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SI Research

A Decarbonization Pathway for the Oil & Gas Sector

Sustainable Investing Expertise by ROBECOSAM

White Paper

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Introduction

The energy sector currently contributes around 75% of global greenhouse gas emissions and 90% of all carbon emission which makes it by far the biggest contributor to the climate crisis.[1] As governments and consumers shift policies and preferences, demand for oil and gas products will decline. Investors must follow and assess how these changes will impact costs and opportunities for O&G companies.

The energy sector currently contributes around 75% of global greenhouse gas emissions and 90% of all carbon emission which makes it by far the biggest contributor to the climate crisis.[2] Unsurprisingly, oil and gas (O&G) companies are already facing growing political, societal, and financial-market pressures to shift away from emission-contributing activities and towards clean technologies and business models. Though it won't be easy, we believe fossil-fuel sector companies can also become part of the solution.

To play its part in mitigating climate change to the degree required, the O&G sector must reduce its emissions by at least 3.4 gigatons of carbon-dioxide equivalent ($GtCO_2e$) a year by 2050. That represents a 90% reduction in current emissions. As O&G companies face declining demand for fossil fuels in the coming decades, investors must follow and assess how these companies change their business models and what costs and opportunities are attached to this evolution.

Reaching these targets would be more likely if fossil fuels are gradually replaced by carbon-neutral products.[3] The O&G Sectoral Decarbonization Pathway (SDP) is part of a series of proprietary decarbonization pathway models Robeco has developed to inform investors of the risks and challenges faced by companies and sectors across the global economy as they decarbonize their operations and products. It is a proprietary framework designed to help investors distinguish O&Gs sector leaders aligned with the energy transition and sector laggards that underappreciate transitional risks or are undercapitalized and therefore incapable of keeping pace with change.

[1] https://www.un.org/en/climatechange/science/causes-effects-climate-change
[2] https://www.un.org/en/climatechange/science/causes-effects-climate-change
[3] McKinsey & Co., Insights, "The future is now: How oil and gas companies can decarbonize." January 2020.

The SDP model's components

The SDP model includes three components: a decarbonization score that rates a company's current and future emission reductions pathways against sector peers and an objective sector benchmark; an assessment of a company's credibility and capacity for hitting its own as well as benchmark emission targets; an analysis of the financial impact of stricter regulatory regimes as well as demand destruction over time.

Overview – the SDP model's components

The SDP model for companies within the O&G sector is a forward-looking tool that attempts to objectively measure the sufficiency and material impact of a company's decarbonization plan through 2050. Our analysis includes:

- benchmarking a company's self-disclosed emission-reduction commitments against scientifically based emissions reductions data for the oil and gas sector from globally recognized institutions
- an assessment of whether companies are adequately financing their emission reduction targets as well as the financial costs of regulatory fines
- valuation modeling that considers the impact of stricter decarbonization policies and more importantly stranded assets on company fundamentals

We begin by evaluating each O&G company's current emission intensity as well as their future reduction commitments against a decarbonization pathway developed specifically for the oil and gas sector by the TPI using IEA globally emissions data as well as guidelines from the IPCC.[4] This shows just how closely individual companies' own emission intensity pathways are aligned with (or deviate from) the required levels determined by science-based climate modeling in the short-, medium- and long-term. Results allow us to assign each company a decarbonization score to facilitate peer-to-peer and peer-to-sector performance comparisons. Scores are useful tools when evaluating the risk-return reward potential of individual stocks and issuers by Robeco's equity and credit investment teams.

Second, in order to assess the credibility of a company's decarbonization strategy, the SDP model estimates the capital expenditures (capex) and operational costs (opex) required for each company to meet its planned decarbonization goals. These estimates are then compared with future capex reported by companies themselves to determine if they are allocating enough funds to cover future technology investments and potential regulatory costs that result from national legislation and market shifts towards net-zero targets.

In a third and final step, we consider the direct costs of decommissioning assets (property, plant and equipment) and the lost revenue that arises from reduced demand for fossil fuels. Estimates can be used by investment analysts in modeling future cash flows and estimating impacts on a company's enterprise value and stock price.

[4] The TPI Global Climate Transition Centre is an independent source of research and data on corporate progress in transitioning to a low-carbon economy. Sector pathways designed by the TPI are calculated by using climate modelling and show the annual reductions in CO2 emissions needed to keep global warming to a set temperature scenario (i.e., 2°C, or below 2 degrees Celsius) by 2050.

Decarbonization pathways – defining targets, scoring performance

An objective pathway

Decarbonization pathways have been developed for each sector by the Transition Pathway Initiative Global Climate Transition Centre (TPI). Using IEA and IPCC climate and global emissions data, TPI constructed different pathways indicating the degree of annual emission reductions each sector needs to make in order to reach a specific temperature target by 2050 (e.g., 2°C, below 2°C, 1.5°C).

Robeco selected the TPI Below 2°C scenario Pathway as the basis for constructing individualized Convergence Pathways that show the minimum share of emission cuts a company must make each year in order for the O&G sector as a whole to align with emission intensity levels that keep temperatures below 2°C by 2050.

Convergence Pathways are built by SI Research analysts for each O&G Company using backward- and forward-looking emission intensity data (disclosed and projected).

Although all O&G companies currently overshoot the TPI's O&G sector emission targets, some are doing better than others which is reflected in the shape of their Convergence Pathway from now through 2050. Convergence Pathways of companies with larger current and mid-term emission intensities will show much steeper declines (Convergence paths with sharper slopes) compared to peers with smaller initial emission intensities. Robeco's Proprietary Convergence Pathways provide practical year by year guidance that show each O&G company where they stand and where they need to be. See Figure 1.

The units of decarbonization

In line with academic and international norms, O&G decarbonization pathways for both companies and sectors are measured in units of carbon emission intensity. Carbon emission intensity is a production-based emissions metric that indicates the total of carbon dioxide and CO2 equivalents (CO2e) emitted per terajoule of energy produced (e.g., tonnes of CO2e per TJ or grams of CO2e per MJ)).

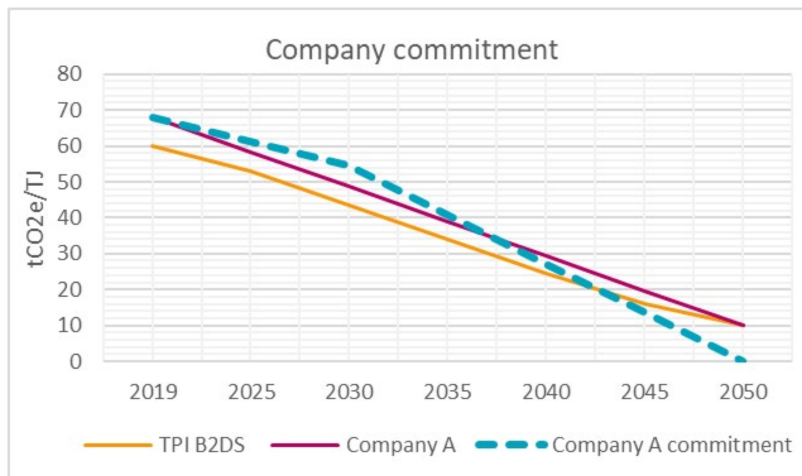
Using a normalized, production-based emissions metric allows us to compare the emission reduction pathways of oil and gas companies of different sizes with peers as well as against a sector-specific emissions reduction pathway (i.e., the sector benchmark pathway).

When calculating carbon emission intensities figures, we use the sum of Scope 1, 2 and 3 emissions. Scope 1 and 2 account for around 10-15% of company emissions, while Scope 3 (emissions from the use phase of products sold) account for the rest. According to Climate Disclosure Project (CDP) about 90% of Scope 3 emissions for oil & gas sector comes from the combustion phase (e.g., burning fuel in motor vehicles).

Company commitments

Whereas Convergence Pathways are objective decarbonization trajectories for companies constructed by SI analysts using company data and scientifically determined climate modeling scenarios, Commitment Pathways are the decarbonization trajectories of companies themselves using disclosed short-term (2025-2028), mid-term (2030-2040), and long-term targets (2050). Though a company's Commitment Pathway could be more ambitious than the SI-constructed Convergence Pathway (meaning they reduce emission intensities further than the minimal annual requirements over time) they could also lag behind it (meaning emission intensities are higher than the minimal requirements modeled in the Convergence Pathway).

Figure 1 | Comparing an O&G Company's commitments with required targets



Source: Robeco internal model

Figure 1 displays decarbonization pathways described above for an illustrative Oil & Gas company. The magenta line indicates Company A's Convergence Pathway constructed by SI Research analyst; the blue dotted line indicates Company A's Commitment Pathway based on the company's planned emission reduction disclosures.

The orange line indicates the TPI Below 2°C Pathway or TPI B2DS (the annual emission intensity reductions the entire O&G sector must make in order for global temperatures to remain below 2°C).

Measuring company performance – O&G sector decarbonization scores

We calculate a decarbonization score by comparing a company's Commitment Pathway with the TPI below 2°C Pathway (See Figure 1). Companies whose Commitment Pathways are ambitious enough in the short-, mid-, and long-term to align with the TPI Below 2°C Pathway will receive a high positive score. Those whose disclosed emission targets fail to meet required decarbonization levels will receive lower scores.

Table 1 shows the decarbonization score (1-10, 10=highest) of selected O&G companies based on their respective alignment with the TPI Below 2°C Pathway. Companies with high shares of renewables or gas and ambitious targets received higher scores. However, none of the O&G companies assessed achieved the highest score as their Scope 3 emissions reduction targets were not ambitious enough. Moreover, many companies rely on customer's using carbon offsets which have not been considered in our model.

When it comes to a company's decarbonization strategy, timing matters. Therefore, we assign different weights based on the timing of a company's commitments and actions along its decarbonization pathway (see Table 2). The final decarbonization score represents the weighted average of short-mid- and long term decarbonization targets.

Table 1: Decarbonization Scores for select companies in the O&G sector

Company	Score
Company A	5.6
Company B	6
Company C	4
Company D	3
Company F	2

Source: Robeco internal model

Table 2: Weights based on company commitment timing

Points of reference	Weight
Current intensity	25%
Short-term intensity	20%
Mid-term intensity	45%
Long-term intensity	10%

Source: Robeco internal model

Finally, scores are designed to be comparable across sectors and are calculated based on backward and forward looking emission data. In other words, a score of 10 assigned to a steel or O&G company means these companies are fully aligned with their respective sectors' decarbonization pathways. It does not mean that they have the same carbon intensity.

Measuring the costs of decarbonizing

The cost of reducing Scope 1 & 2 emissions

Announcing decarbonization targets is one indication of a company's commitment to decarbonize. However, targeted investments in decarbonizing technologies send a more robust signal. A company's strategy for achieving its self-disclosed emissions reductions must be credible to ensure that both stated reductions occur and that shareholders' exposure to transition risks does not increase. To measure credibility, we look at forecasted capex spending on emission-reducing technologies or investments in low-carbon businesses. Moreover, we also assess the cost of regulatory fines resulting from a company's failure to achieve emission targets.

The method of calculating the cost of decarbonizing Scope 1&2 emissions is, in general, different than for Scope 3. As a result, we calculate cost projections for each group separately.

Although Scope 1&2 are much lower relative to Scope 3 emissions, the absolute emission totals are still considerable. Moreover, regulators use Scope 1 emissions in O&G to impose fines, meaning they are the most exposed to regulatory costs.[5] A logical approach for lowering Scope 1 and 2 emissions is for companies to invest in the most cost-effective process changes and technologies that reduce their own energy consumption and therefore their risk of fines.
We calculate the cost of decarbonizing a company's Scope 1 and 2 emissions based on its adoption and deployment of Carbon Capture and Storage (CCS) technologies, which are already being used by some O&G companies to reduce operational emissions. CCS costs are based on IEA estimates for the O&G sector, a company's reported CCS project costs, and its upstream operational capacity for selected processes (See Table 3).

It is important to note that not all O&G companies can or will invest in CCS technologies to the same degree. The specific initiatives a company chooses in order to reduce its emissions will depend on factors such as its geography, asset mix (offshore versus onshore, gas versus oil, upstream versus downstream), and local policies and practices (regulations, carbon pricing, the availability of renewables, and the central grid's reliability and proximity).

[5] At present, Scope 2 emissions are not subject to regulations such as emission trading schemes (ETS) or taxes.

Table 3: Estimated technology and regulatory cost for operational (Scope 1 & 2) emissions decarbonization of company A				
million USD	Estimated cost of operational decarbonization	Potential policy costs 2022-2025	Potential policy costs 2025-2030	Total cost in 2025 for Scope 1+2 emission
Company A	119	1’127	1’274	2’520

Source: Robeco

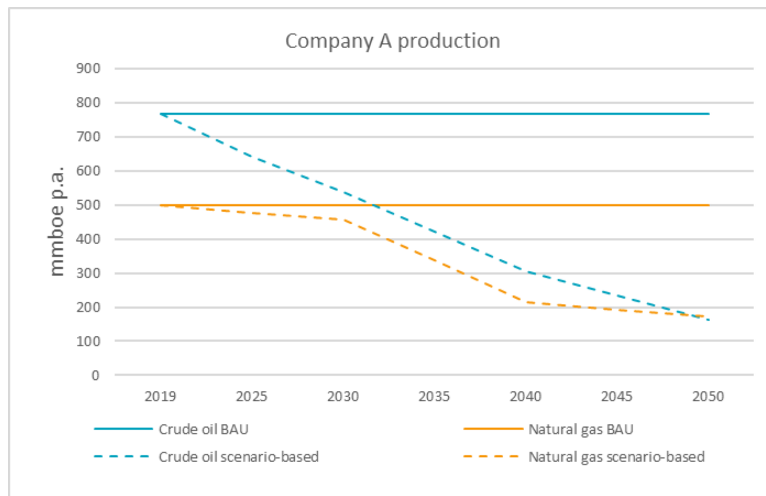
The costs of reducing Scope 3 emissions

To calculate the costs of Scope 3 emission intensity reductions, we assume future demand for fossil-fuel energy will fall as it is replaced by demand for zero-carbon energy. Thus, companies can reduce their emission intensities associated with Scope 3 emissions by, among other things, diversifying away from fossil fuels and producing more energy from other sources such as renewables. We can then measure the company’s cost of decarbonizing its Scope 3 emissions (those burned by end users in consumption) by measuring reduction in O&G production (due to demand reduction), its investments related to renewable energy generation as well as the cost of retiring assets associated with fossil fuel production.

The IPCC projects that the share of primary energy from fossil fuels will decrease from 2020 to 2050 in all of its decarbonization scenarios, with oil declining more sharply than gas. As a result, O&G companies will be faced with the need to retire/decommission assets associated with exploration, extraction, refining and distribution of carbon-heavy energy products. The retirement of balance sheet assets as well as the near total reduction in future revenue streams are essential considerations for fundamental valuation of O&G companies.

Similar to the Convergence Pathway for emissions intensity, we construct a customized demand reduction percentage trajectory for each O&G company in the short- mid- and long-term to reach the IPCC 1.5 °C ‘no or limited overshoot’ scenario by 2050. Figure 2 shows the results for an illustrative O&G company along with its business-as-usual (BAU) scenario for comparison.

Figure 2 | “Company A’s” absolute O&G production decline



Source: Robeco internal model

The chart shows the trajectory of production declines necessary for an illustrative O&G company to meet the IPCC’s 1.5 °C ‘no or limited overshoot’ scenario by 2050. Estimates have been calculated using a proprietary Robeco model using IPCC climate and emissions data.

Oil and gas follow separate trajectories as a result of gas’ lower emissions relative to oil and its status as a transition fuel.

BAU: business as usual

Demand decline is measured in units of Mmboe p.a. (million barrels of oil equivalent per annum).

Long-term valuations for O&G companies

Terminal revenue declines

Most sectors of the economy are expected to incur some costs for modifying their production methods and supply chains to ensure they can achieve the needed decarbonization for achieving a 1.5 °C degree scenario. However, the situation is more dire for O&G sector constituents which are also more likely to experience significant declines in future revenue. The expected absolute reduction of the use of hydrocarbons in a scenario where policymakers, consumers, and companies pursue net-zero targets by 2050, implies meaningful reductions in the expected sales of oil, gas, and their respective derivatives. To counteract this expected revenue decline, many energy companies are investing in renewable sources of energy. However, in most cases, the new business lines may not be able to fully offset the expected revenue losses, as competition for investing in renewables is high and returns tend to be lower.

Thus, we expect many O&G companies to enter a phase of terminal revenue, profits, and cash-flow decline. The idea of terminal decline stands in stark contrast to the 'going concern' principle used in valuing financial instruments, whereby analysts estimate that a business' cash flows will be stable to eternity after an initial modeling period of 5-10 years.

Valuation models for O&G companies must thus assume a terminal rate of decline in order to accurately grasp the impact of Scope 3 carbon emission reduction trends. As one can expect, such forecasts are subject to significant uncertainty. However, uncertainty can be reduced by considering elements such as the company's decarbonization strategy (and its assessed feasibility), the level of political commitment to decarbonization in countries where a company operates, the current and expected importance of O&G for the company's financials, as well as the cost and environmental sustainability of the company's production processes. The baseline (industry-wide) decline rates can be inferred from scenarios laid out by the IPCC, with company-specific adjustments implemented based on the aforementioned factors.

Below we show the equity valuation of an O&G company, for which the decarbonization-related valuation adjustments result in a reduction of fair value which is substantial enough to change the investment conclusion.

In valuing Company A's equity, two adjustments were made:

(1) we subtracted an estimate for decommissioning (adding it to the company's liabilities), and

(2) we based the terminal decline on a roughly 50-50 split of cash flows coming from O&G (absolute reduction in companies' fossil fuel). The latter results in a real (excluding inflation impacts) decline rate of free cash flow by 2.0% per annum (please see Table 4).

Table 4: Equity net present value (NPV) and cumulative impact of decommissioning and terminal decline

Stage	Equity NPV (USD bln)	Change	Upside	Cumulative impact (vs pre-adj.)
Pre-adjustments	100		35%	
Incl. operational, policy, and decommissioning costs of decarbonization	79	-31	7%	-21%
Incl. terminal decline (absolute reduction)	64	-23	-13%	-36%

Source: Robeco

Mandatory Scope 3 emission reductions means productive assets today will become stranded or unusable in the future. Stranded assets can impair a company's capital asset base. For O&G companies this includes O&G reserves, production equipment, pipeline infrastructure, and oil product downstream assets to name a few.

When analyzing a company's credit securities, we treat "long-term asset retirement obligation" as part of "total adjusted debt" to highlight the potential liability related to a company's obligation to remove such impaired assets. The total amount of such retirement obligation is equivalent to the discounted present value of its future asset removal expenses. We also incorporate relevant assumptions in our model such as annual capital investment budget and the expected revenue and EBITDA related as a result of low-carbon business investments over the next four-years. These assumptions help to assess the impact of a company's carbon reduction initiatives on its future profitability, free cash flow generation, and credit valuation metrics such as leverage ratio through our four-year time horizon in our model.

Outlook and conclusion

Supportive policies and tightening regulations are already changing the energy landscape. In the years ahead, the cost of capital will continue to rise, stranded assets will accumulate, demand for fossil fuels and company revenues will plummet. As the transition accelerates, forward-looking companies will be lead the switch to low- to zero-carbon technologies, creating attractive opportunities for investors along the way.

Risks and Investment Opportunities

We expect changing demand and supply dynamics as well as further regulation to impact the O&G sector's decarbonization pathway. As the least GHG-intensive fossil source, natural and liquified natural gas (LNG) demand is expected to decline later than that of oil and oil-derivative products. Natural gas is likely to play an important role in fulfilling the growing demand for electricity in the coming two decades and brings synergies and efficiencies with the new low-carbon businesses of energy companies.

A supportive government regulatory environment should stimulate the growth in renewable sources and enhance the pace of the energy transition. The recently passed Inflation Reduction Act ("IRA") in the US marks a stunning turnaround for climate action. The bill will inject at least USD 369 bn into the US clean energy economy, benefitting both renewable suppliers in the power sector and EV segments in the transportation sector.

As these sectors grow, future demand for fossil fuel should decline at a faster pace. Moreover, the IRA offers tax credits, grants, and loans to support solar and wind power generation and incentivizes newer technologies like hydrogen and carbon capture utilization and storage (CCUS). Overall, the IRA offers nearly four times as much funding for clean energy as the 2009 Recovery Act.[6]

European oil demand has been broadly flat over the last decade (excluding 2020) and the release of the EU's "Fit for 55" proposal sets more aggressive emission targets for road transport, aviation, and shipping predicated on the switch to electric vehicles (EVs) as well as to alternative fuels such as biofuels and LNG. Additionally, the application of the EU Taxonomy from January 1, 2023, will have an important impact on the way investors allocate capital which will also substantially impact companies' cost of capital and valuations for those companies with certifiably "green products".

Meanwhile, opportunities in emerging markets are positive but their timing is uncertain. China and India are among the largest fossil fuel consuming countries globally, and while both countries have increased investments in renewable products in recent years, we still have not seen meaningful measures from either to limit the consumption of fossil fuel products over the medium term.

Conclusion

Robeco's proprietary SDP model attempts to assess the risks and opportunities associated with the decarbonization of O&G companies. Decarbonization of Scope 1&2 will be different than Scope 3 emissions. While Scope 1 and 2 are important, they are mainly related to improving the operational efficiency of extraction and processing. Therefore, the costs incurred by O&G companies for reducing these types of emissions could be significantly less than for Scope 3 emissions which are directly related to reductions in absolute production.

High correlations between a company's fossil fuel divestments and simultaneous investments in low-carbon products should confirm the credibility of their commitments to emission reduction pathways. Within the model, we have carefully assessed the impact of regulatory fines, capex costs, business model disruption and transition-strategy financing and feasibility. Based on our sample group analyses, the majority of O&G companies seem to be capable of financing their commitments for Scope 1 and 2 emissions, but not Scope 3.

[6] The American Recovery and Reinvestment Act of 2009 (Recovery Act): a law under US President Barack Obama to stimulate the economy which included measures to modernize the US energy infrastructure and enhance energy independence.

In addition to internal analysis, direct engagement with O&G companies reveals there are attractive investment opportunities in the energy sector even as it decarbonizes over time. Many companies we follow have incentives to create new, low-carbon business models to gradually reach their long-term decarbonization targets, particularly for Scope 3 emissions. Energy that is low carbon (or renewable) offers much more attractive enterprise valuations and lower volatility compared to traditional fossil-fuel business models. Strong free-cash-flow generation underpinned by solid fundamentals should create incentives for some issuers to decarbonize much faster over the next years. As a result, the O&G sector presents attractive acquisition and divestment opportunities.

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Generally, no offer or sale of the Shares is permitted in Malaysia unless where a Recognition Exemption or the Prospectus Exemption applies: NO ACTION HAS BEEN, OR WILL BE, TAKEN TO COMPLY WITH MALAYSIAN LAWS FOR MAKING AVAILABLE, OFFERING FOR SUBSCRIPTION OR PURCHASE, OR ISSUING ANY INVITATION TO SUBSCRIBE FOR OR PURCHASE OR SALE OF THE SHARES IN MALAYSIA OR TO PERSONS IN MALAYSIA AS THE SHARES ARE NOT INTENDED BY THE ISSUER TO BE MADE AVAILABLE, OR MADE THE SUBJECT OF ANY OFFER OR INVITATION TO SUBSCRIBE OR PURCHASE, IN MALAYSIA. NEITHER THIS DOCUMENT NOR ANY DOCUMENT OR OTHER MATERIAL IN CONNECTION WITH THE SHARES SHOULD BE DISTRIBUTED, CAUSED TO BE DISTRIBUTED OR CIRCULATED IN MALAYSIA. NO PERSON SHOULD MAKE AVAILABLE OR MAKE ANY INVITATION OR OFFER OR INVITATION TO SELL OR PURCHASE THE SHARES IN MALAYSIA UNLESS SUCH PERSON TAKES THE NECESSARY ACTION TO COMPLY WITH MALAYSIAN LAWS.

Additional Information for investors with residence or seat in Mexico
The funds have not been and will not be registered with the National Registry of Securities, maintained by the Mexican National Banking and Securities Commission and, as a result, may not be offered or sold publicly in Mexico. Robeco and any underwriter or purchaser may offer and sell the funds in Mexico on a private placement basis to Institutional and Accredited Investors, pursuant to Article 8 of the Mexican Securities Market Law.

Additional Information for investors with residence or seat in Peru
The Fund has not been registered with the Superintendencia del Mercado de Valores (SMV) and is being placed by means of a private offer. SMV has not reviewed the information provided to the investor. This document is only for the exclusive use of institutional investors in Peru and is not for public distribution.

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Additional Information for investors with residence or seat in Spain
Robeco Institutional Asset Management B.V., Sucursal en España with identification number W0032687F and having its registered office in Madrid at Calle Serrano 47-14º, is registered with the Spanish Commercial Registry in Madrid, in volume 19.957, page 190, section 8, sheet M-351927 and with the National Securities Market Commission (CNMV) in the Official Register of branches of European investment services companies, under number 24. The investment funds or SICAV mentioned in this document are regulated by the corresponding authorities of their country of origin and are registered in the Special Registry of the CNMV of Foreign Collective Investment Institutions marketed in Spain.

Additional Information for investors with residence or seat in South Africa
Robeco Institutional Asset Management B.V. is registered and regulated by the Financial Sector Conduct Authority in South Africa.

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Additional Information relating to RobecoSAM-branded funds/services
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Some Funds referred to in this marketing material have been registered with the UAE Securities and Commodities Authority (the Authority). Details of all Registered Funds can be found on the Authority's website. The Authority assumes no liability for the accuracy of the information set out in this material/document, nor for the failure of any persons engaged in the investment Fund in performing their duties and responsibilities.

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The sale of the Fund qualifies as a private placement pursuant to section 2 of Uruguayan law 18,627. The Fund must not be offered or sold to the public in Uruguay, except under circumstances which do not constitute a public offering or distribution under Uruguayan laws and regulations. The Fund is not and will not be registered with the Financial Services Superintendency of the Central Bank of Uruguay. The Fund corresponds to investment funds that are not investment funds regulated by Uruguayan law 16,774 dated September 27, 1996, as amended.

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