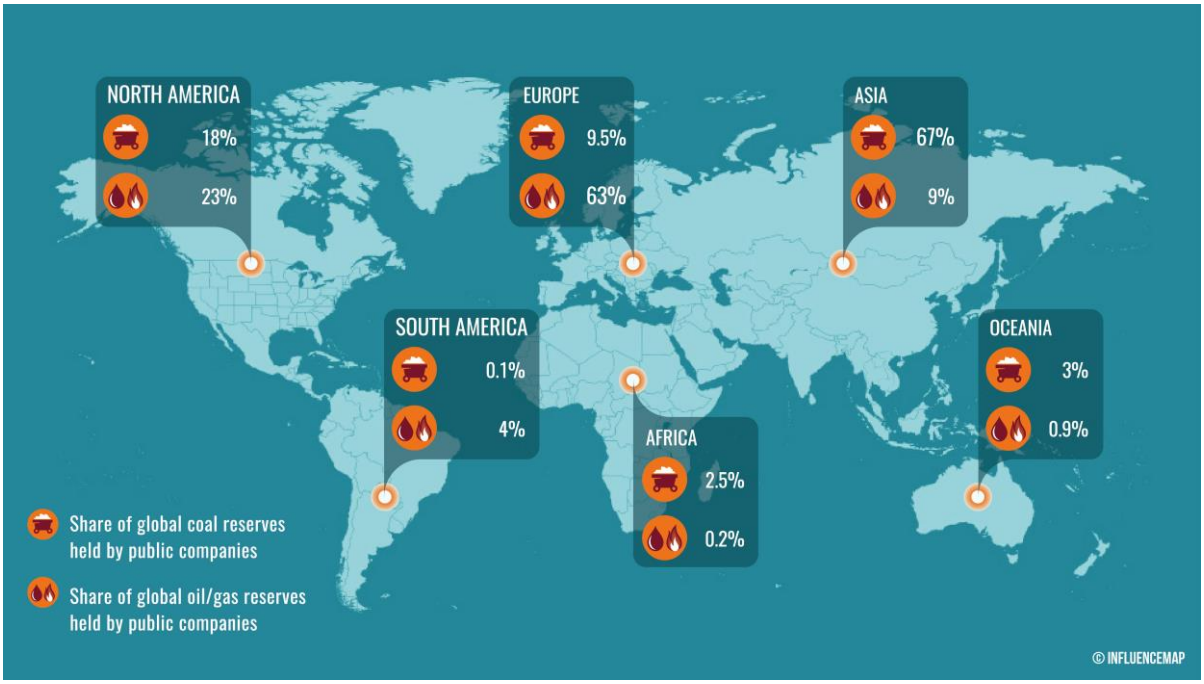
# Fossil Fuels and Climate Change

## Publicly Listed Companies and Fossil Fuels

The IPCC's 5th Assessment estimated in 2014 that thermal combustion of the world's remaining proven fossil fuel reserves would greatly exhaust of the planet's remaining carbon budget for the well below $2^0$C target established by the Paris Agreement. Based on the IPCC's most recent Special Report (*Global Warming of 1.5 °C*, released October 2018), the same combustion levels would exceed the more ambitious $1.5^0$C budget many times over. The world's proven fossil fuel reserves are controlled by state-owned enterprises (such as Saudi Aramco), privately held companies or companies listed on the world's stock exchanges (like ExxonMobil, BHP and Peabody Energy). This research looks at the approximately 300 publicly listed companies who control the largest quantities of fossil fuel reserves and production. Together, they account for more than 98% of all fossil fuel reserves within listed companies and represent roughly $5 trillion in combined market capitalization (noting **not** all this value is in the fossil fuel reserves). A dynamic online spreadsheet is available documenting these companies, with all data taken from the latest financial filings.

## Where the World's Listed Fossil Fuel Companies are Registered

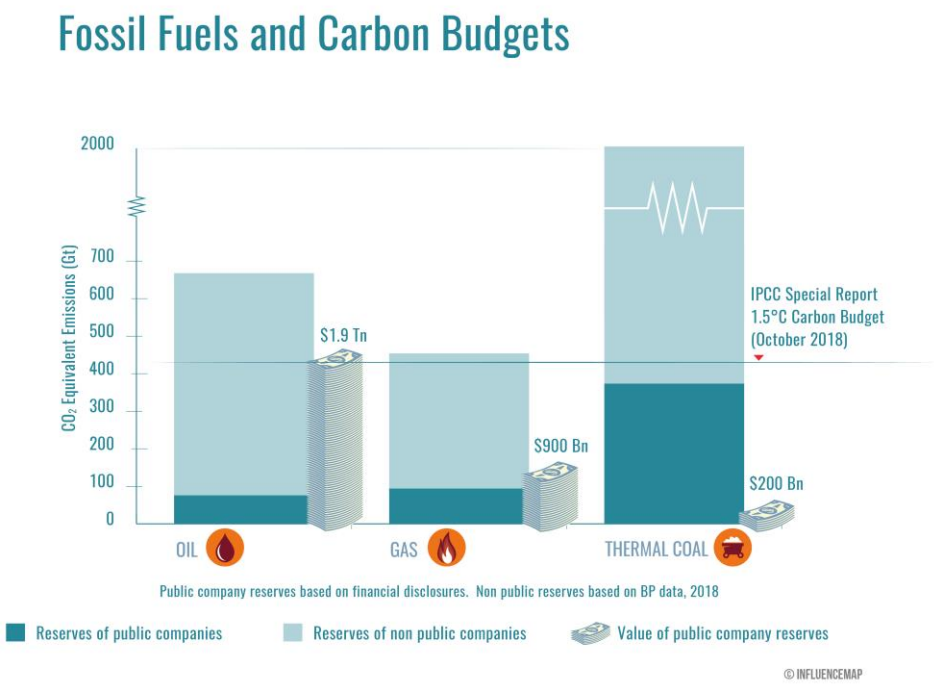
The following shows the location of thermal coal, oil & gas reserves in listed companies, according to where these companies are registered.



The thermal coal, oil and gas reserves held by these companies are compared with those held by non-public companies in the graphic below. It will be apparent that the majority are controlled by non publicly listed entities like state owned enterprises or by governments directly. The data on proven reserves globally is taken from the BP Statistical Review of World Energy 2018 (based on 'geological and engineering data') while the data on reserves held by publicly listed companies is from company disclosures. This research excludes metallurgical coal. It also recognizes that a portion of extracted oil and gas has applications aside from fuel. An October 2018 IEA report The Future of Petrochemicals estimates that in 2017 12% of crude oil was used for petrochemicals, thought this proportion is expected to rise rapidly through to 2050 as transport fuel use declines.

## Fossil Fuel Reserves and Carbon Budgets

The chart compares the potential carbon emissions from the proven reserves of oil/gas and thermal coal owned by public vs. non-public companies, should these reserves be combusted. It also notes the value the market currently places on the reserves owned by publicly listed companies. Full details of the method for computing these values may be found in online FAQs and in Appendix B.




If combusted for power, the thermal coal reserves controlled by publicly listed companies alone would account for nearly the entire remaining carbon budget for limiting warming to 1.5$^0$C, based on the IPCC's latest estimates (*this chart updated Jan 4$^{th,}$ 2019*).

With no significant government regulation in place to restrict the extraction or use of fossil fuels, attention has turned to the potential influence that shareholder power has over these companies' activities. Investors have adopted a mixture of strategies, including reduced exposure (divestment and portfolio adjustment), engagement, and investment in climate friendly options.

- **Divestment**: This refers to the adjustment of various sectors and commodities within a portfolio, including the elimination of holdings in a particular sector such as fossil fuels. To some degree, this has been triggered by citizen-focused campaigning over the last decade. The leading divestment website, gofossilfree.org, notes that (as of May 2018) 893 financial institutions responsible for $6.15 trillion of assets had made some kind of divestment pledge (e.g. to divest from coal, all fossil fuels, coal and tar sand oil etc.). This movement began with citizen pressure on pension funds and endowments and is now being considered by global asset managers like Allianz, Aegon, AXA and CalPERS. The recommendations of the Task Force on Climate-related Financial Disclosures apply to asset owners and managers as well as companies and contain references to stranded fossil fuel assets. One of the world's largest asset owners, Norges Bank (which manages Norway's $1 trillion pension fund), announced last year it was considering significantly reducing its exposure to oil and gas equities. Norges Bank also has a policy of exclusion for companies whose income is more than 30% derived from thermal coal, a form of partial divestment.

- **Engagement:** Shareholders engage with a company to change it. For example, this FT piece from April 2018 describes how investors pressured Shell to reduce its fossil fuel capital investment, ultimately resulting in a shareholder resolution against the company. Of note is the Climate Action 100+ initiative (launched at the end of 2017), which commits key asset owners with a total of $30 trillion in AUM to engage with 100 of the world's largest companies on climate change issues. Leading coal producers like China Shenhua Energy and Coal India are on the list, along with the oil and gas majors.

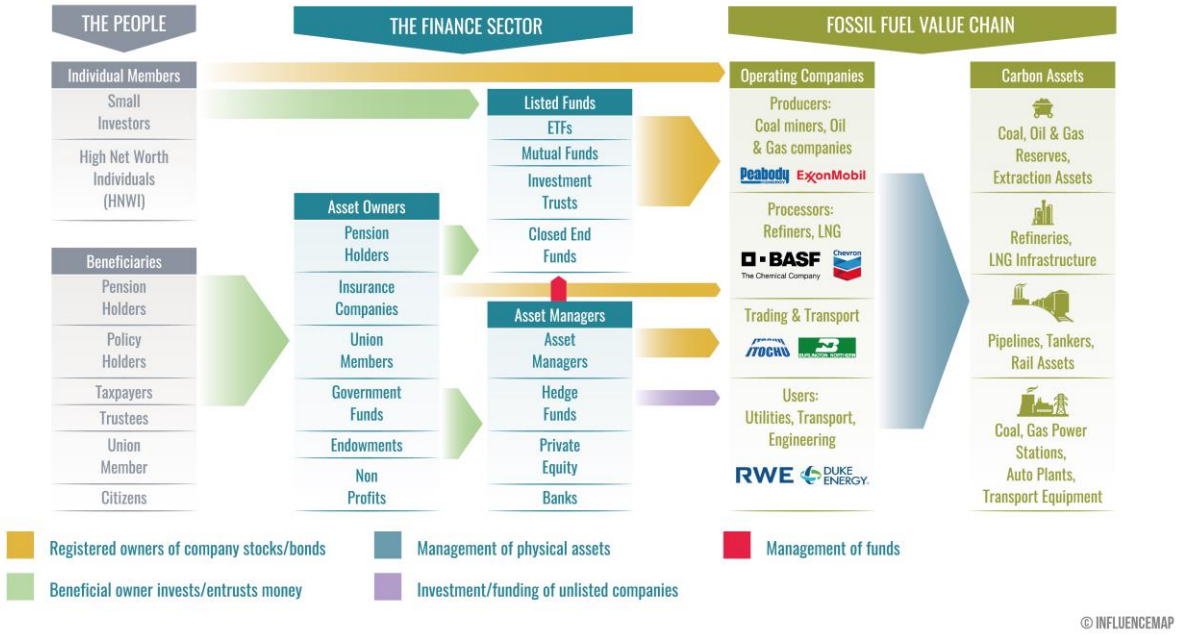
- **Climate friendly funds and investments:** Many climate themed funds have been created by major asset managers in response to increasing demand from climate-concerned investors. One key example is the UBS Life Climate Aware World Equity Fund.

These strategies are not mutually exclusive, and many large investors are now deploying some or all to a certain extent.

# Fossil Fuels and the Financial System

## The Ownership Chain

The chart below shows the links between individual shareholders and the physical assets controlled by the fossil fuel value chain, with the oil/gas and coal producers in the upper right.




Ultimately, all assets are beneficially owned by individuals, rather than institutions; however, these individuals are often represented by range of intermediaries. These individuals are shown on the far left and include taxpayers, pension and insurance holders, small investors, savers and high net worth individuals. The progression from left to right shows the complex finance chain between the individual owner-beneficiaries and physical assets of the real economy. A goal of campaigns like the divestment movement is to empower individuals in the left-hand column to impact the fossil fuel value chain and its physical assets through this ownership chain. Individual owners entrust their investments to asset owners such as pension funds, endowments, insurance companies and even national governments (who own assets through state pensions, sovereign wealth and other funds). Asset owners in turn rely on the asset manager sector for a variety of investment services.

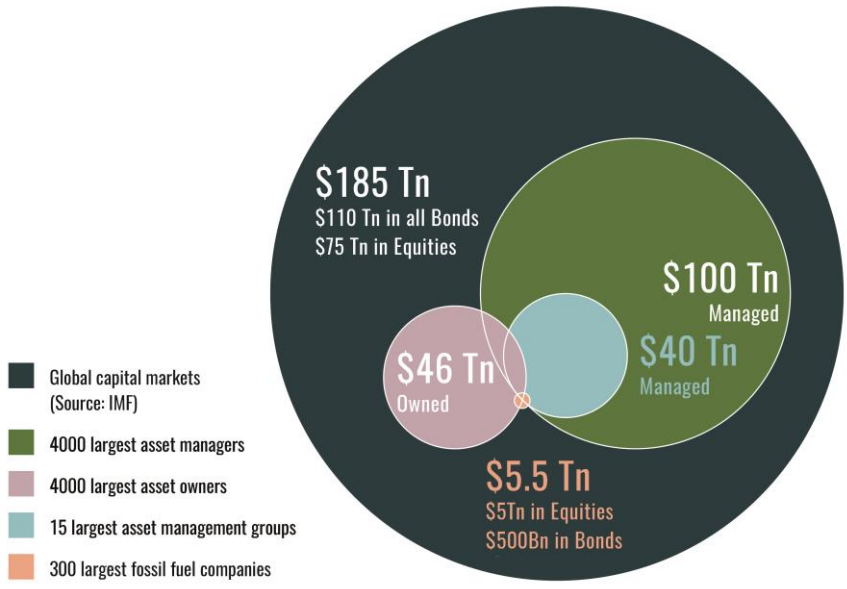
An increasingly important part of this landscape is the fund sector. This research considers "listed funds" as collective pools of capital, managed by investment professionals and traded on markets or offered to institutional/other investors in a regulated manner. The database used in this research is

derived from the Thomson Reuters Lipper financial database, which states "Lipper includes mutual funds, closed-end funds, ETFs, hedge funds, retirement and pension funds, and insurance products." They now represent more than 30% of all capital market assets globally, according to a leading finance trade group. This research maps out the 4,000 largest asset owners, the 4,000 largest asset management firms and the 60,000 largest listed funds, as well as their inter-relationships (see here for our mapping methodology). The scale of global capital markets – with the 300 fossil-fuel producing companies in context – is noted below.

- The combined market value of Facebook, Amazon, Google, Microsoft and Apple recently exceeded $4 trillion, not far behind the aggregate $5 trillion market value of the publicly listed fossil fuel producing companies. This represents a remarkable shift in financial markets from a decade ago when oil majors, led by ExxonMobil and PetroChina, made up four of the top ten most valuable global companies.

- The aggregate value of the publicly listed coal producers' thermal coal reserves represents just over 0.25% of all global equities. When contextualized, the thermal coal sector is thus very small indeed, and therefore likely of little strategic concern to large institutional investors.

- The 15 largest asset manager groups, making up several hundred operating companies among the 4,000 largest asset managers, have $40 trillion of assets under management (representing more than 20% of all global capital markets). As such, the information and signals they provide to their clients on investment trends and corporate governance are extremely important.



# Asset Owners and Fossil Fuels

## A Mandate to Address Climate Risk

As the ownership chain in the preceding section shows, institutional asset owners such as pension funds, government funds and endowments are effectively one step away from citizen beneficiaries like savers, students, pension payers and taxpayers. The fact that many such funds are large enough to own significant portions of key listed companies has made them a target for campaigners aimed at deploying shareholder power through the ownership chain. Many are also internally addressing systemic climate risk in their portfolios. These so-called universal owners have holdings in most listed companies globally, and thus see both risks and opportunities for their portfolios from climate change. For example, Norges Bank Investment Management, which administers the roughly $1 trillion assets of the Government Pension Fund of Norway, has issued clear statements on climate change that include corporate governance expectations. This policy has its origins in Norway's parliamentary system, which acts on behalf of the citizen beneficiaries of the fund.

Many asset owners have responded to the divestment movement, and now have a policy on ownership of fossil fuel-related assets. A leading divestment website, gofossilfree.org notes that (as of May 2018) 893 financial institutions responsible for $6.15 trillion of assets had made some kind of divestment pledge (e.g. to divest from coal, all fossil fuels, coal and tar sand oil etc.). Such asset owners vary in size from the state pension systems of California (CalPERS) and New York State to smaller university endowments. State pension system policies towards fossil fuels are often driven by regulatory oversight, while those of university endowments can be triggered by student activism. At the national level, Ireland passed a divestment bill this summer, making it the first country to detail a plan to sell off all fossil fuel assets (coal, oil, gas and peat).

## Recent Thermal Coal Divestors

As noted by gofossilfree.org, there is a spectrum of divestment policies covering a range of fossil fuel types and time frames. Given the prominence of thermal coal in the targets of the Paris Agreement – and even more so in light of IPCC's recent report – the presence of thermal coal in portfolios is likely to be a high priority for divestment-minded campaigners and asset owners alike. Accordingly, this research investigates evidence of strategic removal of thermal coal producers from the portfolios of the database of 4,000 asset owners over the last two years.

The world's 4,000 largest asset owners represent $46 trillion in collective assets. However, the research indicates that public data exist for only about 40% of these asset owners' portfolios. These data are accrued through financial databases, based on public disclosures. Some asset owners, like Norway's pension fund, choose to disclose fully. Others, like the similarly sized Japan Government Pension Investment Fund, disclose only their asset allocation ratios.

Considering these data limitations, the following represents a list of the ten largest asset owners for whom publicized financial data includes equity holdings information *and* who have divested thermal coal from their portfolios (99% or more) within the time frame following the Paris Agreement (2016 – 2018) that this research has tracked. These owners represent total assets under management of nearly $1.4 trillion. In addition to the entities highlighted below, numerous additional asset owners have fully divested from thermal coal over the last five years, including Yale University, Emory University, Harvard Management Company, Derbyshire County Council and Danica Pension. The data below refer to direct holdings of the asset owners, as available from public disclosures; any holdings owned through asset managers or funds are not necessarily included. The reasons for the thermal coal divestment are not clear; none of the asset owners in the list appear to have fossil fuel divestment policies, according to the gofossilfree.org database.

| Asset Owner (Country) | Total $AUM | Type of Asset Owner | Coal Reserves Divested 2016 – 2018 (Tons) |
|---|---|---|---|
| Kuwait Investment Authority (Kuwait) | $570 bn | Government Fund | 3,200,000 |
| Qatar Investment Authority (Qatar) | $333 bn | Government Fund | 980,000 |
| Ontario Teachers' Pension Plan (Canada) | $190bn | Pension Fund | 1,700,000 |
| Washington State Investment Board (USA) | $120 bn | Pension Fund | 163,000 |
| IBM Retirement Fund (USA) | $97 bn | Pension Fund | 220,000 |
| Keva (Finland) | $51 bn | Pension Fund | 152,000 |

| | | | |
|---|---|---|---|
| Commonwealth Superannuation Corp. (Australia) | $28 bn | Pension Fund | 3,600,000 |
| Retirement Fund (Incorporated), (Malaysia) | $27.5 bn | Pension Fund | 305,000 |
| Government Pension Fund (Thailand) | $23 bn | Government Fund | 850,000 |
| PUNCEF Fundacao dos Economiarios Federais (Brazil) | $14 bn | Pension Fund | 323,000 |

# Asset Managers and Fossil Fuels

## Asset Managers and their Funds

This research details 4,000 of the world's largest asset management firms, all of them legal entities operating in particular geographies (e.g. BlackRock UK Ltd). The methodology links them to larger asset manager groups where applicable (e.g. BlackRock UK Ltd is linked to BlackRock) and also tracks any listed funds they may operate (e.g. BlackRock UK Ltd may operate listed funds under the iShares brand within the UK). Close to 60,000 listed funds are tracked in this way. The portfolio contents of listed funds can be determined to a high degree via regulatory disclosures, while the full portfolio contents of asset managers and asset manager groups can be determined to a lesser extent. It should be noted that all such financial data is necessarily out of date in that it relies on past disclosures, generally made up to several months prior to the date of data taken.

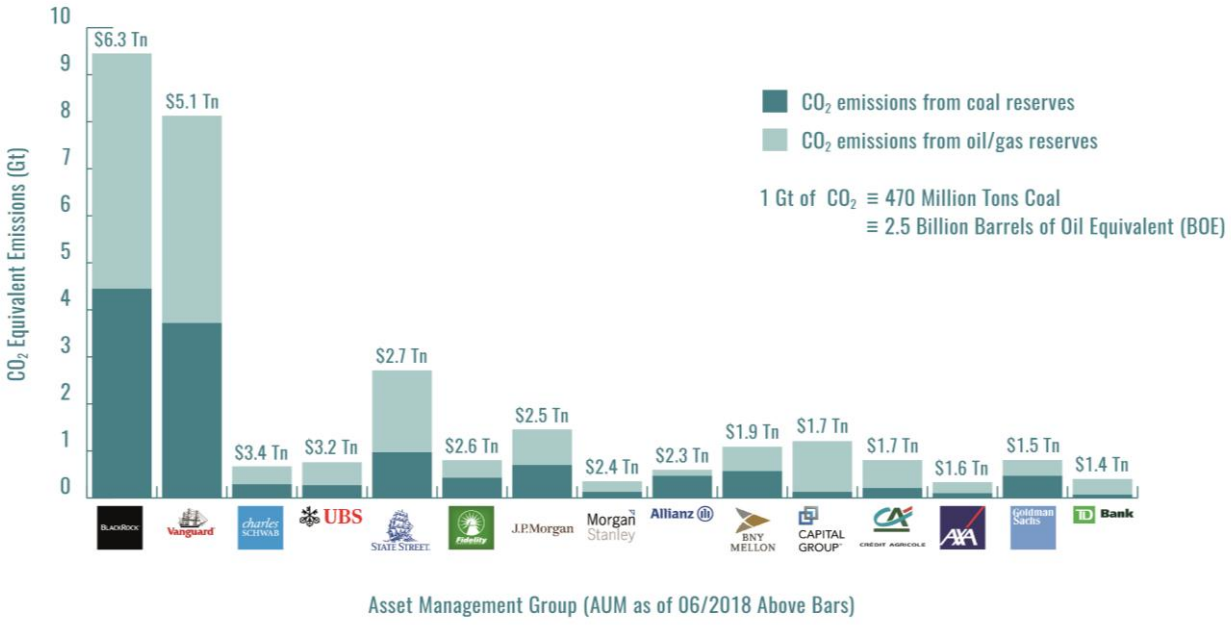
As of June 2018, the 15 largest asset manager groups in the world have a combined $40 trillion in assets of all kinds under management on behalf of asset owners, from individual investors to the world's largest pension funds. This constitutes over 20% of all global capital market assets. At the head of the list are giant US firms BlackRock and Vanguard, with a combined $11 trillion of AUM.

This research recognizes that the asset management sector holds shares in listed companies on behalf of institutional and individual asset owners and hence may not have final decision-making power in terms of allocating fossil fuel assets. However, given their scale and resources, asset managers, along with asset owner-consultants like Mercer and financial index creators such as MSCI and S&P, remain hugely influential in shaping the asset allocation trends within global markets.

A number of leading asset manager groups have made statements and enacted policies on climate change, and on thermal coal in particular. The latest IPCC report – which highlights the drastic need to reduce thermal coal consumption by 2030 – may put additional pressure on these highly influential financial players to articulate guidance on these assets.

The following chart compares the aggregate sum of fossil fuel reserves held by the 15 largest asset managers by total AUM through the companies in their portfolios. This value is expressed in Gt of $CO_2$ emissions equivalent to allow comparison of thermal coal with oil/gas reserves from a climate perspective. These physical quantities are independent of share price variation and thus more accurately track shifts in the portfolios of these assets.

# The Largest Asset Manager Groups and Fossil Fuel Holdings



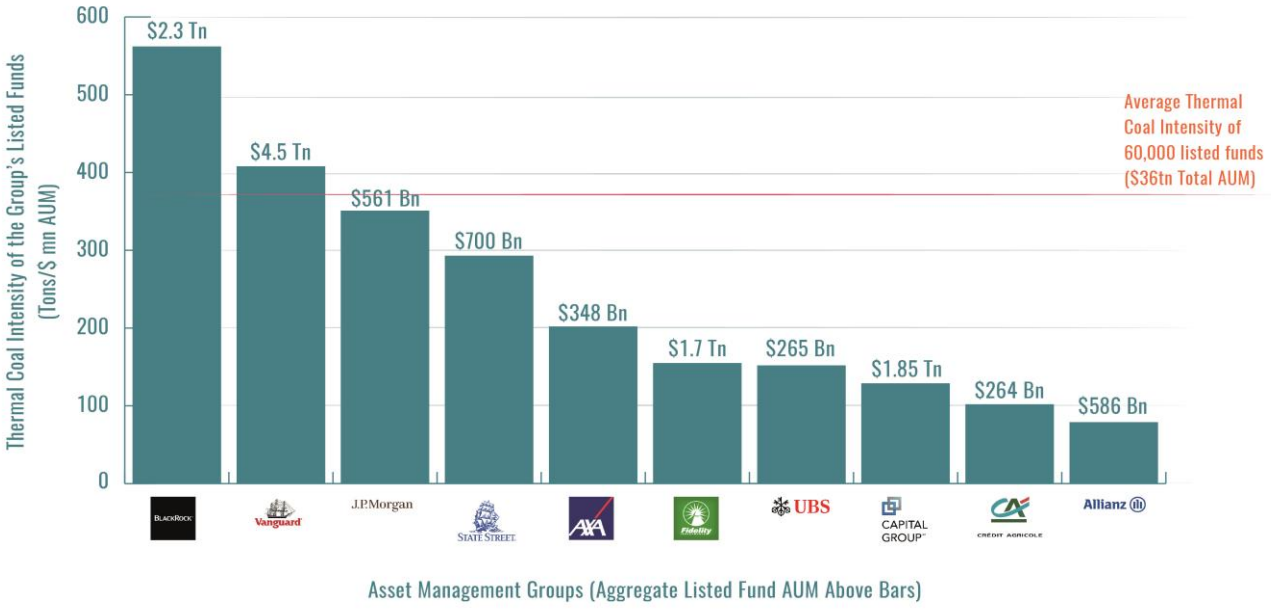

The October 2018 IPCC report estimates a remaining carbon budget of 420 Gt $CO_2$ to maintain a 66% chance of achieving the 1.5$^0$C target. The current thermal coal holdings of the 15 largest asset manager groups alone account for more than 3% of this latest carbon budget. While not a huge proportion, the signals and actions demonstrated by these 15 asset manager groups are hugely influential to the overall financial market and, importantly, to the overall economy. The actual monetary value of these thermal coal holdings is small (0.25% of all global equity market assets), so any divestment or re-allocation would likely have minimal impact on financial performance overall.

In light of the IPCC's recommendations for drastic cuts in the use of coal power, the remainder of this research focuses on the thermal coal holdings of the asset management industry. In particular, it focuses on thermal coal held in listed funds. This research defines listed funds as collective pools of capital, managed by investment professionals and traded on markets or offered to institutional/other investors in a regulated manner.

Listed funds (see here for the broad definition used in this research based on the Lipper database) represent a rapidly growing fraction of global market assets, and the dynamics of these markets are thus increasingly important to short and long-term market direction. The full portfolio contents, total assets under management, and net in/outflows of listed funds can be determined to a high degree of accuracy via strict regulatory disclosure requirements, compared to similar data for asset managers on the company level.

This research introduces the *thermal coal intensity* (TCI) metric, defined as the tonnage of thermal coal held per $mn AUM, which allows for like-for-like comparison. This metric can be applied both at an individual fund level and across multiple portfolios of funds managed by the same asset management group. The TCI factors of the ten largest operators of listed funds are considered below (a subset of the 15 largest groups above), all of whom manage over $250bn of funds, according to data from Thomson Reuters' Lipper database.

## Thermal Coal Intensity of the Largest Fund Managers




- Among the asset management groups with the largest aggregate fund AUM, BlackRock holds the most coal intensive portfolios with an average TCI of 571 tons/$mn AUM. However, there are key differences in the data on BlackRock's passively and actively managed funds.[1] The group's passively managed funds (termed *index tracking*) show a thermal coal intensity in 2018 of over 650 tons/$mn AUM, while its actively managed funds (termed *non-index tracking*) show a much lower TCI of 300, well below the global fund benchmark of 376.

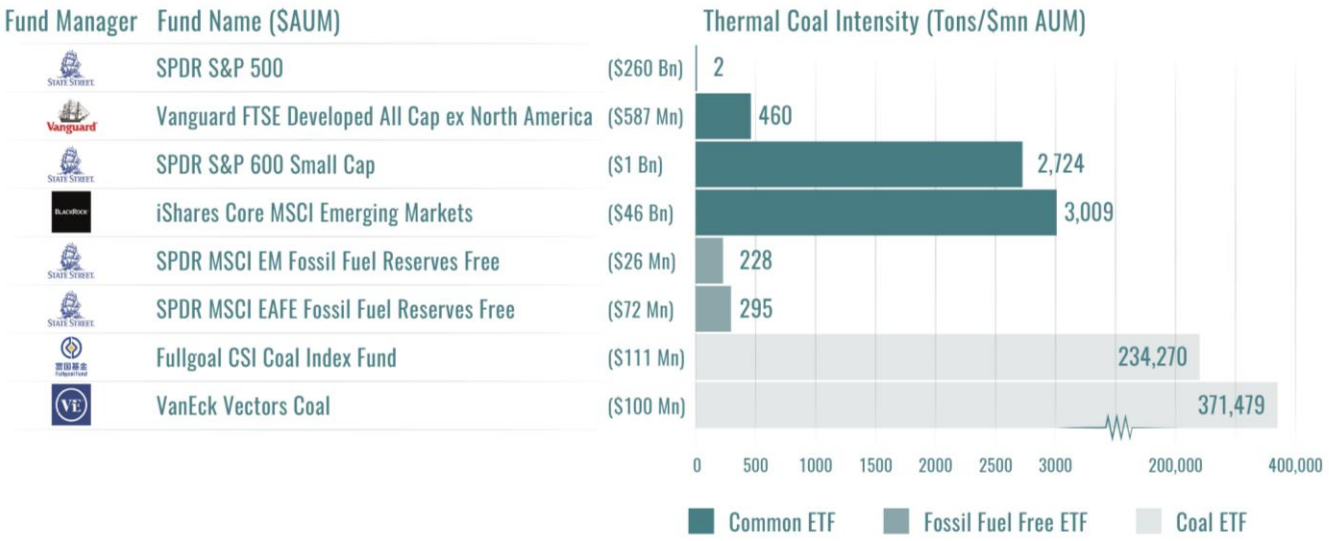
- German fund manager Allianz, which introduced a thermal coal divestment policy just before the Paris Agreement in 2015, registers the lowest TCI with just 80 tons/$mn AUM - about 80% lower than the benchmark, likely indicative of a proactive push to go underweight in thermal coal.

[1] This research distinguishes between passively and actively managed funds using the Thomson Reuters Lipper database.

- Other European asset managers AXA and UBS, who have stated policies on thermal coal or climate change, appear to have significantly lower TCI factors than their large US counterparts. As they are all massive global players, it is likely the groups have equity investments in similar geographic regions.

## Thermal Coal Intensity of Selected ETFs

On the individual fund level, the following chart provides a comparison of the TCI factors of representative exchange traded funds (ETFs) in three categories: mainstream, climate, and coal funds.



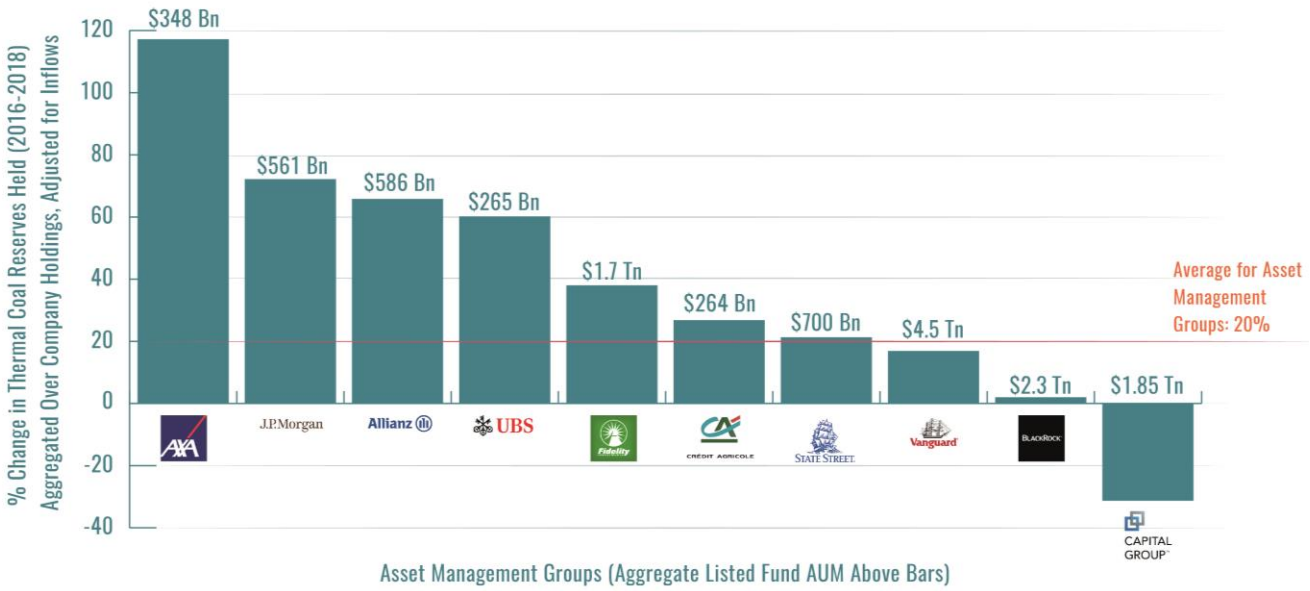

- US fund manager State Street sells two funds marketed as fossil fuel free, constructed using MSCI indices, with TCI figures of over 200 tons/$mn AUM. These funds are in fact **100 times as thermal coal intense** as State Street's flagship $250 billion SPY ETF, which is based on the S&P 500 index of the largest US companies.

- The two funds (SPDR MSCI EAFE Fossil Fuel Reserves Free ETF and SPDR MSCI Emerging Markets Fossil Fuel Reserves Free ETF) – worth a combined $100mn – contain significant fossil fuel reserves through holdings of companies including Wesfarmers, RWE and Vale.

- The MSCI indices on which the State Street funds are based state they are a "*benchmark for investors who aim to eliminate fossil fuel reserves exposure from their investments due to concerns about the contribution of these reserves to climate change*."

- Specialist ETF provider VanEck, a $47 billion US asset manager, offers a fund with most of its assets in thermal coal to score a record-high TCI factor of over 370,000.

# Change in Thermal Coal Reserves Held by the Listed Funds of the Largest Asset Management Groups (2016 – 2018)




This research tracked the variation in the thermal coal reserves held by the funds which the same ten asset manager groups operate from 03/2016 to 06/2018 – that is, the approximately two years since the Paris Agreement. This change is depicted in the chart above.

- The values in the chart above were computed based on the aggregated coal reserves of the fossil fuel companies held by the asset manager groups' listed funds. Inflows and outflows from the funds are accounted for in these computations.
- While the reasons behind this 20% increase are not entirely clear, the total thermal coal reserves controlled by the listed companies considered in this research increased by only 6% in the period following the Paris Agreement. This 6% is largely accounted for by two US thermal coal companies – Peabody Energy and Arch Coal – which re-entered the publicly listed company universe in the same period as they emerged from bankruptcy
- These two companies have since been extensively acquired, likely following their re-entry into commonly followed indexes. Both are top global holders of thermal coal among listed companies (with combined reserves of over 8 billion tons, or 20 Gt $CO_2$ equivalent emissions potential).

- Though BlackRock leads in TCI, with 571 tons per $mn AUM, its holdings of thermal coal reserves are virtually unchanged between 2016 and 2018. While BlackRock's fully passive funds have decreased their thermal coal holdings, this has been largely offset by increases in thermal coal holdings among the group's actively managed funds, as well as its increasingly popular Optimized index-tracking funds, including numerous iShares ETFs.

- The over 100% increase in thermal coal reserves held by AXA group's funds is largely attributable to holdings in Arch Coal and Peabody Energy in listed funds managed by its majority-owned US subsidiary, AllianceBernstein.

- It is likely that a significant part of the allocation within portfolios of listed funds is driven by passive management based on indices provided by financial data companies such as MSCI, S&P and FTSE Russell. For example, both Peabody Energy and Arch Coal appear to have re-entered the popular Russell 2000 index of small cap US companies during 2016-18, which would have resulted in their acquisition by numerous funds linked to this index.

- The trend toward passive trading by index tracking has risen dramatically in the last decade, driven in part by the demand for lower cost investment strategies. Given this trend, any effective approach to addressing thermal coal and other commodities at climate risk within mainstream portfolios will require the involvement of the major financial index providers.

The key coal holdings of the two asset management groups with the largest aggregate fund AUM, BlackRock and Vanguard, as well as the group which showed the largest increase in thermal coal holdings between 2016 and 2018, AXA, are highlighted in the table below.

| Aggregate Fund $AUM | Adjusted % Change in Thermal Coal Reserves 03/16 – 06/18<br>Fund Thermal Coal Intensity 2018 (tons/$mn AUM) | Key Holdings (% of company held) and Notable Changes 2016-18 | Policy on Thermal Coal Holdings |
|---|---|---|---|
| Vanguard<br>$4.5 tn | 17%<br>408 | Consol Energy (9%), Peabody Energy (6%), Adani Enterprise (0.8%). New stake in Arch Coal in 2018 (8%). | No specific policy |
| BLACKROCK<br>$2.3 tn | 2%<br>571 | Consol Energy (10%), Cloud Peak Energy (10%), Arch Coal (6%). 2 mn additional shares in Peabody Energy. | No specific policy |
| AXA<br>$348 bn | 117%<br>206 | Black Hills Corporation (2%), Peabody Energy (0.5%), Consol Energy (0.5%). New stake in Arch Coal (0.5%). | Partial divestment pledge for asset management division of group. |

# Climate Funds and Fossil Fuels

## The Climate-themed Fund Industry

The marketing of climate-themed funds has been in progress for at least a decade, catering to individual and institutional investors hoping to adopt a climate-sensitive investment strategy. A number of leading asset managers, including UBS and Legal & General's asset management arms, now offer climate-themed funds and strategies for their institutional asset owner clients (e.g. UBS's Climate Aware and L&G's Future World Fund). This research considered over 80 funds marketed under a climate related theme, representing a total of $14 billion in assets. While these funds constitute a relatively minor segment of the listed fund market, their target audience represents an important demographic of individuals wishing to deploy sustainable strategies in their finances (particularly with regard to climate change). It is therefore important that the contents of the funds reflect these concerns over key climate risks.

The use of climate related terminology to market financial products remains unregulated by the relevant authorities, and the use of terms like "low carbon", "climate", "transition", "fossil fuel free" and "clean energy" is often inconsistent. Further, there is scant disclosure of the full holdings of the funds by the asset management companies marketing them (with often only the top 10 companies detailed).

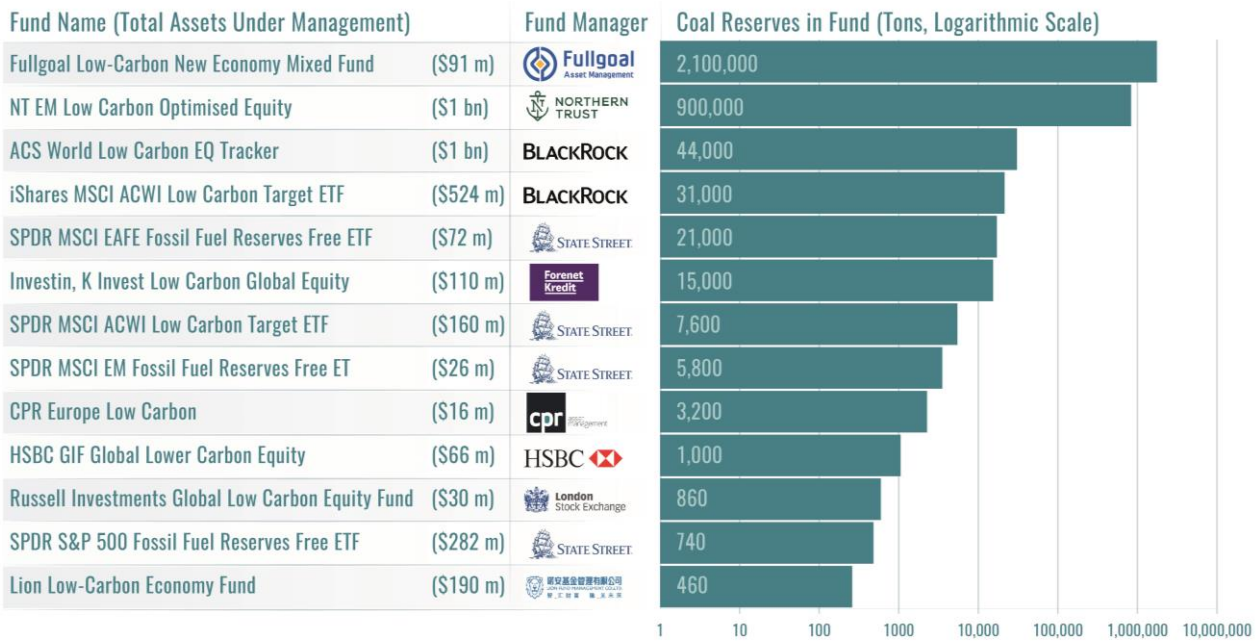
To create these funds, asset managers often rely on external index providers like MSCI and S&P, which have developed a range of indices for this purpose. The major indices are listed below with their target impact, as declared by the index companies themselves.

- MSCI ACWI Low Carbon Target Index (managing potential risks associated with the transition to a low carbon economy)
- MSCI EAFE Ex Fossil Fuels Index (excluding companies that own oil, gas and coal reserves)
- S&P 500 Fossil Fuel Free Index (measuring the performance of companies in the S&P 500 that do not own fossil fuel reserves)

Leading asset managers BlackRock (iShares) and State Street make extensive use of these indices in creating their climate fund products, while others, like the asset management arms of HSBC, Credit Agricole and BNP Paribas, appear to utilize in-house indices. The full make up of these indices, like the full contents of the funds themselves, are generally not publicly available.

# Climate Funds and Thermal Coal

The inclusion of companies that hold reserves of thermal coal as their assets in climate-themed funds is somewhat controversial. While labelling funds with terms such as "low carbon", "climate change" and "clean energy" does not specifically indicate the exclusion of such companies, climate-aware buyers would understandably expect funds marketed as fossil fuel free not to contain such holdings. Without commenting on whether the following funds are in violation of their stated remit, this report identifies 13 funds marketed with climate related language whose constituent companies have thermal coal holdings. The full list is in Appendix A, while some notable comments are below.




The fund with the largest coal holdings is the Fullgoal Low-Carbon New Economy Mixed Fund, run by Hong Kong based Fullgoal Fund Management. The relatively small $91m fund effectively owns 2.1 million tons of coal reserves, worth 3.5% of its portfolio value.

Two State Street funds (SPDR MSCI EAFE Fossil Fuel Reserves Free ETF and SPDR MSCI Emerging Markets Fossil Fuel Reserves Free ETF) – worth a combined $100m – actually contain significant fossil fuel reserves through holdings of companies including Wesfarmers, RWE and Vale. Both funds rely on MSCI fossil free indices for their construction. Details of the composition of these indices are not disclosed by MSCI; however, State Street does publish the holdings of all of its listed funds in the ETF section of its US site. As highlighted in the *Thermal Coal Intensity of Selected Funds* graph above, both

of these funds have TCI values over 200 – more than 100 times greater than State Street's flagship $250 bn SPY ETF, which is based on the S&P 500 index of the largest US companies.

All of the climate-themed funds connected to S&P and MSCI indices which contain coal are 'optimized' with respect to the method by which they track their affiliated index. That is, they do not rely on direct tracking (which entails no input from the fund's asset manager); instead, the portfolio of an 'optimized' may be adjusted by a fund manager to replicate the index using a representative sample of securities. Given that the degree of input implied by 'optimization' is variable, it is uncertain whether the inclusion of fossil fuel holdings in the index funds originates with the fund manager or the index provider.

Both the index providers such as MSCI and S&P and the asset managers that use them to market climate themed funds are likely to be more carefully scrutinized on these funds and fossil fuel reserves contained within them in light of the IPCC's latest statements on thermal coal.

# Appendix A: Financial Data

## Fossil Fuel Holdings of the Largest Asset Manager Groups

| Asset manager group; latest $AUM | Group Thermal Coal Reserves; Oil/Gas Reserves (06/2018, $CO_2$ equivalent) | Number of Listed Funds (Aggregate $AUM) | Thermal Coal Intensity of Group's Funds (tons/$mn AUM), % Change in Thermal Coal Held by Funds 2016 - 2018 | Policy on Fossil Fuels/Climate Change |
|---|---|---|---|---|
| BlackRock<br>$6.3 tn | 4.5 Gt $CO_2$<br>5 Gt $CO_2$ | 1086 ($2.3 tn) | 571, 2.0% | Has committed to engaging with climate risk exposed companies in line with TCFD recommendations. |
| Vanguard<br>$5.1 tn | 3.7 Gt $CO_2$<br>4.4 Gt $CO_2$ | 229 ($4.5 tn) | 408, 16.9% | No specific policy on fossil fuel holdings. |
| Charles Schwab<br>$3.36 tn | 0.28 Gt $CO_2$<br>0.38 Gt $CO_2$ | 88 ($208 bn) | 532, 2.0% | No specific policy on fossil fuel holdings. |
| UBS<br>$3.17 tn | 0.27 Gt $CO_2$<br>0.49 Gt $CO_2$ | 500 ($265 bn) | 155, 60.2% | Policy of limiting portfolio risk (exposure to fossil fuels); aspiration of 'aligning the portfolio' with a 2°C scenario. |
| State Street<br>$2.73 tn | 0.97 Gt $CO_2$<br>1.7 Gt $CO_2$ | 263 ($700 bn) | 298, 21.3% | No overriding policy on fossil fuel holdings *(does 'expect' companies in oil and gas sector to disclose on climate risks)*. |

| | | | | |
|---|---|---|---|---|
| Fidelity Investments<br><br>$2.6 tn | 0.08 Gt $CO_2$<br><br>0.37 Gt $CO_2$ | 553 ($1.7 tn) | 182, 38.0% | No overriding policy on fossil fuel holdings *(does 'engage' with companies on their carbon exposure)*. |
| JP Morgan Chase<br><br>$2.53 tn | 0.70 Gt $CO_2$<br><br>0.76 Gt $CO_2$ | 402 ($561 bn) | 367, 72.2% | Policy of limiting portfolio risk by engaging with companies, diversifying, or 'eliminating positions'. |
| Morgan Stanley<br><br>$2.4 tn | 0.10 Gt $CO_2$<br><br>0.22 Gt $CO_2$ | 116 ($95 bn) | 32, -0.8% | No specific policy on fossil fuel holdings, but has made general statements on climate and fossil fuels here. |
| Allianz<br><br>$2.3 tn | 0.13 Gt $CO_2$<br><br>0.13 Gt $CO_2$ | 550 ($586 bn) | 80, 65.8% | Has pledged to fully divest from coal-based business in its proprietary investments by 2040. |
| BNY Mellon<br><br>$1.9 tn | 0.47 Gt $CO_2$<br><br>0.52 Gt $CO_2$ | 239 ($166 bn) | 251, 173.5% | Holds policy of balancing "reducing carbon exposure and achieving suitable risk exposure" by engaging companies on their climate impacts. |
| Capital Group<br><br>$1.7 tn | 0.57 Gt $CO_2$<br><br>1 Gt $CO_2$ | 134 ($1.85 tn) | 131, -31.3% | Policy of not divesting from fossil fuel companies, but instead to engage with these companies to reduce their climate impacts. |
| Credit Agricole<br><br>$1.67 tn | 0.13 Gt $CO_2$<br><br>0.6 Gt $CO_2$ | 604 ($264 bn) | 104, 26.8% | Strategic policy in asset management branch of partial portfolio decarbonization by reallocating capital away from high carbon risk companies. |

| | | | | |
|---|---|---|---|---|
| AXA<br><br>$1.64 tn | 0.16 Gt $CO_2$<br><br>.24 Gt $CO_2$ | 536 ($348 bn) | 206, 117% | Pledged in 2017 to partially divest from coal, oil and gas, including a €2.4 billion divestment from thermal coal and a halt on investment in oil sands. |
| Goldman Sachs<br><br>$1.49 tn | 0.47 Gt $CO_2$<br><br>.34 Gt $CO_2$ | 209 ($162 bn) | 488, 131.6% | No overriding policy on fossil fuel ownership. Holds a policy on carbon footprint analysis of companies held by its asset management arm. |
| TD Bank<br><br>$1.42 tn | .07 Gt $CO_2$<br><br>0.33 Gt $CO_2$ | 97 ($126 bn) | 226, 307.8% | No specific policy on fossil fuel holdings. |
| Group Totals<br><br>$40 tn | 13 Gt $CO_2$<br><br>16 Gt $CO_2$ | 5936 ($14 tn) | 322*, 20% | The proportion of total reserve assets of listed fossil fuel companies held by these 15 asset managers is roughly 17% for oil/gas, but < 3% for thermal coal. This reflects the fact that a majority of shares in large coal producers like Coal India and China Shenhua Energy are held by governments and other strategic Asian investors. |

Note: 1Gt $CO_2$ ≡ 470 million tons coal ≡ 2.5 billion barrels of oil equivalent (BOE)
* This TCI factor refers to the average for the 15 largest asset manager groups, rather than the benchmark of 376 tons/$mn AUM for the 60,000 listed funds in the total research universe.

# Fossil Fuel Holdings Within Climate-themed Listed Funds

This research assessed 80 listed funds employing a variety of climate-related terminology (e.g. “low carbon”, “climate”, “fossil free”, “clean energy”) and representing a total AUM of $14bn. This research detected thermal coal reserves belonging to companies in the following portfolios as of June 2018.

| Fund Manager | Fund Name and $AUM (06/2018) | Tons of Thermal Coal Reserves in Fund (Tons) | Oil/Gas Reserves in Fund (BOE) | External Index (Tracking Method*) |
|---|---|---|---|---|
| Fullgoal Fund Management | Fullgoal Low-Carbon New Economy Mixed Fund ($91 m) | 2,100,000 | 0 | |
| Northern Trust Corp. | Northern Trust Emerging Markets Low Carbon Optimised Equity ($1 bn) | 900,000 | 5,200,000 | |
| BlackRock | ACS World Low Carbon EQ Tracker ($1 bn) | 44,000 | 480,000 | |
| BlackRock | iShares MSCI ACWI Low Carbon Target ETF ($523 m) | 31,000 | 207,000 | MSCI ACWI Low Carbon Target Index (Optimized) |
| State Street | SPDR MSCI EAFE Fossil Fuel Reserves Free ETF ($72 m) | 21,000 | 30,500 | MSCI EAFE Ex Fossil Fuels Index (Optimized) |
| Forenet Kredit FMBA | Investin K Invest Low Carbon Global Equity ($110 m) | 15,000 | 248,000 | |
| State Street | SPDR MSCI ACWI Low Carbon Target ETF ($160 m) | 7,600 | 70,000 | MSCI ACWI Low Carbon Target Index (Optimized) |
| State Street | SPDR MSCI Emerging Markets Fossil Fuel Reserves Free ETF ($26 m) | 5,800 | 5,000 | MSCI Emerging Markets Ex Fossil Fuels Index, (Optimized) |
| Rue la Boetie | CPR Europe Low Carbon ($16 m) | 3,200 | 104,000 | |

| | | | | |
|---|---|---|---|---|
| HSBC | HSBC GIF Global Lower Carbon Equity Fund ($66 m) | 1000 | 35,000 | |
| London Stock Exchange Group PLC | Russell Investments Global Low Carbon Equity Fund ($30 m) | 860 | 72,000 | |
| State Street | SPDR S&P 500 Fossil Fuel Reserves Free ETF ($282 m) | 740 | 0 | S&P 500 Fossil Fuel Free Index (Optimized) |
| Lion Fund Management | Lion Low-Carbon Economy Fund ($190 m) | 460 | 0 | |

*The nomenclature for the index tracking method is sourced from the Thomson Reuters Lipper Database.

# Appendix B: Methodology and FAQs

## What is the *Who Owns the World's Fossil Fuels* report?

While our Finance Map project will consider all industrial sectors sensitive to climate risk, the *Who Owns the Fossil Fuels* media release is an output based on the initial phase of this project. It demonstrates our mapping of the finance sector and considers a key component of portfolio climate risk - the fossil fuel production companies. We have mapped out fossil fuel ownership trends globally and the resultant back-end database has been in use by the climate and asset owner communities since May 2018, with the media report released in late November 2018.

## How do you define the fossil fuel industry?

The research considered a group of listed companies who control the largest amounts of fossil fuel (thermal coal, oil, gas) reserves and production. This includes large conglomerates such as Japan's Itochu, for whom fossil fuel production is only a minor business but whose size renders them a substantial player. This research defines these companies as the "largest" based on an aggregation of their sales, market cap and the amount of physical reserves and production they control.

These roughly 300 companies control more than 95% of all oil, gas and thermal coal reserves within listed companies and represent roughly $5 trillion in combined market capitalization as of Oct 2018. It should be stressed that this $5 trillion in market value is the aggregate of all the companies, not the value attributed to their fossil fuel production business. As noted, companies like Itochu and Berkshire Hathaway maintain a relatively small share of their business in fossil fuel production. When weighted for % of sales due to fossil fuels, the value within the fossil fuel business of these 300 companies is closer to $2 trillion. Therefore, this group of companies is important for investors looking to utilize their power as shareholders to address climate change. All data on these 300 companies is based on the latest financial and annual report disclosures from the companies themselves (in most cases, as of end 2017).

The majority of proven reserves of oil and gas are controlled by non-public entities, such as Saudi Aramco. However, roughly half of all thermal coal reserves are controlled by publicly listed producers, and thus are held by the world's capital market investors. This research covers thermal coal only and excludes the significant amount of metallurgical coal mined for industrial use. This data will be updated annually, next in mid-2019.

## How accurate is your fossil fuel reserves data?

The process of classifying and accounting for fossil fuel reserves varies considerably between companies, as well as between different authorities that require this disclosure. Where possible, this research takes oil/gas

reserve data as classified under the 1P (proven), 2P (proven + probable) and 3P (proven + probable + possible) Security Exchange Council (SEC) or Society of Petroleum Engineers PRMS system. Where this has not been possible (e.g. for many of the Russia-based companies) the disclosure has been converted as accurately as possible to match the 1P, 2P, 3P system. While this research has collated data on 3P reserves where disclosed, this data is not currently available online nor does it feed into the computations. Where a company has not disclosed 2P data this has been set to zero, so that in these cases 2P is taken to be equivalent to 1P. This research maintains a single reserve number for proven coal reserves. Thus, 2P is used in allocating oil/gas reserves to shareholders while the single proven reserves number is used for thermal coal.

Data on the coal, oil and gas reserves and production for each company is taken from annual reports or financial disclosures. The quality and structure of disclosure by fossil fuel companies on their reserves varies by region and company. This research deploys a flexible tagging system to identify the location and characteristics of reserves (e.g. method of extraction, type of oil) for each company. We recognize that due to inadequate disclosure of reserve details by the sector, large investors and industry players may use proprietary databases (such as woodmac.com) which are not public. A secondary goal of collecting and publicizing this data is to challenge the fossil fuel sector to make more precise disclosure on its reserves.

## How do you compute carbon emissions?

To arrive at the potential CO2 emissions equivalent in gigatons (GtCO2), reserve totals are multiplied by an emissions factor specific to the type of reserve, which accounts for vented, flared and fugitive emissions (Heede, 2015). The IPPC 5th Assessment total $2^0$C carbon budget represents the total emissions that can be released to give a 66% chance of remaining within a $2^0$C temperature change relative to pre-industrial levels, while the IPPC total **1.5$^0$C** carbon budget (as stated in the October release Global Warming of 1.5 °C) provides a current estimate for keeping temperatures within 1.5$^0$C. As well as oil and gas reserves, this research covers thermal coal specifically, and excludes the significant amount of metallurgical coal mined for industrial use. It also recognizes that a portion of extracted oil and gas is used for non-fuel combustion but does not attempt to analyze this in depth. An October 2018 IEA report entitled The Future of Petrochemicals estimates that in 2017 12% of crude oil was used for petrochemicals, a proportion expected to rise rapidly through to 2050 as transport fuel use declines.

Heede's methodology used for CO2 equivalent emissions factors from coal, oil, gas used in this repprt notes "*Other estimates of potential emissions from reserves (IPCC, IEA, Carbon Tracker) assume that all of the carbon in the fuel reserves is combusted to the atmosphere. This study makes the more realistic assumption that not all carbon in fuel reserves is burned; we deduct for carbon in the products used for non-energy purposes, such as waxes, lubricants, petrochemicals, carbon fibers, pigments, fertilizers, steelmaking, and road oil. The methodology also accounts for emissions from subsequent combustion of non-energy products, such as tyres, waxes, lubricants, and plastics.*"

## How do you value fossil fuel reserves and allocate these values to shareholders?

While the fossil fuel companies directly control fossil fuel reserves, these companies are owned by shareholders who in theory can impact the management of these reserves. The method this research deploys is to compute the reserves each shareholder effectively "owns" through their aggregated holdings. Two metrics are computed. One is simply expressed in tons of coal or BOE (barrels of oil equivalent) for oil/gas. This metric is useful as it can be directly correlated to greenhouse gas emissions should these reserves be combusted. The other metric is the monetary value of these aggregated reserves in US$. For each company, the value of its fossil fuel reserves is calculated by multiplying its market capitalization by the percentage of sales it accrues from the fuel. This percentage value is obtained from company disclosures. For example, this research estimates that ExxonMobil gains 30% of its sales from oil and hence the value of its reserves are 30% x $360 bn, or $108bn. A shareholder holding 2% of Exxon's shares will therefore be allocated $2.16bn in oil reserves value from its ExxonMobil holding.

At present, we do not track changes in reserves of the fossil fuel companies through time. Corrections in reserves attributed to shareholders as a result of any increase or decrease in reserve levels from 2016 to end 2017 are therefore not at present included in the system. The initial assessment of any resulting errors indicates that this correction is likely not material to the result (i.e. less than 10%). The exception to this is thermal coal reserves, wherein we have tracked major changes in companies like Arch Coal, Rio Tinto and Glencore over the 2016-18 period and these adjustments are reflected in the reserves allocated to shareholders of the companies in the 2016-18 span.

Clearly, the aggregated $ value of a shareholder's reserves in oil/gas/thermal coal will vary with both the shareholder's holdings *and* with the value of the underlying companies. However, the physical quantity of the shareholder's aggregated reserves (tons, or BOE) will only vary with changes in the shareholder's holdings. Therefore, the change in this metric is a practical indicator of how the shareholder is adjusting their portfolio in terms of thermal coal, gas or oil assets. Tracking these trends is useful for the Fossil Fuel Divestment movement, which is pressuring Asset Owners and Asset Managers to remove fossil fuel holdings from their portfolios.

## How do you differentiate between oil and gas?

Despite their common usage, the terms 'oil' and 'gas' cover various types of hydrocarbons, as defined by different physical properties. It is therefore not always immediately clear what these terms specifically refer to. This research uses the following classifications:

Gas: Consisting primarily of methane, this refers to natural gas derived from both conventional and unconventional extraction techniques. This includes shale gas, tight gas, associated gas, non-associated gas, coal bed methane (coal seam gas) and Liquefied Natural Gas (LNG).

Oil: Companies frequently disclose crude oil reserves/production aggregated with the figures for natural gas liquids (NGLs) or condensate - often referred to as ‘liquids.’ As such, this research uses the term 'oil' to encompass: crude oil extracted through conventional and unconventional methods, including tight oil and

shale oil; NGLs, including liquefied petroleum gas, pentane-plus and condensate; and synthetic crude derived from bitumen, tar sands and oil shale. 'Liquids' might be a more technically accurate term, but is not widely recognized. The term 'oil' has therefore been used for communications purposes.

## What types of coal are included?

While all coal has similar geological origins, slight differences have resulted in varying properties. Depending on these properties, coal is used for one of two primary purposes: direct combustion for energy generation (thermal coal) or the creation of coke used in industrial processes such as iron and steel making (metallurgic coal). From a climate change perspective, thermal coal is the key concern due to the high greenhouse gas emissions resulting from the combustion process. Other uses of coal include coal gasification to produce Syngas which in turn may be used to generate power. A related, although at present test-scale process converts coal to hydrogen, with the hydrogen destined for energy generation for transport. The IEA states that in 2017 86% of global coal production was steam and lignite (thermal) with the other 14% accounted for by coking coal intended for metallurgical use. Coal destined for Syngas and other gasification uses is likely a minor proportion. BP's Statistical Review of Energy classifies coal as anthracite, bituminous, sub-bituminous and lignite, all of which to varying degrees are used in power generation, as noted by the US EIA in 2017 data on coal use for power. Bituminous coal also has metallurgical uses. Based on IEA estimates we assume 86% of coal production and reserves are thermal.

The research process looks at all coal production and reserves by the companies in our study. It then determines what portion of these reserves are thermal coal by the latest disclosures from the companies. Such disclosure varies and can be characterized by the type of coal or by its end use. If the company specifies only the type of coal in their production/reserves mix, we characterize lignite, anthracite and sub-bituminous coal as thermal coal. Where companies disclose by end use, we categorize thermal coal as any coal tagged by companies as thermal coal, and also include coal gasification to generate syngas, which we assume is primarily used for power generation. The latter is significant in the case of coal producer Sasol of South Africa, for example.

## How do you map the investment sector?

This research maps out the finance sector (i.e. investment management) in a hierarchical manner as follows. At the top are "financial groups" (e.g. Blackrock), which are affiliations of commercial entities with cross-holding structures. Under this are nationally registered entities (e.g. Blackrock Ltd, Blackrock Inc.), which are "asset managers" that are the registered owners of shares on behalf of their clients. These asset managers may also operate "Listed Funds" (e.g. iShares ETFs), which are pools of capital market assets that can be traded on exchanges and are the registered owners of shares on behalf of the owners of the Listed Funds. Another class of funds, which are not traded on markets, are known as "pooled investment funds." These are special purpose investment companies managed by hedge funds and asset managers and sold to wealthy

individuals and institutions. Our system at present does not identify these individual non-traded funds but it does assess the aggregated holdings of the asset managers who run them.

Outside of this structure are "asset owners" (e.g. pension funds, foundations and government funds) which may either own shares directly, employ asset managers to own shares on their behalf or invest in Listed Funds. In addition, there are also "other shareholders" such as corporations, wealthy individuals or government treasuries who own large portions of fossil fuel companies for strategic reasons.

The terms "financial groups" and "asset manager groups" are used interchangeably. Groups such as BlackRock are primarily engaged in asset management while groups like HSBC engage in asset management in addition to a variety of banking activities (hence these are better known as financial groups). Likewise, many financial groups - like AXA, Aviva and Legal and General - have extensive insurance branches as well as asset management businesses. Our system aggregates all companies, regardless of type of business, within their financial groups and aggregate all shareholdings we can track to these groups. We maintain a separate database of holdings by each of the companies within the financial groups.

## How do you obtain ownership data and how accurate is it?

Our data on shareholders in listed companies rely on a number of disclosure sources, which may be mandatory (e.g. US SEC 13-F filings applying to asset managers with more than $100mn under management) or voluntary (e.g. the Government Pension Fund of Norway's portfolio disclosure). These disclosures vary by region and shareholder type. Our data is most accurate for listed funds, followed by asset managers and then by asset owners. In terms of region, the US offers the most disclosure on shareholders. For example, roughly 70% of ExxonMobil's shareholders may be identified, while this figure is far lower for Chinese and Russian fossil fuel companies and investors. The gap in knowledge of any company's shareholders is primarily due to the lack of disclosure requirements for individual investors, special purpose companies, or small-scale asset managers to declare their holdings. We point users to our Terms and Conditions for issues relating to the use of and reliance on our data. In particular, our data should in no way be considered as guidance on investment activity.

We update our shareholding data bimonthly and the data on the fossil fuel companies each year as new Annual Reports become available. The system tracks ownership of shares via specific ticker symbols representing types of shares traded on particular markets. We aggregate all such ticker symbol-ownership attributed to a shareholder to arrive at the portion of the company own. The ownership % held by a shareholder is computed as the shares held divided by the total number of shares outstanding.

The system can thus state the minimum holdings held by an entity and measure any recent changes in these holdings. It should be noted that all such financial data is necessarily out of date in that it relies on past disclosures, generally up to several months prior to the date of data taken.

## How do you define listed funds and their management?

This research considers "listed funds" as collective pools of capital, managed by investment professionals and traded on markets or offered to institutional/other investors in a regulated manner. The database used in this research is derived from the Thomson Reuters Lipper financial database, which states "Lipper includes mutual funds, closed-end funds, ETFs, hedge funds, retirement and pension funds, and insurance products." The open-ended segment of this market is likely to contain up to 30% of all global market assets, according to the European Fund and Asset Management Association as of Q2 2018. The dynamics of these markets are thus highly important to short- and long-term market direction. Low cost funds which track external indices from index providers such as S&P or MSCI (and thus require minimal input from the asset manager providing the funds) are an increasingly popular investment mechanism, accounting for the strong recent growth exhibited by US asset manager giants Vanguard, Fidelity and BlackRock.

Listed funds are commonly described as passively or actively managed. In reality there is a spectrum of management strategies used by the fund management industry. To distinguish between different methods of fund management, this research employs the following designations and definitions from leading financial data provider Thomson Reuter's Lipper database. The database flags funds which track indexes, as well as identifies the specific method of index tracking. The database identifies two methods of fund management in which the portfolio is fully allocated by tracking an index: 'Full Index-Tracking' (defined as funds which hold positions in all securities of the underlying index in proportion to their weightings in the index) and 'Swap Index-Tracking' (in which the fund manager does not have to physically hold the securities, but instead gains exposure to the underlying index through the use of derivatives, which serve as contracts obliging a 3rd party to pay the fund manager the exact performance of the index). In this study, 'Full' and 'Swap' index-tracking funds are grouped together due to their precise tracking of indices. Lipper identifies a separate category of partly index-tracking funds, labelled 'Optimized'; these funds involve some input from a fund manager, who aims to replicate exposure to an index by investing in a representative sample of securities. Funds not flagged by the database as employing an index-tracking method may or may not involve active management and are therefore designated 'non-index tracking' in this research.

## How do you decide who are the largest asset manager groups?

This research tracks 4000 Asset Managers, which are registered companies providing financial services in specific geographies. Our financial data tracks their shareholdings both directly, and through the listed funds they operate. It also tracks the total amount of capital market instrument (equities, bonds, other) assets they have under management (AUM). The research then "tags" each of these asset managers if they are part of larger financial groups (a term used interchangeably with "asset manager group"). For example, BlackRock UK Ltd will be tagged with "BlackRock". To arrive at the largest asset manager groups, the research aggregates all the operating companies under a given group's control. The 15 largest Asset Manager Groups manage a

combined $40 trillion in AUM, representing more than 21% of all global capital markets value ($185 trillion in 2017, according to the IMF).

This method of categorizing the asset management sector may differ from others (for example the IPE Top 400 list does not aggregate asset managers to their highest corporate group level). In addition, our research also consider groups like Charles Schwab, which may provide transaction-only services for a large portion of the $3.5 trillion the company lists as AUM in our ranking. In reality, all asset managers may provide a spectrum of offerings - from low cost transaction services to bespoke institutional investment solutions covering multi-billion-dollar portfolios - often within the same asset manager group. All are in a position to provide some level of climate risk-related information or advice to their clients and hence are of interest to our project and platform.

In assessing the assets held by these large asset manager groups, our research effectively considers all the companies operating under the parent grouping. In some cases (e.g. AXA or Legal and General) the same parent grouping may contain: a company conducting insurance activities, which holds and invest premiums for citizens; a company providing asset management services for other institutional investors; and the parent grouping's own corporate pension fund. Similar concepts apply to UBS, which operates private and corporate banking, institutional asset management and also has its own corporate pension fund for its past and current employees. While our system separates out the holdings of each of these sub-group entities, they are aggregated together for the purposes of analyzing the 15 largest asset manager groups.

## How do you track changes in fossil fuel holdings by shareholders?

This research computes the change in effective ownership of fossil fuel reserves (coal, oil and gas) by shareholders in the time period 31/03/2016 to 30/06/2018 (covering their activities following the Paris Agreement). Measuring effective ownership of aggregate reserves is useful as it provides a metric for physical assets in the portfolio independent of share price movement. The presence of thermal coal in a portfolio will clearly be of interest to the coal divestment community, for example. With respect to effective ownership of oil/gas reserves, we consider 2P reserves (proven + probable). We temper the change metric for fossil fuels owned with outflows and inflows into the portfolio during this period. For listed funds this is available from financial data sources, and for asset managers and asset manager groups we obtain this from their financial filings). We express the change in thermal coal/oil/gas in terms of physical units (tons/BOE). as this is independent of share price variation and represents, in combination with the inflow/outflow factor, actual shifts in exposure to these assets.

We represent the percentage inflows/outflows into the portfolio over the two-year period as c, and the physical reserves at the start and end of two years by s and e, respectively. If the reserves held by a fund had changed in exact proportion to its size over the two-year period, then the reserves at the end would be $e_0=s \times (1+c)$. Our change factor f is defined as the relative deviation of the actual reserves e from $e_0$: $f=(e-$

e_0)/e_0. This can be expressed as either a positive percentage for an increase or a negative percentage for a decrease.

### What is thermal coal intensity?

Where we have information on the total Assets under Management (AUM) in a portfolio and the tons of thermal coal held by the companies in the portfolio, for comparison purposes we define a metric, "Thermal Coal Intensity", as the tonnage of thermal coal held per $mn AUM.