



# Assessing Readiness for the Low-Carbon Transition

Climate scenario analysis of Peruvian pension fund investment portfolios

A PACTA Coordinated Project

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# Imprint

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The **2° Investing Initiative** (2DII) is an independent, non-profit think tank working to align financial markets and regulations with the Paris Agreement goals.

Working globally with offices in Paris, Berlin, London, and Brussels, 2DII coordinates some of the world's largest research projects on sustainable finance. Its team of finance, climate, and risk experts develop research, tools, and policy insights to help financial institutions and regulators hasten and adapt to the energy transition. In order to ensure its independence and the intellectual integrity of its work, 2DII has a multi-stakeholder governance and funding structure, with representatives from a diverse array of financial institutions, governments, and NGOs.

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# Executive Summary

According to the Intergovernmental Panel on Climate Change (IPCC), human influence has warmed the climate at an unprecedented rate over at least the last 2000 years.<sup>1</sup> Many of the climate changes already triggered - such as increased storms, droughts, and sea level rise - are irreversible over hundreds or thousands of years. To have a reasonable probability of keeping warming to well below 2°C and ideally 1.5°C, the latest report from the UNFCCC shows that emissions will need to decline by 45% by 2030 compared to 2010. Unfortunately based on the most recent Nationally Determined Contributions, emissions are in fact expected to rise by 16%.<sup>2</sup>

Commitments are needed to reduce emissions to the required levels. Not simply by taking daily individual actions to avoid further impact on natural resources, but by supporting long-term projects that will enable a transformation to a more sustainable economy. Furthermore, for companies to be resilient in the face of these new changes, they need the support of financial institutions and investors who can see the opportunities that this transition brings and who can then support companies in these initiatives, as significant capital investments will be required to move into clean energy, new forms of mobility, etc.

Motivated by concerns about the adverse effects of climate change at the national level, - such as glacial retreat, access to associated water resources, unusual variations in temperatures on the land and in the sea, changes in historical rainfall patterns and coastal upwelling, as well as an increase in the intensity and frequency of extreme weather events-, the Peruvian government has created programs and implemented measures to address climate change and to mitigate and prevent the effects of climate change. One example of these initiatives is the National Climate Change Strategy, which guides and promotes national actions regarding climate change per sector, region, and public institution to be implemented through their action plans. The Inter-American Development Bank has also highlighted the work the Peruvian financial regulator is doing, which requires all listed companies to disclose their environmental policy, thus obliging them to include the environmental risks of their economic activity, which has not been done yet in other Latin American countries.

This report: "*Climate scenario analysis for Peruvian pension fund investment portfolios. A PACTA Coordinated project*" is part of the project "*Strengthening capabilities on climate action for investors of the Peruvian financial ecosystem, within the framework of the Green Financing Roadmap*," financed by UK PACT and led by the PIR (Programa de Inversión responsable).

A crucial component of the Paris Agreement is Article 2.1(c), which requires making finance flows to be consistent with a pathway towards low greenhouse gas emissions and climate-resilient development. However, progress in aligning capital flows at the global level has been difficult, mainly because of the challenges in adequately measuring climate-related financial flows. The open-source Paris Agreement Capital Transition Assessment (PACTA) tool can play a helpful role in this regard. PACTA measures the (mis)alignment of investor and bank portfolios with climate goals. PACTA compares what needs to happen in sectoral decarbonization pathways with what the companies in those sectors are planning to do as reflected in their production plans for the coming five years. This approach allows financial institutions to measure the alignment of their exposures to these companies. A misalignment indicates a potential exposure to transition risk in the event of a disruptive

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<sup>1</sup> <https://www.ipcc.ch/2021/08/09/ar6-wg1-20210809-pr/>

<sup>2</sup> <https://unfccc.int/news/full-ndc-synthesis-report-some-progress-but-still-a-big-concern>

transition, i.e., in the event of a rapid and disorderly shift from a high-carbon to a low-carbon economy. Further information on the methodology is provided in Chapter 2 of this document.

PACTA Coordinated Projects is a dedicated program in which the 2 Degrees Investing Initiative (2DII) collaborates with governments, supervisors, or trading associations on an individual or collective basis, to help them apply PACTA to the portfolios of financial institutions. This program aims to measure the alignment of the entire financial sector or that of a sector and the individual participating institutions. The outcome can be used by governments, supervisors, and participating FIs to inform their climate finance strategies. Already, 2DII has helped to run such assessments in Switzerland, Liechtenstein, Norway, Luxembourg, and Austria. Further governments and supervisors are set to do the same throughout 2022.

This report provides alignment results that are based on the financial exposures of the five Pension Funds in Peru to seven sectors: oil & gas upstream, coal mining, power generation, auto manufacturing, steel manufacturing, cement manufacturing, and aviation. In addition to this aggregate sectoral-level analysis, each participating pension fund has access to their individual results with company-level information<sup>3</sup> in order to help them better understand where their climate exposures are coming from and as a basis for engaging with companies or setting strategies to align with Climate scenarios.

The analysis provided in this report, carried out by 2DII as part of a collective initiative with the PIR, represents an important step forward in the efforts that Pension Funds are making to identify and measure climate risks, and it is considered as a source of information and a pedagogical exercise for Pension Funds to strengthen their understanding of their climate performance based on the outcomes of the same tool (PACTA) and thus advance in the implementation of strategies for the decarbonization of their portfolios in the coming years.

### Summary of results by sector

PACTA shows alignment results per technology within specific sectors. The reason for this sectoral approach is that what needs to happen to meet the goals of the Paris Agreement is different per sector. Some sectors need to move faster than others, and some sectors need to switch technologies (power generation) while others need to phase down (fossil fuels). Below, a summary of results per sector is provided.

Measuring alignment requires scenarios that explain what needs to happen in a sector to decarbonize. While climate change scenarios don't predict the future, they provide essential information to understand climate change and the pathways to reach specific goals. In the efforts to tackle climate change, it is critical to understand what can happen and what should happen in a future that, although uncertain, can be planned for with the aid of the foresight provided by scenarios. It is important to note that climate scenarios are built using a range of different assumptions and, therefore can propose different courses of action to achieve climate targets. Not all scenarios cover all sectors, as such, so different sectors might be analyzed using different scenarios. The table below shows an overview of the scenarios used in this report and for which sector they are used.

**Table 1: Overview of scenarios used in this report**

Scenario	Sectors used	Implied Temperature rise in 2100	Probability	Publication	Abbreviation
Sustainable Development Scenario	Oil and Gas, Power	1.8°C	66%	IEA, WEO 2020	SDS

<sup>3</sup> The interactive report currently provides company-level information for the energy and automotive sectors.

Stated Policy Scenario	Oil and Gas, Power	2.7°C	50%	IEA, WEO 2020	SPS
Current Policy Scenario	Oil and Gas, Power	3.2°C	50%	IEA, WEO 2019	CPS
Below 2 Degrees Scenario	Automotive, Steel, Cement, Aviation	1.7°C	50%	IEA, ETP 2017	B2DS
2 Degrees Scenario	Automotive	2°C	50%	IEA, ETP 2107	2DS
Reference Technology Scenario	Automotive	2.7°C	50%	IEA, ETP 2017	RTS

### **Power generation:**

Pension fund portfolios have a mixed performance in the power sector. Companies that compose the corporate bond portfolio are in line with the Sustainable Development Scenario (SDS which is consistent with an average global temperature rise in 2100 of 1.8°C) in hydro power and gas power capacity. Nevertheless, bond issuers still need to decrease faster their oil powered energy generation and increase their investments in renewables and nuclear energy to be aligned with the Beyond 2 Degrees (B2DS) scenario.<sup>4</sup> The planned level of production of portfolio companies for the coming 5 years puts them on a >3.2°C pathway in the mentioned technologies. Regarding coal power, despite a low exposure to this technology Peruvian pension funds' portfolios are not aligned with the SDS scenario as scenarios require a decline in coal power generation, while the bond portfolio companies plan an expansion that puts them on a 2.7°C - 3.2°C pathway.

Regarding equity investments, issuers are aligned with the SDS scenario (consistent with an average global temperature rise in 2100 of 1.8°C) in coal and gas power. This is because the companies in which the pension funds are investing have no plans to increase their power generation capacity through use of these high carbon technologies. However, they will need to increase their renewable and hydroelectric power generation capacity. This may be possible to achieve through targeted engagement with companies interested in investing in green technologies. Concerning oil power in equity investments, despite a small exposure compared to the other technologies, Peruvian portfolios are on a >3.2°C pathway.

### **Automotive Manufacturing:**

Electric vehicle production in the corporate bond portfolio is in line with the B2DS scenario (which is consistent with an average global temperature rise in 2100 of 1.75°C). For listed equity investments, the planned production level is not yet sufficient and needs to increase faster to align with the B2DS scenario. Current plans for this technology puts them on a 1.7°C - 2°C pathway.

<sup>4</sup> The PACTA analysis compares the prospective production of the portfolio companies over five years with that of the climate change scenarios for the same time period. However, results should be interpreted taking into account region-specific considerations, in this case for Peru, as the climate change scenarios do not incorporate zone-specific policies or regulation.

In order to improve performance in this sector, efforts must be made to increase the production of hybrid vehicles and to decrease the manufacture of internal combustion vehicles. For these latter two technologies, the current portfolio exposures are on a pathway of above 2.5°C.

**Fossil Fuels:**

Companies in the pension funds' portfolios still plan to increase their coal production, which is not consistent with the climate scenarios. The planned level of production of portfolio companies in this technology for the coming five years puts them on a >3.2°C pathway. In relation to upstream oil and gas, the portfolio companies plan to phase down oil extraction over the next five years and the portfolio is in line with the SDS scenario (which is consistent with an average global temperature rise in 2100 of 1.8°C). Performance is the same across the two types of assets, equity and bonds.

**Steel:**

Technology roadmaps that can be used for alignment measurement do not yet exist for the steel industry. The companies in the portfolio will still have to work to reduce emissions and will need to carry out technology research & development in order to develop and finance strategies to make steel production more efficient and to reduce emissions intensity to the levels set by the B2DS scenario by 2050.

**Cement:**

As is the case for the steel industry, technology roadmaps for alignment measurement do not yet exist for cement industry. The analysis of this sector is therefore performed by comparing the emissions intensity per ton of cement with the scenarios. While the equity issuers are more efficient than bond issuers, there is still a need to decrease CO<sub>2</sub> emissions in this sector. It is expected that in the coming years there will be innovations that will allow the use of new cement compositions that emit less CO<sub>2</sub>.

**Aviation:**

The B2DS scenario requires a steep decline in the emissions intensity of aviation companies. This will require an increase in the efficiency of the aircraft used by operators, and the use of more efficient fuels, which would allow the sector to align with the B2DS pathway.

# Methodology and Data sources

## PACTA Climate Scenario Analysis

**The Paris Agreement Capital Transition Assessment (PACTA) is a free and open-source methodology and software tool developed by the 2° Investing Initiative (2DII) to assess the alignment of investor and bank portfolios with climate goals across a set of climate critical sectors and technologies.**

At its core, PACTA compares what needs to happen in sectoral decarbonization pathways with financial actors' exposures to companies in oil and gas, coal, power, automotive, cement, aviation, and steel (the "PACTA sectors"). PACTA provides a five-year forward-looking, bottom-up analysis. The analysis looks at companies' investment and production plans based on physical asset-based company level data and consolidates that information to identify the energy transition profile of the companies and their related financial instruments. This information is aggregated at the portfolio level and compared to the production plans projected by the sectoral decarbonization pathways in different climate scenarios. The current (mis) alignment between a portfolio and these scenarios allows users to infer potential exposure to transition risks and opportunities. The information provided by the PACTA analysis can be used by investors for transition risk management, identification of engagement opportunities and needs with companies, disclosure and reporting, and strategy setting and decision making.

The sectors covered by PACTA are amongst the most carbon-intensive sectors of the economy (i.e., the most exposed to transition risks). Together, they are estimated to be responsible for over 75% of all CO<sub>2</sub> emissions.<sup>5</sup> In each sector, PACTA focuses on the part of its value chain with the largest contribution in terms of influencing CO<sub>2</sub> emissions.

For example, in the oil and gas sector, the focus is on upstream activities related to production, while in the power sector, the focus is on power generation and related sources of energy. For more information regarding the parts of the value chain that PACTA focuses on, see the Annexes of this report.

The PACTA climate scenario analysis for listed equity and corporate bonds has been used by over 1,500 organizations worldwide representing a total of USD 106 trillion in assets under management. Funding for the development of the methodology and tool has been provided by the European Union's Life Program as well as a range of governments and philanthropic institutions. In addition to the PACTA climate scenario analysis, 2DII has developed climate stress test scenarios and models in collaboration with a number of financial supervisors and central banks.

This section provides a brief overview of the core principles behind the PACTA methodology. More information on the methodology and data sources is provided in reports published by 2DII<sup>6</sup> and on the PACTA Knowledge Hub.<sup>7</sup>

The core climate scenario analysis provides answers to the following three questions:

1. *What portfolio share is currently exposed to activities in sectors affected by the transition to a low carbon economy?*
2. *How aligned are the investment and production plans of companies in the portfolio with different climate scenarios and the Paris Agreement?*

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<sup>5</sup> This is the high-level estimate done by 2DII based on the World Resources Institute's greenhouse gas emissions data.

<sup>6</sup> Further details can be found on [www.transitionmonitor.org](http://www.transitionmonitor.org).

<sup>7</sup> The knowledge hub can be found here: <https://2-investing-initiative.gitbook.io/pacta-knowledge-hub>

3. *What is the portfolio's technology mix in climate-relevant sectors expected to look like in five years based on current investment plans of the companies underlying the portfolio, and how does it compare to a technology mix aligned with the Paris Agreement?*

The following table provides an overview of the key components and principles underlying the PACTA methodology.

**Table 2: Overview of principles of the PACTA methodology**

<b>Asset based company level data</b>	The analysis is based on data covering 40,000+ companies and 230,000+ energy-related physical assets obtained from third-party data providers. This alleviates the necessity to rely on companies' self-reported data that is published in a non-standardized manner and often does not account for scope 2 and 3 emissions.
<b>Forward-Looking</b>	PACTA provides a five-year forward-looking analysis of the production plans financed by a portfolio that are then compared to climate scenarios.
<b>Sector-specific approach</b>	The analysis outputs are metrics and indicators at the sector and technology level that allow for a detailed evaluation of a portfolio's alignment, rather than one aggregated indicator at portfolio level.
<b>Allocating macroeconomic goals to microeconomic actors</b>	The PACTA analysis uses a <i>market-share approach</i> to allocate macroeconomic climate targets to companies in sectors where low-carbon technologies are available thus, all market-level trends and targets are allocated to companies based on their current market share in the sector or technology for low- and high-carbon technologies, respectively. For sectors with no low-carbon technologies, the sectoral decarbonization (SDA) approach is used to benchmark portfolio production against climate scenarios. The SDA was developed by the Science-based Targets Initiative. <sup>8</sup>

### Data Sources and Coverage

The PACTA methodology is, in principle, agnostic to the data sources used to run it. The following tables outline the three types of data input that are needed and the data providers used.

**Table 3: Core data needed to perform the analysis**

<b>1. Financial data</b>	Data from financial databases and provider Lipper is used to assign securities to sectors and link them to parent and subsidiary companies.
<b>2. Asset based Company Level data</b>	For each sector covered in the analysis, 2DII sources data from its provider Asset Resolution. In turn, Asset Resolution sources its data from independent industry data providers that obtain data on individual assets in climate-relevant industries using a variety of research capabilities, including web scraping, desk research, and direct engagement with industry. The Asset based company level data covers more than 230,000 individual

<sup>8</sup> <https://sciencebasedtargets.org/>

	assets (power plants, oil fields etc.) and are estimated to account for more than 75% of global carbon emissions.
<b>4. Climate scenarios</b>	Production plans are compared to the sectoral decarbonization pathways of climate scenarios published by the International Energy Agency (IEA) and DG Joint Research Centre of the European Commission. However, PACTA being a scenario agnostic tool, the analysis can be executed with other scenarios.

**Table 4. Asset Based Company Level Data collected by Asset Resolution**

<b>Data provider</b>	<b>Sectors</b>	<b>Key data points</b>
<b>GlobalData</b>	Power, oil & gas, coal mining	a. Power plant data, including installed capacity, technology, status (i.e., announced, active, decommissioned, etc.). b. Oil and gas field data, including annual production volume. c. Coal mine data, including yearly production mass.
<b>AutoForecast Solutions</b>	Automotive	Production forecasts for light-duty vehicles
<b>RightShip</b>	Shipping	Ship data, including ship type and the GHG rating score
<b>CIRIUM, AirNav</b>	Aviation	Passenger, cargo and combined aircraft data, including number of seats or tonnes transported, aircraft model, etc.
<b>PlantFacts</b>	Steel	Steel plant data, including production and CO <sub>2</sub> emissions
<b>Global Cement Directory</b>	Cement	Cement plant data, including production and CO <sub>2</sub> emissions
<b>Power Systems Research</b>	Heavy Duty Vehicles	Production forecasts for heavy duty vehicles

The portfolios of financial institutions are mapped to the asset level data based on the International Securities Identification Number (ISIN).

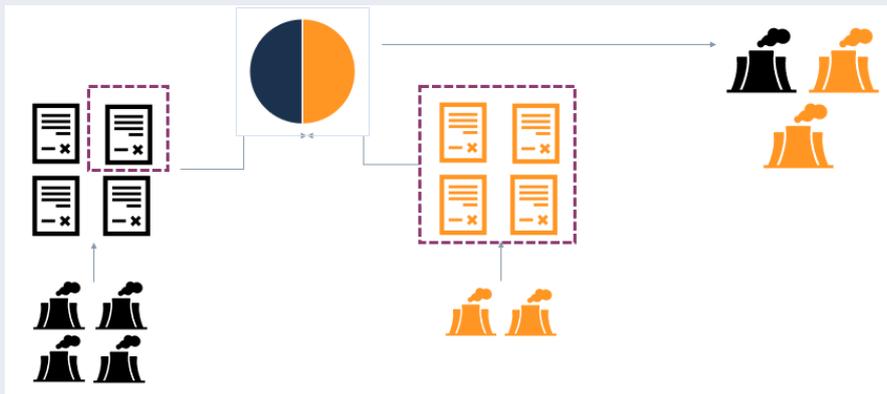
### Allocation methodology

In the interactive report available for each entity, among the options for calculating and plotting the results, users can find two methodologies - the Portfolio approach and the Ownership approach. These methods are used to attribute the physical assets of a company to the financial instrument or portfolio. The ownership approach is only available for equity, and the portfolio approach is available for both bonds and equity. The difference between these approaches is explained in the box below (See box 1).

### Box 1: Mapping and allocating company-level activities to financial instruments and portfolios Ownership vs Portfolio Approach

The ownership approach is based on what the investor owns. It is only available for equity as the equity holder has a proportion of the company that is delimited by the number of shares he owns. As the owner of a proportion of the company, they have control over that same proportion in company decision-making.

As an example, let's assume there are two companies that compose a portfolio, each one of them issue four shares, and the portfolio is owner of one share of the blue company and four shares of the yellow company. Under the ownership approach, 25% of the production of the assets owned by the blue company (1 power station) and 100% of the assets owned by the yellow company (2 power station) will be attributed to the portfolio.



The portfolio approach, on the other hand, allocates the production of the physical assets of the companies taking into account the proportion that the company represents in the portfolio. Although bondholders have relevant bargaining power with the issuer, investors do not have decision-making rights, which is why the production allocation method used for bonds is the portfolio approach.

The result of the previous example under the portfolio approach would be as follows: If the same portfolio is composed of two companies that are equally weighted, under the portfolio approach, half of the production of the assets owned by the blue company and half of the production owned by the yellow company will be attributed to the portfolio. Thus, two power stations from the blue company, and one power station from the yellow company.



As mentioned previously, in the individual interactive reports, users can choose the allocation methodology used in each of their charts, however, for this report, the portfolio approach was used for bonds and the ownership approach for equity.

## Metrics

PACTA has three main metrics: Technology Mix, Volume Trajectory, and Emission Intensities. The metrics used in each sector depend on the existence of clearly identified technology decarbonization pathways. For Power and Automotive, there are clear low- or zero-carbon technologies available. For example, power generation must transition from fossil fuels to renewables in the power sector. But there are other sectors where technology decarbonization pathways are not so well-defined, such as Steel, Cement, and Aviation. For these last sectors, given that the climate change scenarios do not prescribe technology roadmaps but give absolute values of production and carbon dioxide emissions, the approach PACTA takes is to measure alignment using emission intensity per unit of production.

### Technology Share Mix

The technology share mix represents the weight of each technology in the sector as a percentage of investment therein. The portfolio's technology mix is compared to the scenario and a market benchmark (see Figure 0.1 as an example).

The technology mix metric focuses on technology shifts within the power, fossil fuels, and automotive sectors, namely in terms of

:

- (i) the changes in the technological processes by which outputs are produced (e.g., shift from coal-fueled to renewable-fueled power capacity), and
- (ii) changes in the nature of the output itself (e.g., shift from internal combustion engines to electric vehicles).

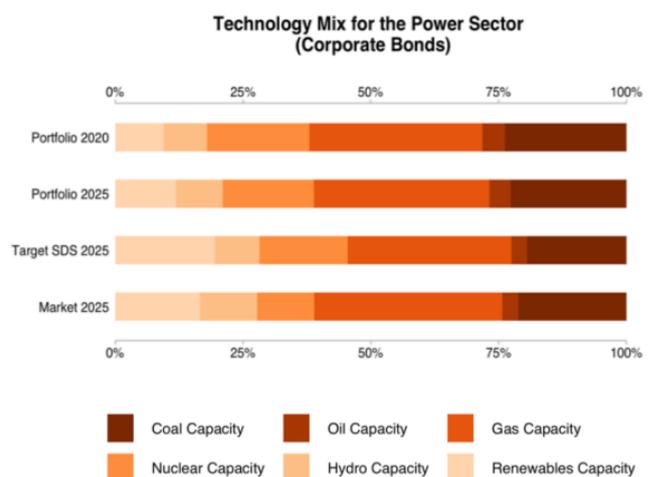
This metric measures the portfolio's relative exposure to the economic activities that are likely to be impacted by the transition to a low-carbon economy. It is a function of how diversified the investments' portfolios are across the companies they invest in and how diversified these companies' activities are across technologies or output types.

Figure 0.1 shows the high and low carbon technology mix for the power sector in a bond portfolio:

- Portfolio 2020: reflects the current technology mix of the power sector in the analyzed portfolio.
- Portfolio 2025: reflects the projected future technology mix of the power sector in the analyzed portfolio.
- Target SDS 2025: shows the anticipated technology mix of the portfolio in 2025 based on the SDS scenario.
- Market 2025: reflects the projected technology mix in 2025 based on the companies' capital plans for the next five years at a global level.

PACTA assumes a static balance sheet. As such, the difference in the technology mix between Portfolio 2020 and Portfolio 2025 is solely a result of the production plans of the companies the investor is currently invested in and not a result of any change in the portfolio composition.

**Figure 0.1: Example of the Technology mix metric**



### Production Volume Trajectory

The production volume trajectory metric aims to measure the alignment of a portfolio's projected production volume change, based on the five-year capital investment plans of companies, to those given in climate scenarios at a sectoral level.

**Figure 0.2: Example of the Volume Trajectory Chart**  
**Electric Automotive production alignment relative to the IEA's scenarios**

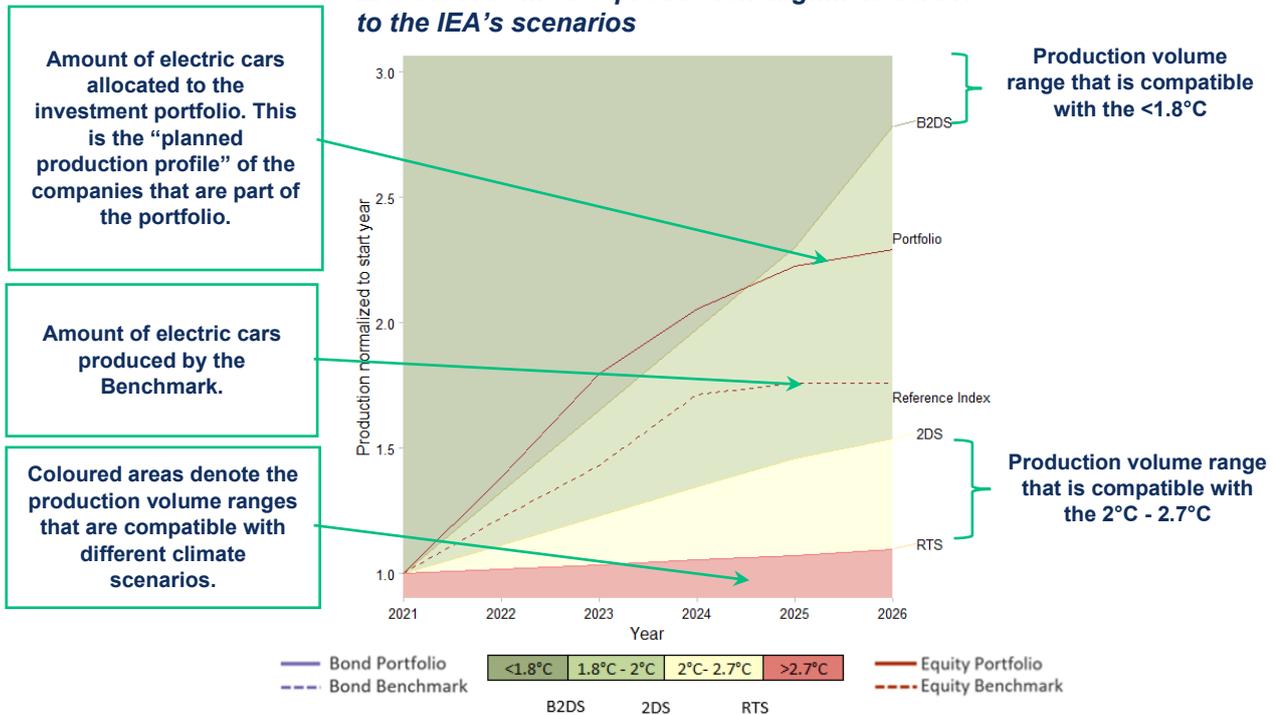


Figure 0.2 shows the production volume trajectory metric for electric vehicles as an example. This metric measures the alignment of a portfolio's projected production volume over the next five years with the ranges of change in production volumes derived as targets from different climate scenarios. Changes in production volume result either from the transfer of production from one technology to another (e.g., internal combustion engines to electric vehicles) or from the expansion or contraction in production related to the technology/fuel (e.g., a company brings a new coal-fired power plant online). The Y-axis shows the normalized production change planned for the next five years, with the current capacity represented as 1.

In Figure 0.2, the portfolios' electric vehicle production trajectory falls within the light green area and increases between 2021 and 2026. This means that portfolio companies' production plans for electric vehicles for the next five years are compatible with the 2 Degrees scenario (2DS), but production is not increasing enough to be aligned with the Beyond 2 Degrees (B2DS) scenario. In this example, the portfolio is outperforming the results obtained for the benchmark.

**The technology mix metric and the production volume trajectory metric**, both indicate how aligned the companies that are part of the portfolio are with the Paris Agreement goals. However, they differ in that the technology mix metric is a measure of the relative amounts invested in different climate relevant technologies within the portfolio. In contrast, the production volume trajectory measures whether the rate of change in the production amount is sufficient to meet target derived from the benchmark scenario that is in line with Paris Agreement goals. For example, it is possible that renewable power generation makes up a large portion of a portfolio relative to carbon intensive power generation, resulting in a portfolio that is aligned with the Sustainable Development Scenario (Paris Agreement aligned) from a technology mix perspective.

Yet the rate of renewable power generation increase may not be enough to meet the same scenario from a production volume trajectory perspective.

### ***Emissions Intensity***

Emissions intensity metrics are used to measure the average CO<sub>2</sub> intensity of a portfolio in the steel, cement, and aviation sector. The emissions intensity is measured in terms of CO<sub>2</sub>/economic output unit (for example, CO<sub>2</sub>/per ton of steel produced). It is then compared to a climate scenario's emissions intensity reference point.

While this is not the main metric of choice for the largest sectors addressed in this methodology, the emissions intensity of the activities financed by the portfolio is nonetheless the main metric in sectors for which no clear technology pathways have been set out (namely, steel, cement, and aviation). Put differently, for these sectors, no zero-carbon alternative yet exists. As such, it is not possible to use the technology mix metric or the volume production volume trajectory metric to measure alignment. However, it is still imperative to steer capital in a way that aims to decrease carbon emissions in these sectors – hence the emissions intensity metric is used.

# Transition Risk Exposure of Peruvian Pension Funds

## Coverage of the analysis

This chapter presents the results of the application of the PACTA methodology to the investment portfolios of the five Peruvian Pension Funds at an aggregate level. The portfolios analyzed in this report represent a total estimated value of assets under management of USD 42,5 bn as of the 31<sup>st</sup> of December 2020 that corresponds to the five financial institutions' equity and corporate bond portfolios. Three out of four private pension funds confirmed their participation in the analysis, as well as the country's public pension fund. In order to perform the analysis of the entire sector, publicly available information for the portfolio of the non-participating entity was included in this analysis. The results are shown per type of asset, per sector, and per technology within a sector for which technology roadmaps exist, and the results are compared to the MSCI Emerging Markets UCITS ETF USD and the Global Corp Bond UCITS ETF USD indices for equities and corporate bonds, respectively.

In terms of their composition, 33% of the pension funds investment portfolio is in listed equity, 15% in corporate bonds, and the remaining 52% in other instruments.<sup>9</sup> Figure 1 shows that Peruvian pension fund portfolios have a higher exposure to climate-relevant sectors in corporate bonds (21%) than in listed equities (12%).

**Figure 1: Exposure of bonds and equity portfolios to PACTA sectors.**

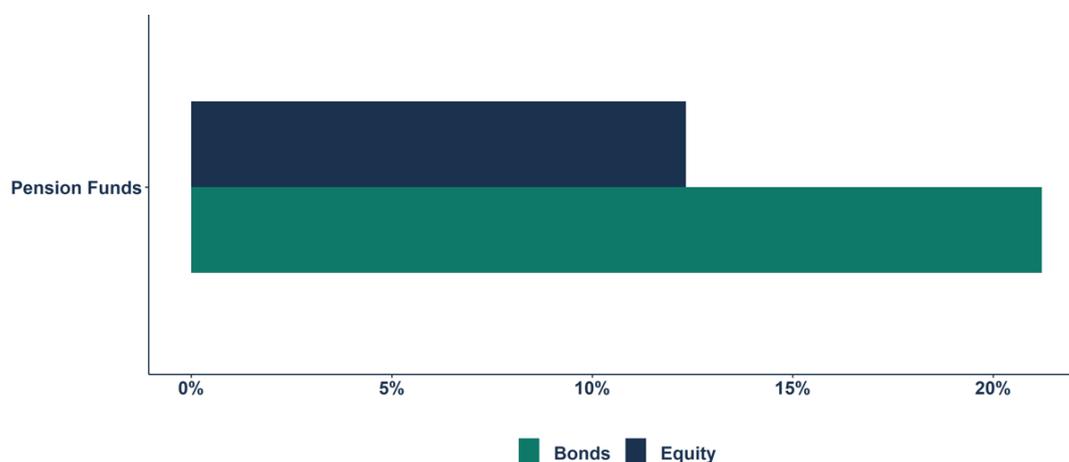
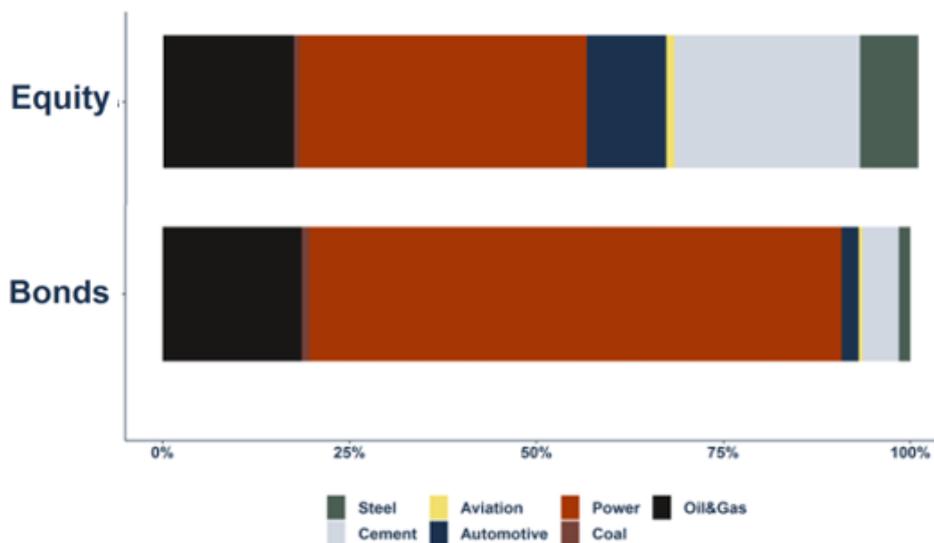


Figure 2 below shows the portfolios' exposure to each sector as a percentage of total exposure to the sectors covered in the analysis. The power sector has a predominant position in corporate bonds investments, with a 71% share, followed by the oil and gas (18%) and cement (5%). Steel, aviation, and automotive investments account for the remaining 6%. Equity holdings are more diversified, with 38% of investments in the power sector, 24% in cement, 17% in oil and gas, 10% in automotive, and 7% in steel.

<sup>9</sup> Investments in funds composed of listed equity and corporate bonds are included within the listed equity and corporate bonds estimates.

Due to its higher exposure to power generation companies than the listed equity portfolio, the corporate bond portfolio could incur more significant financial losses through exposure to transition risks affecting these companies. Although the exposure to the automotive sector is low in both portfolios, the listed equity portfolio shows higher exposure to transition risks than the corporate bond portfolio, since pension funds are investing in companies with high production of internal combustion vehicles (ICE) and insufficient production of hybrid and electric vehicles, compared to what the SDS scenario proposes.

**Figure 2: Sector share coverage, by asset type.**



## Fossil Fuels

According to the Intergovernmental Panel on Climate Change (IPCC), in 2018, 89% of the world's CO<sub>2</sub> emissions came from fossil fuels (oil, gas, coal), being the dominant cause of global warming. While natural gas is often presented as a cleaner energy source than coal and oil, it still accounts for a significant share of total global CO<sub>2</sub> emissions (20%). Oil is responsible for for approximately 30% of total global emissions.<sup>10</sup> While concerns regarding climate change have grown in the last years and there is pressure to abandon oil and gas, The United Nations Environment Program (UNEP) states in its Production Gap Report that despite the net zero-emission goals commitments and increased pledges of many countries, governments' plans to extract fossil fuels up to 2030 are still incompatible with keeping global temperatures to 1.5°C.<sup>11</sup> Therefore, it is expected that regulation will become more stringent in the years to come in order to achieve the proposed targets for CO<sub>2</sub> emissions reductions and to curtail global warming.

Fossil fuels extraction and combustion are among the main drivers of climate change. Over the last ten years the CO<sub>2</sub> emissions associated with the sector's value chain were responsible for about 64% growing to 86% of all emissions associated with human activities.<sup>12</sup>

### Technology mix

Just over 4% of the Peruvian pension funds' portfolio of listed stocks and corporate bonds is invested in direct oil and gas extraction and coal mining. Figure 3 shows that fossil fuels exposure is lower than the global market

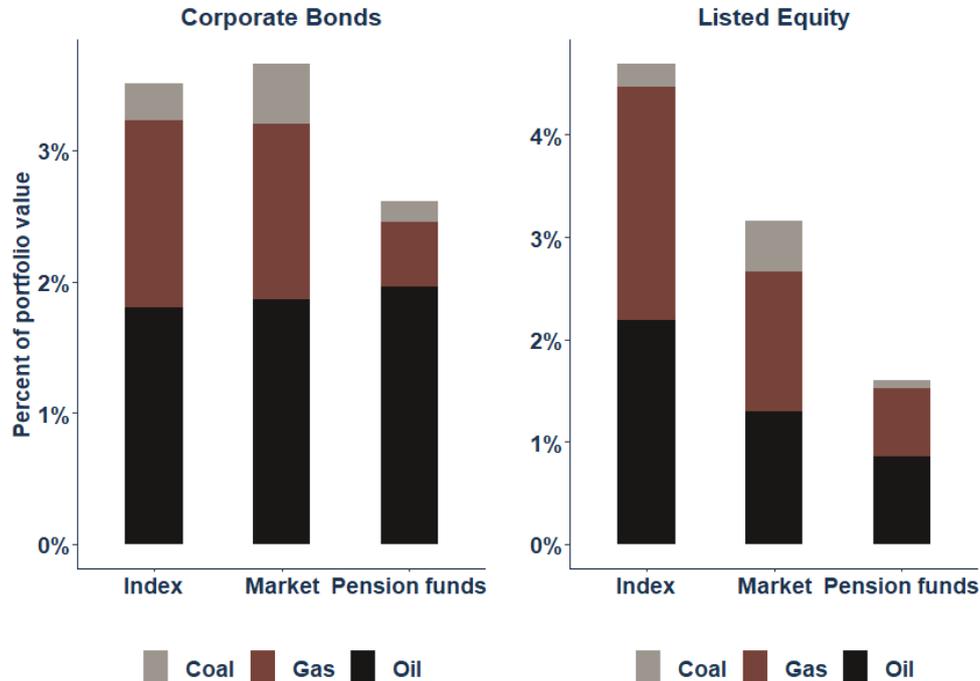
<sup>10</sup> [https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15\\_Full\\_Report\\_High\\_Res.pdf](https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf)

<sup>11</sup> <https://www.unep.org/resources/report/production-gap-report-2021>

<sup>12</sup> <https://www.ipcc.ch/report/ar6/wg1/#TS>

average<sup>13</sup> and the index used as a benchmark (iShares MSCI EM UCITS ETF USD (Dist) for equities and iShares Global Corp Bond UCITS ETF USD Dist for fixed income). The fossil fuel that has the largest share in

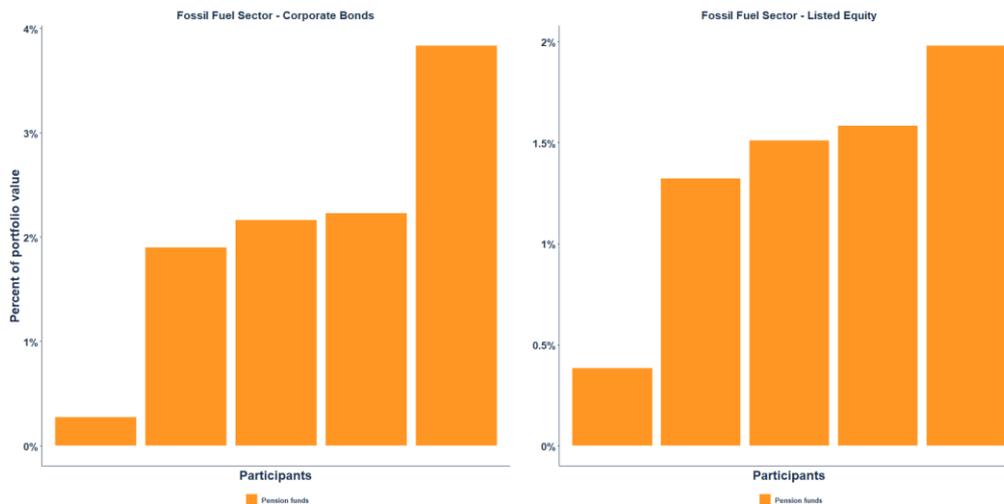
**Figure 3: Exposure of Peruvian pension fund portfolio to upstream fossil fuel extraction as a % of portfolio value.**



both equities and corporate bonds is oil (2,9%), followed by gas (1%), and coal (0,3%) from a total exposure of 4,2% in Fossil Fuels.

Exposure to fossil fuel extraction varies from one entity to another. Among corporate bonds portfolios, the entity with the largest exposure has investments representing approximately 4% of its portfolio value. The one with the lowest portfolio exposure has less than 0.5%. For equities, the portfolio with the highest exposure has investments of around 2% (see figure 4).

**Figure 4: Individual exposure of Peruvian pension fund portfolios to fossil fuel extraction.**



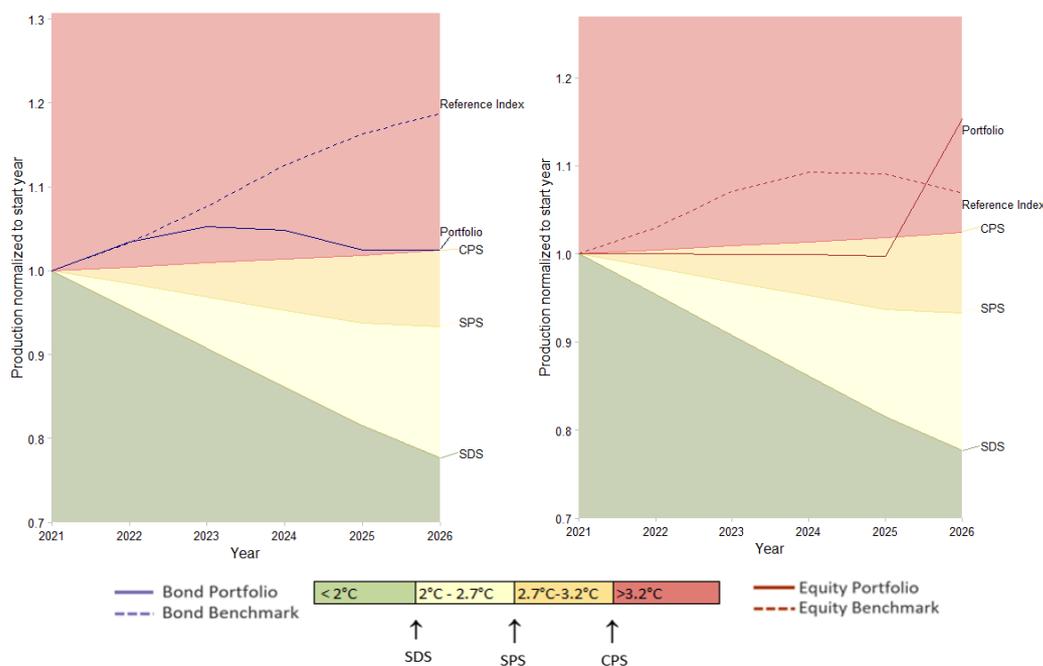
<sup>13</sup>Global market refers to all the companies included in the dataset used to conduct the analysis.

### Trajectory Alignment

A common consensus in all climate change transition scenarios is that to limit global warming to below 1.5°C, there must be a progressive decrease in the extraction of fossil fuels. The shaded areas of the following volume trajectory graphs for the fossil fuel sector reflect the International Energy Agency's WEO scenarios projections.

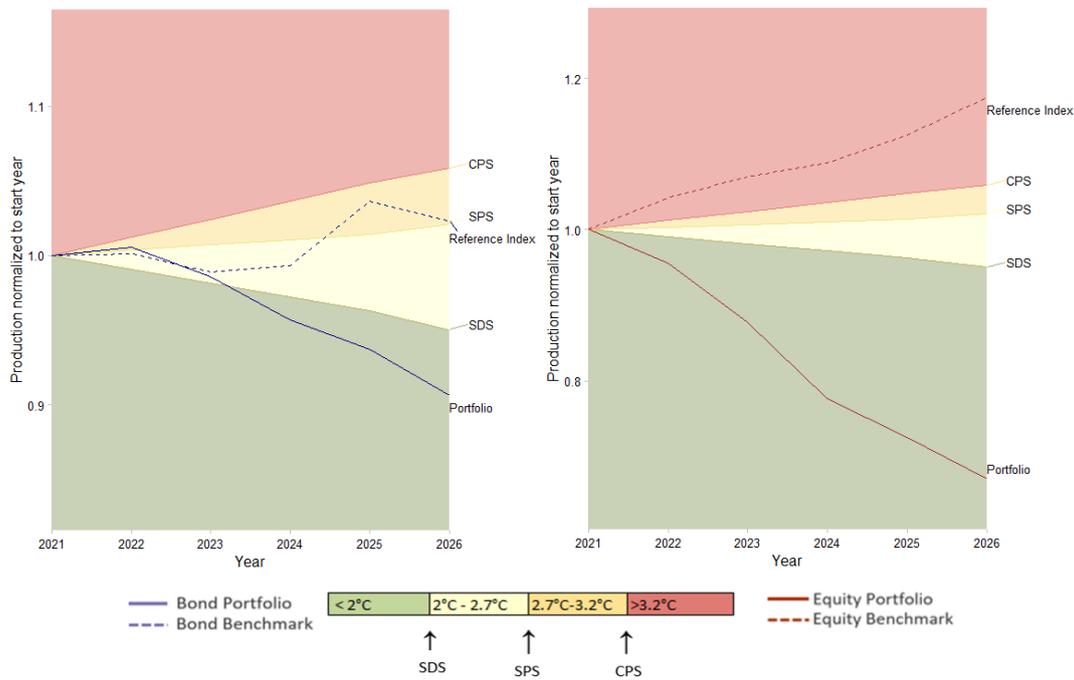
**Coal:** Companies that compose the portfolios, both in stocks and corporate bonds, plan to increase their coal extraction in the next five years. Companies have used bonds to make investments will increase coal extraction until 2023, after which a phase-down is planned. Nevertheless, by 2026, corporate bond investments are expected to be aligned with a Current Policy (CPS) scenario (consistent with a global average temperature rise of 3.2°C). Regarding equity investments, companies follow a path consistent with a global average temperature rise of 2.7°C – 3.2°C until 2025, after which a substantial increase in coal mining is planned, putting them on a trajectory consistent with a global average temperature rise of > 3.2°C. According to the IEA, to align with the SDS scenario, coal extraction must decrease by 22% in both portfolios over the next five years. While bond investments outperform the benchmark, the production trajectory of the equity portfolio plans to increase coal mining by 7% and the bond portfolio by 2%, which is contrary to what the scenario requires to meet climate change targets. In both assets, Peruvian pension funds are therefore exposed to transition risks (see Figure 5).

**Figure 5: Alignment of coal mining in corporate bond (left) and listed equity (right) investments relative to the IEA scenarios.**



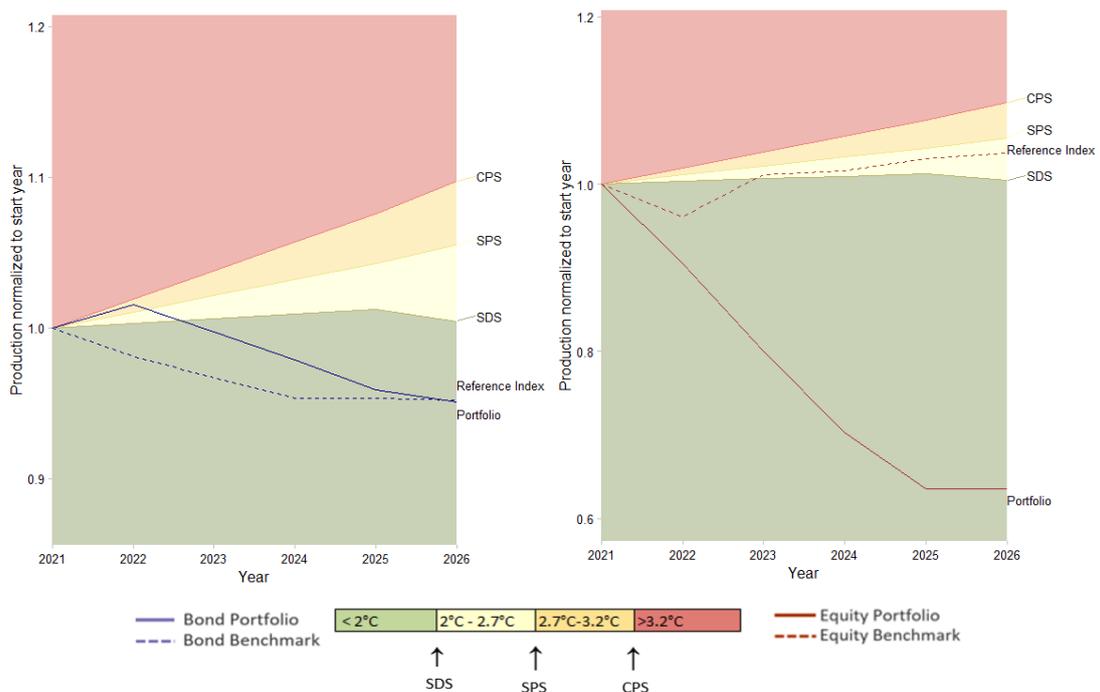
**Oil:** Forecast oil extraction associated with bonds and equity decreases at an appropriate rate and in line with the SDS scenario. Pension fund portfolios outperform the benchmark used in the two asset classes for the analysis. On one hand, the iShares Global Corp Bond UCITS ETF USD Dist is on a trajectory compatible with a temperature between 2.7°C and 3.2°C while the iShares MSCI EM UCITS ETF USD (Dist) is on a trajectory consistent with a temperature >3.2°C. Even though oil has an important share among the fossil fuels in the portfolio, there appears to be no high transition risk associated with these investments for Peruvian pension funds. (See Figure 6).

**Figure 6: Alignment of oil extraction in corporate bond (left) and listed equity (right) investments relative to the IEA scenarios.**



**Gas:** Gas extraction by the companies composing the portfolio will decrease in equity and corporate bond investments. For the equity portfolio, this decrease will be 37% and for the corporate bond portfolio 5%. This forecast reduction is in line with the SDS scenario, implying that they are on a trajectory consistent with a temperature rise of <2°C (See Figure 7).

**Figure 7: Alignment of gas extraction in corporate bond (left) and listed equity (right) investments relative to the IEA scenarios.**



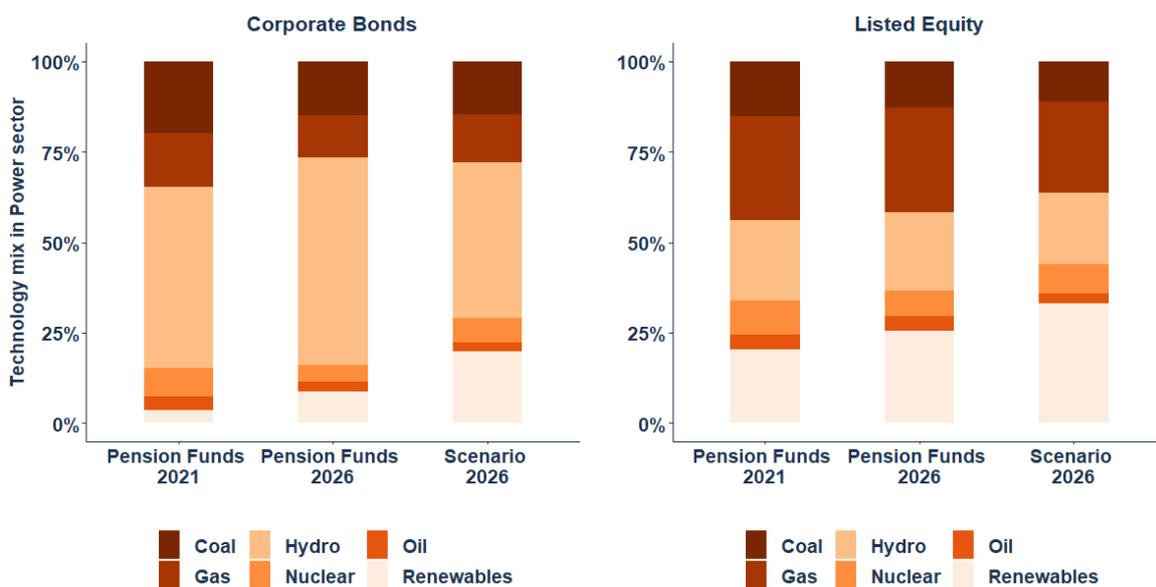
## Power

The power sector is at the center of the low-carbon transition and accounted for 42% of global energy-related CO<sub>2</sub> emissions in 2018. Electricity and heat are responsible for at least 20% of all Greenhouse Gas (GHG) emissions in Central and South America according to WEO2021<sup>14</sup>, hence the urgency of a climate transition in the power sector to meet the Paris Agreement's goals of limiting the global average temperature rise to well below 2°C above pre-industrial levels. Fortunately, different technologies have been developed to generate clean energy, such as renewable energy and hydroelectric. Naturally, the climate transition scenarios favor the production of power through these clean technologies and propose a decrease in the power production capacity from high carbon technologies based on coal, gas, or oil to meet the remaining carbon budget for this sector. According to the IEA, in 2019, 68% of electricity in the region was generated by renewables due to the large potential of hydropower (80% of renewables, 54% of total electricity generated)<sup>15</sup>. Despite the share and relevance of this technology in the sector, according to the IEA, dam capacity should only increase a further 6% by 2025, while other renewables should double their capacity by 2025 to follow the SDS pathway.

### Technology mix

Figure 8 shows the current and future exposure of the portfolios aggregated by asset type and are compared to the SDS scenario. Equity investments have significant exposure to gas power generation 29%, hydroelectric 22%, renewables 20%, and coal 15%. Technologies with the lowest share in this sector are nuclear (9,4%) and oil-based power generation (4%). Portfolio companies plan to increase the share of renewable energy production (+5,36% by 2026), but according to the IEA's SDS scenario, exposure to renewables should be greater than that planned by the companies by 2026 (43,10%). As for bond investments, the largest exposure is associated with hydropower capacity, accounting for 50% of portfolio investments in the energy sector. Coal power capacity is the second most relevant technology in this portfolio, with a share of 19,75%, followed by gas power, with 14,96%. The high capacity in hydropower, which is 35% higher than the power sector<sup>16</sup>, makes the corporate

**Figure 8: Current and future technology mix of power capacity generation of the listed equity and corporate bond portfolios as a % of the sector.**



<sup>14</sup> World Energy Outlook, 2021.

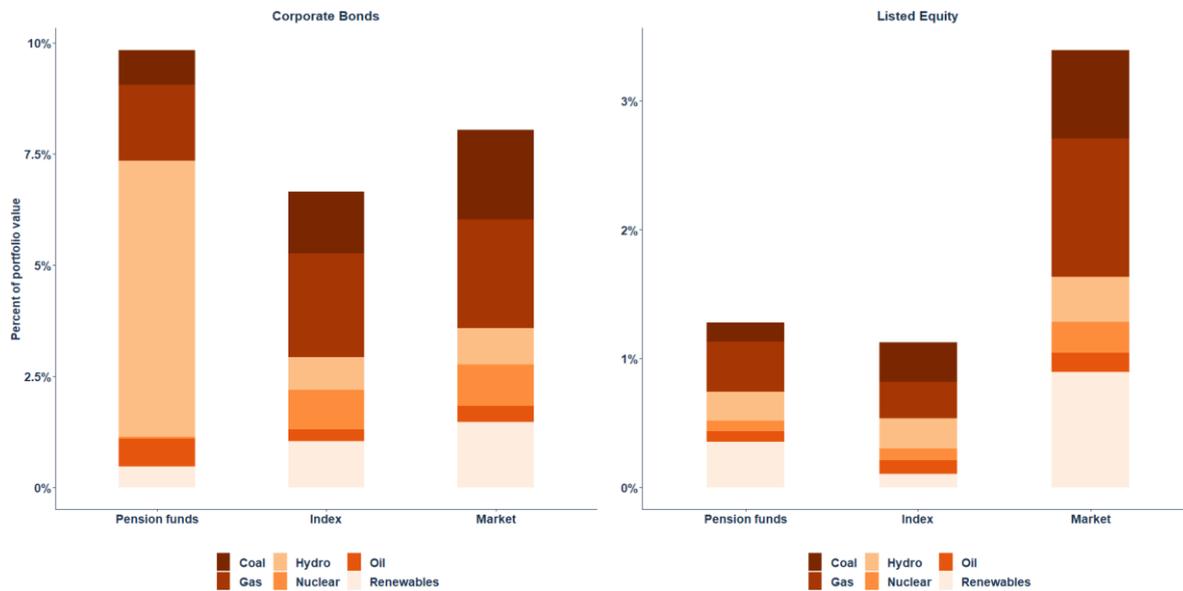
<sup>15</sup> World Energy Outlook, 2020.

<sup>16</sup> Global market refers to all the companies included in the dataset used to conduct the analysis

bond investments more aligned than the market or the index used as a benchmark for this type of asset. (See details of the trajectory alignment for hydropower).

Figure 9 shows that while there is a higher exposure of the corporate bond portfolio to the power sector, most of this power is generated using green technologies, with 67% versus 38% and 43% for the portfolio, index, and market respectively. In the case of listed equities, while the portfolio's exposure is lower than the market's, more than half of the energy generated is through low carbon green technologies, while in the market, 65% of the energy generated is through high carbon brown technologies. While the index has a lower share of power generation, 62% of it is generated using high carbon brown technologies.

**Figure 9: Current technology mix of power capacity generation as a % of portfolio value compared with the benchmark and the global market.**

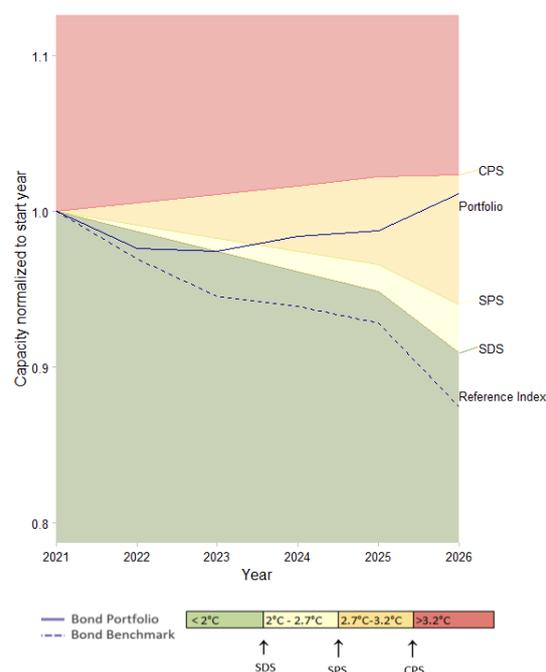


**Figure 10: Alignment of coal power generation in corporate bond relative to the IEA scenarios.**

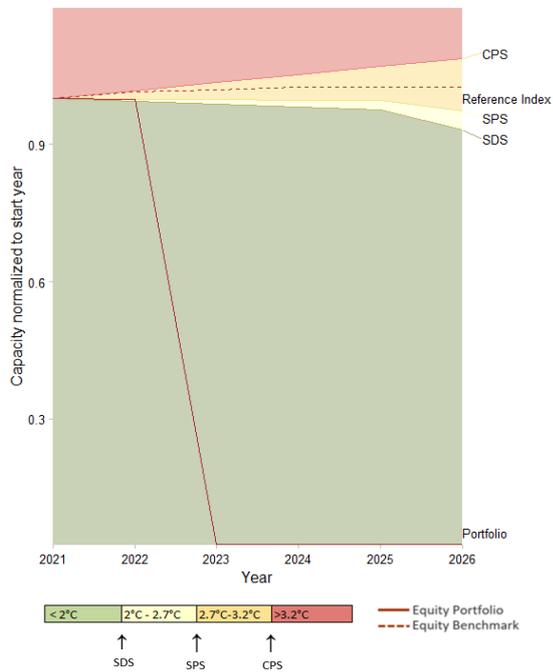
### Trajectory Alignment

**Coal power:** While the bond portfolio will be aligned with the SDS scenario until 2023, coal capacity additions in the next three years misalign the portfolio with the SDS from 2023 onwards. Bond portfolio companies plan to increase their coal power capacity marginally by 1% over the next five years, while it would need to decrease by 9% to align with the SDS. This increase is compatible with a 2.7°C - 3.2°C scenario. (See figure 10). The benchmark used for the bond investment outperforms the Peruvian portfolios. This may be due to benchmark companies having already begun the transition to power generation with cleaner technologies.

Regarding equity investments, while the reference index has a stable trajectory aligned with the CPS scenario, in the equity portfolio of Peruvian funds, there is a sharp reduction in coal capacity by 2023. This reduction results from the fact that there are



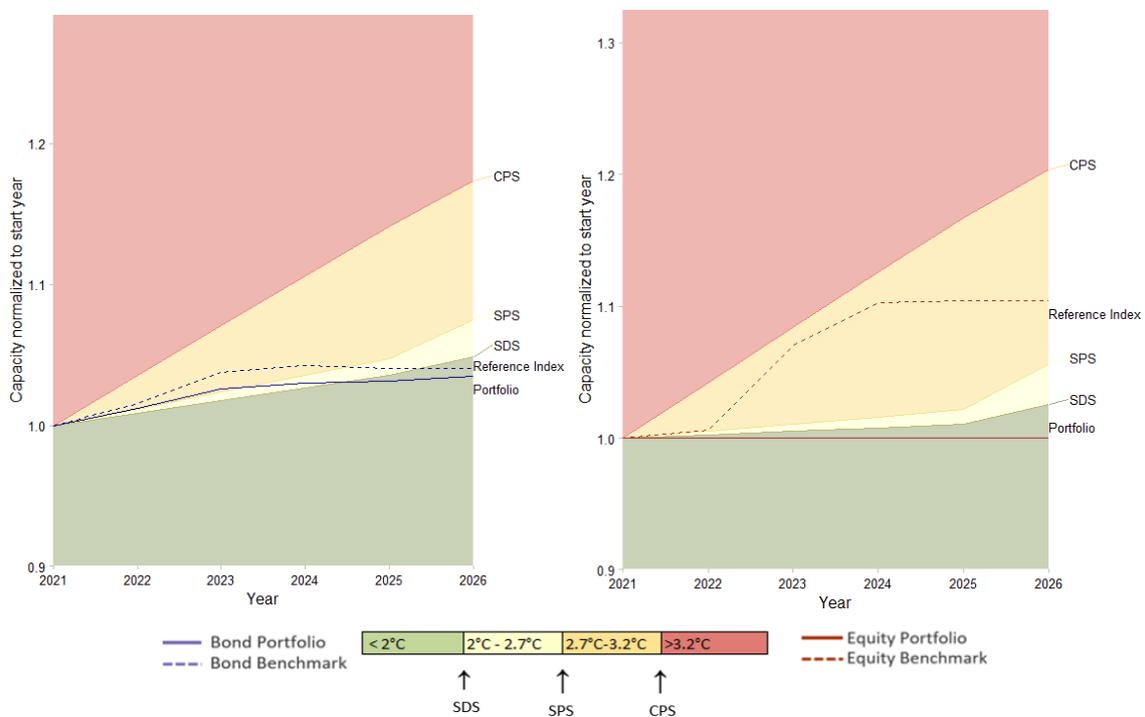
**Figure 11: Alignment of coal power generation in listed equity relative to the IEA scenarios.**



few companies in the portfolio exposed to this technology, and the companies that are currently exposed to coal-fired power generation capacity, plan to phase out coal-based power generation. Therefore, there is low exposure to transition risk arising from equity investments in this technology. (Figure 11).

**Gas Power:** Most scenarios allow an increase in gas power to compensate for some necessary decrease in oil and coal and not to over-rely on the intermittency of renewables. Nevertheless, it's important for companies to avoid increasing their exposure in excess, as this would imply an increase in transition risk exposure further into the future. Companies that constitute the Peruvian pension funds' bond investment portfolio plan a 3.4% increase in gas generation capacity, while SDS anticipates a maximum 4.8% increase. Listed equity issuers foresee no change in their production plans, while SDS anticipates a maximum 2.5% increase in gas capacity. Both portfolios align with the SDS scenario which is consistent with a global average temperature rise of <math><2^{\circ}\text{C}</math> (See Figure 12).

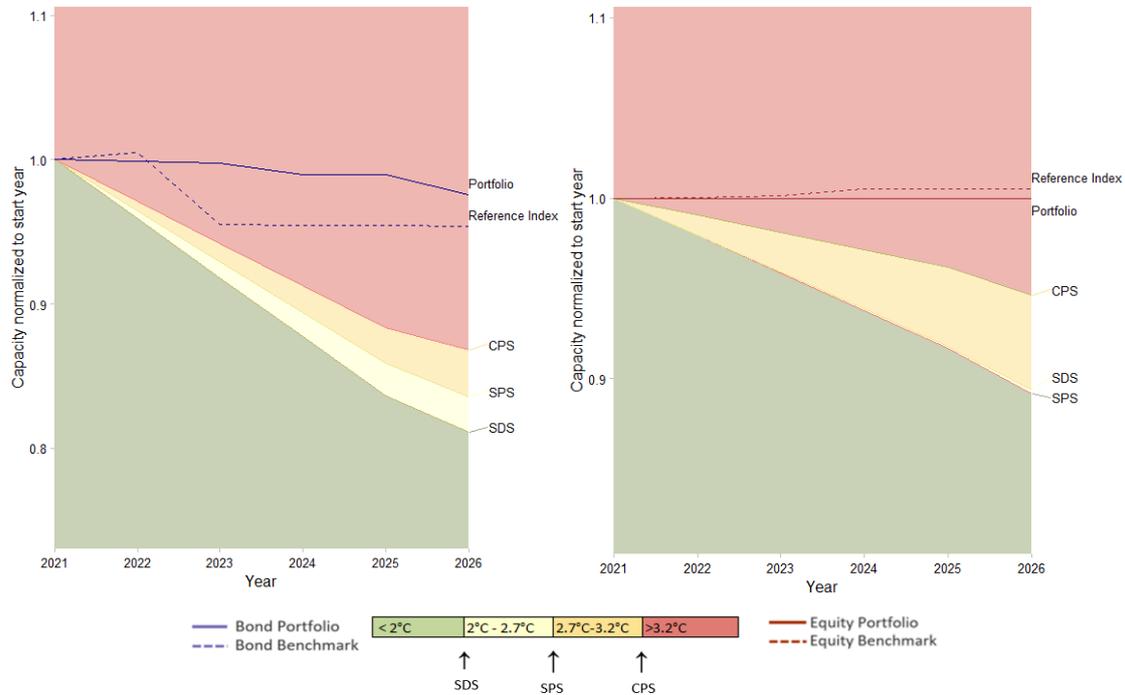
**Figure 12: Alignment of gas power in corporate bond (left) and listed equity (right) investments relative to the IEA scenarios.**



**Oil power:** Bonds and equity investments follow a similar trend in relation to oil power. While none of the issuers in these types of assets are planning to add oil power capacity in the next five years, they are not phasing down enough the capacity to be aligned with the IEA's transition scenarios by 2026, thus both portfolios follow a >math>3.2^{\circ}\text{C}</math> scenario trajectory. The listed equity portfolio requires a decrease of 20% in oil power generation capacity by

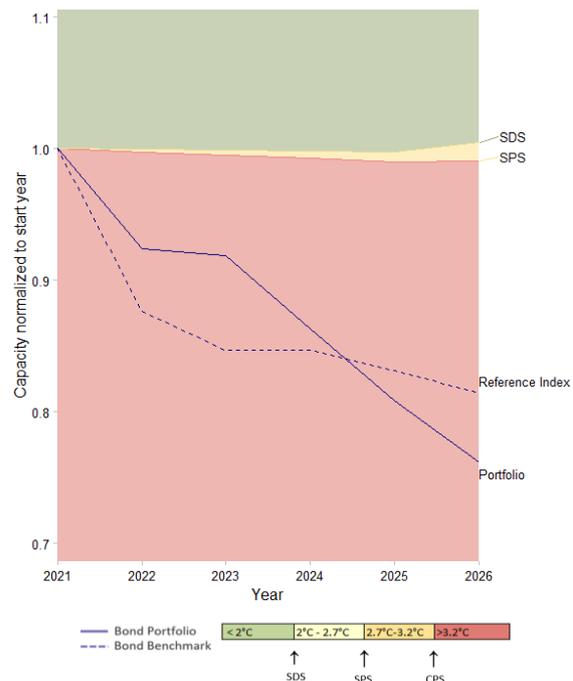
2026 to align with a <math>2^{\circ}\text{C}</math> scenario, while the corresponding reduction in the corporate bond portfolio needs to be 29%. (See figure 13)

**Figure 13: Alignment of oil power in corporate bond (left) and listed equity (right) investments relative to the IEA scenarios.**



**Nuclear Power:** Another technology that is expected to address the intermittency of renewables is nuclear energy. While the IEA scenarios plan a minor increase in this technology, the companies that compose equity and bonds investments follow an opposite pathway (See figure 14). Nuclear capacity in bond investments is planned to decrease sharply (around 20%). Some other scenarios also indicate some pathway shifting out off nuclear power. This is the case for the Institute for Sustainable Futures' scenario prepared for Net Zero Asset Owner Alliance<sup>17</sup>. But even in those scenarios, the decrease in nuclear is around 5% in the next five years, so the decrease planned by the companies in the portfolio is much greater. As for equity investments, the portfolios remain constant in terms of nuclear power capacity over the next five years. However, to be in line with the SDS scenario, nuclear power generation capacity must increase by at least 1.5 times current production.

**Figure 14: Alignment of nuclear power in corporate bond investments relative to the IEA scenarios.**

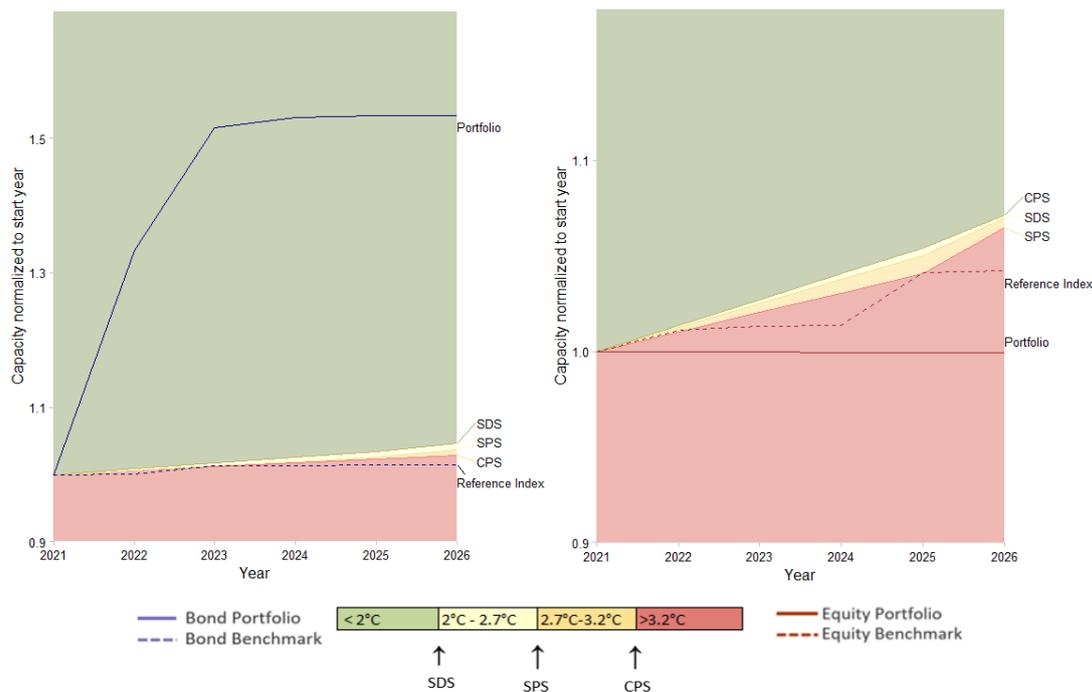


**Hydroelectric Power:** Misalignments within the power sector can be potentially compensated by an increase in hydropower, given the potential for the

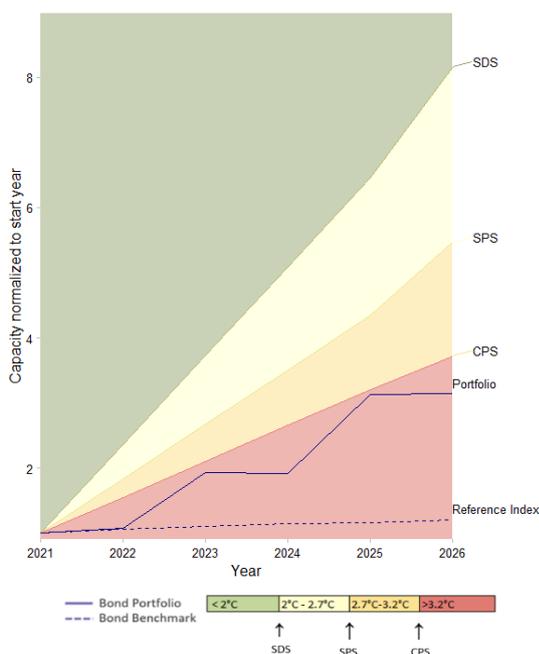
<sup>17</sup> <https://www.uts.edu.au/sites/default/files/2020-12/OECM%20Sector%20Pathways%20Report%20FINAL.pdf>

growth of this technology in South America. Figure 15 show that although the corporate bond portfolio is already significantly exposed to hydropower companies, they plan to build more hydropower capacity at a higher rate than the SDS scenario. Regarding the equity portfolio, issuers have no plans for an increase in hydroelectric power generation capacity. Therefore, equity investments are not aligned with the SDS scenario in hydroelectric power. The portfolio's trajectory is compatible with a >3.2°C scenario (See figure 15).

**Figure 15: Alignment of hydroelectric power in corporate bond (left) and listed equity (right) investments relative to the IEA scenarios.**



**Figure 16: Alignment of renewable power capacity in corporate bond investments relative to the IEA scenarios.**



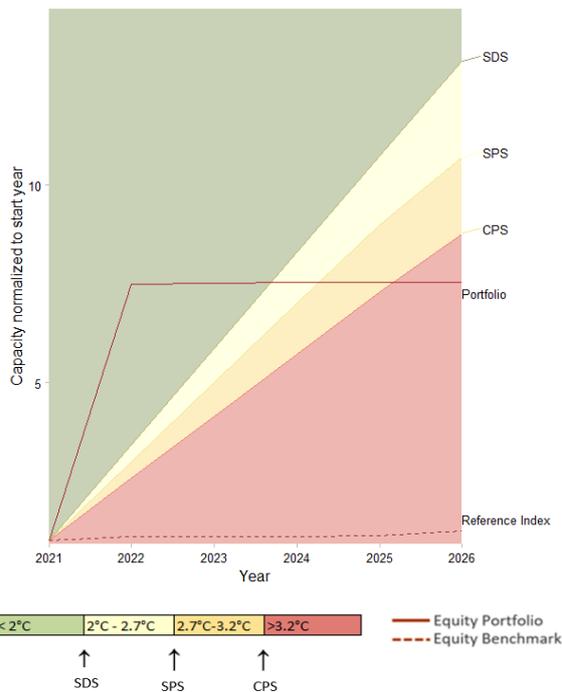
**Renewables:** Although there is an increase in renewable energy capacity in bond investments, the companies' efforts are not yet sufficient to be in line with the SDS scenario. According to the plans of the companies that make up the portfolio, bond investments would be consistent with a global average temperature rise above 3.2°C (Figure 16). The increase required to be aligned with a Paris Agreement scenario is 15 times their current production in renewables compared to the three fold increase that the portfolio companies in bond investments are planning over the next five years. As for equity investments, the portfolio will experience a large increase during the first year of the analysis due to one single company (which plans to increase its capacity in renewables to seven times its current capacity). However, in order to be aligned with the SDS scenario by 2026, the efforts made by the companies in the equity portfolio should be greater and constant during the remaining four years of the analysis (See figure 17). The results indicate that companies in the power sector might not be seizing opportunities to invest more in renewable energy sources in the context of the energy transition.

### Peer comparison for low carbon technologies in power

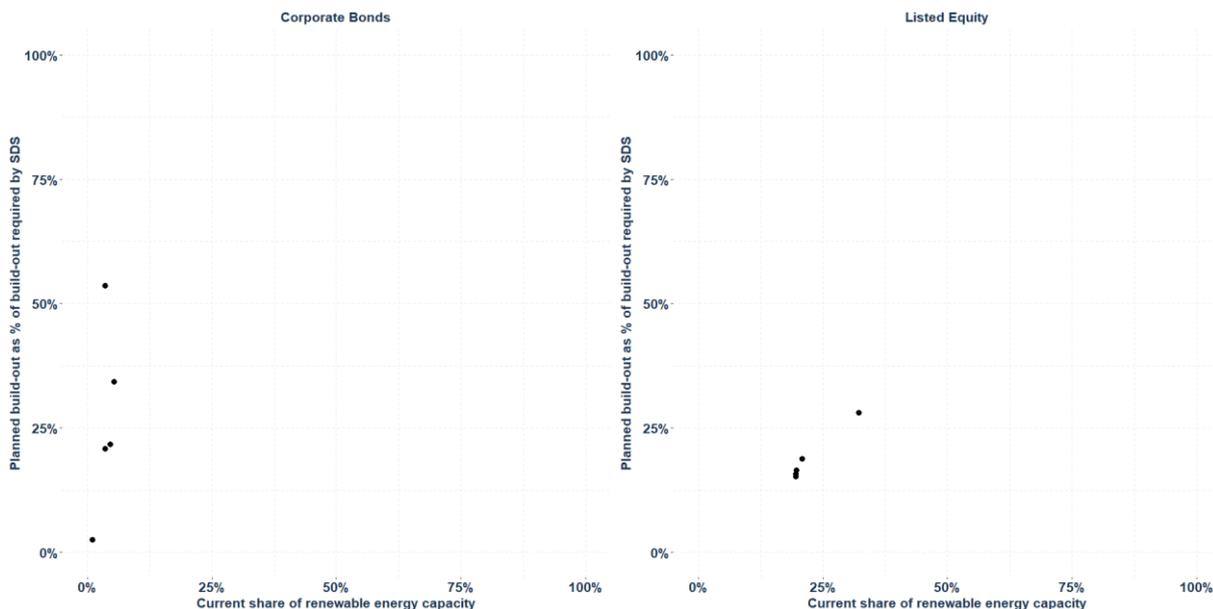
The following section presents an anonymous comparison of the performance of each pension fund compared to its peers as a function of exposure to green technologies (renewables in this case) and the percentage of the company's effort to achieve a Paris-aligned scenario. The portfolios located towards the right in the charts in figure 18 are currently more exposed to renewables. As for the Y-axis, the higher the portfolio is on the chart, the more buildout of capacity is planned and so exposure to renewable energy will increase in the future.

One of the equity portfolios outperforms its peers, having more exposure to renewables (about 33%) and also investments in companies that plan to build renewables faster (about 28%). In terms of bond investments, all portfolios are currently less exposed to green technologies compared to equity investments, which is due to a higher exposure to hydropower, but the buildout of renewables planned varies a lot between portfolios, ranging from about 5% to about 55%. (See figure 18)

**Figure 17: Alignment of renewable power capacity in listed equity investments relative to the IEA scenarios.**



**Figure 18: Current exposure vs future build out in renewable power for both equity and bond portfolio**



**Figure 19: Participants exposure to low carbon technologies in power sector**

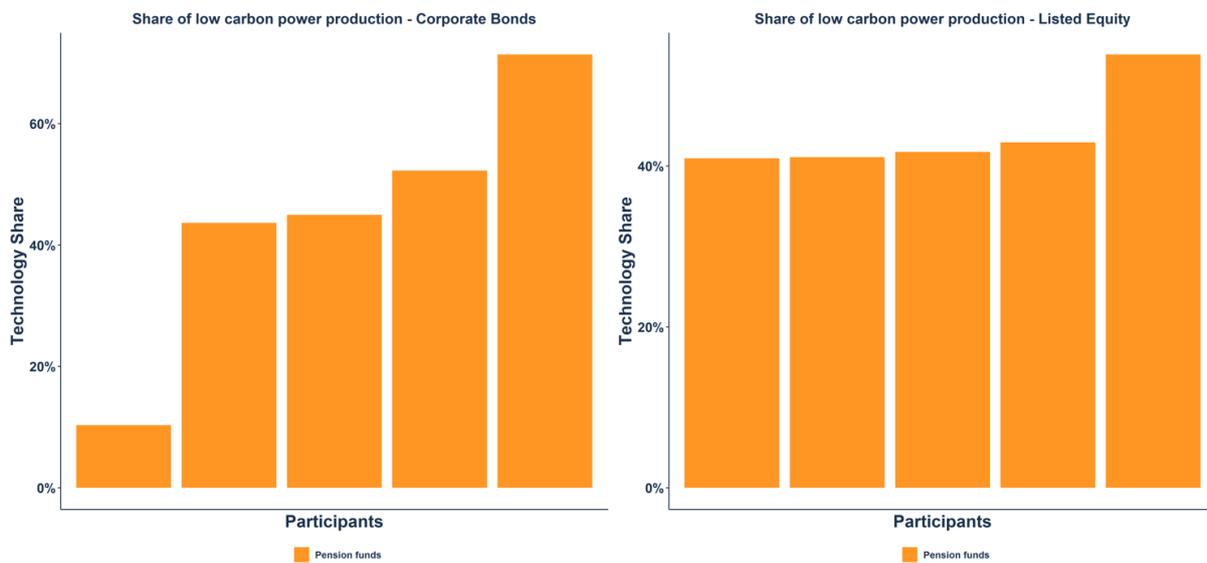


Figure 19 shows the participation of individual portfolios in energy generation using low-carbon technologies. While the portfolios of Pension Funds show a similar proportion in low carbon technologies investments in the equity portfolios, ranging between 40% and 50%, in the fixed income portfolios energy generation using these technologies is more variable. One of the portfolios is invested in companies that generate approximately 70% of the energy through low carbon technologies, meanwhile, another portfolio is invested in companies that generate only 10% of their energy using low carbon technologies. The other three funds have stakes of between 40% and 50% in these technologies.

## Automotive (Light Duty Vehicles)

Despite being a major contributor to global warming, the automotive industry has for many years been an essential part of day-to-day life for people in many parts of the world. The uncontrolled increase of internal combustion engine cars may, however, prevent us from limiting global warming to well below 2 degrees Celsius.<sup>18</sup> Different options exist to limit CO<sub>2</sub> emissions in this industry, such as hybrid vehicles or electric vehicles. Companies will need to adapt in order to manufacture new technologies or face significant government action that could affect their finances and impair their ability to operate.

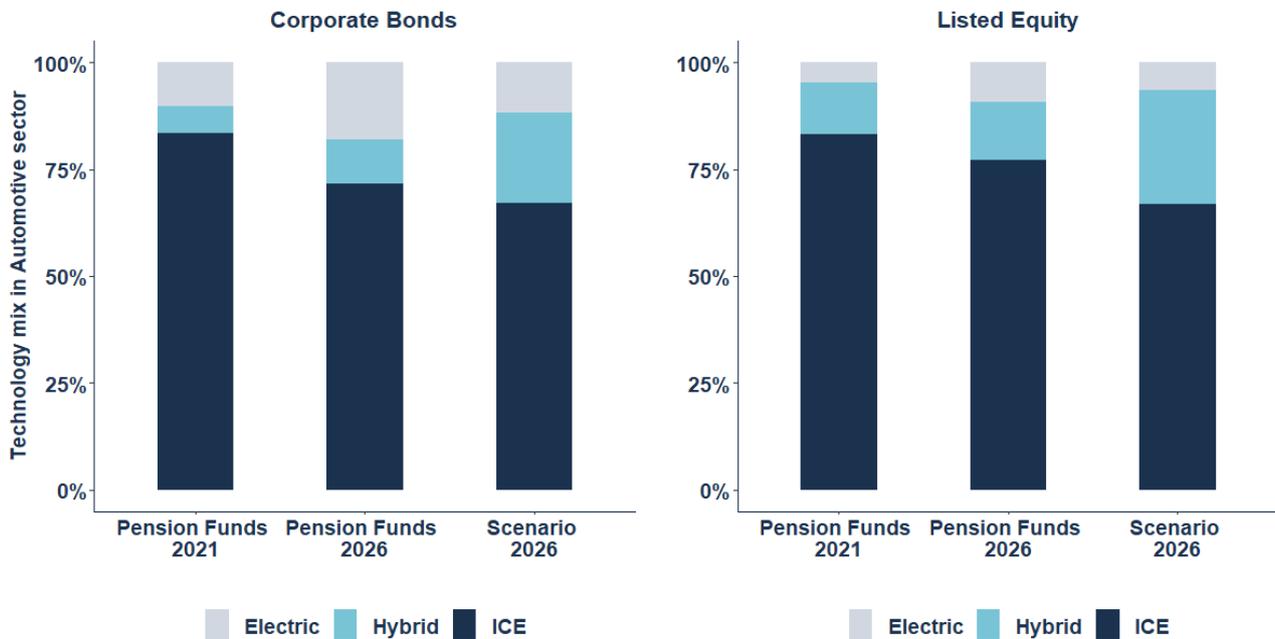
### Technology mix

Peruvian pension funds' listed equity portfolio has a higher exposure to the automotive sector than the corporate bond portfolio (see Figure 2). The technology with the highest exposure in both portfolios is ICE (Internal Combustion Engines), accounting for 83.3% of the total vehicles produced by the companies comprising the bond portfolio and 83.1% of the total vehicles produced by the companies in the equity portfolio. It can also be observed in Figure 20, that bond issuers plan to increase their stake in electric vehicle production to a greater extent than the equity issuers, with 8% and 4% additional participation, respectively. Regarding hybrid vehicle production, both portfolios plan to increase their participation, but the levels expected by 2026 are still insufficient to reach the SDS scenario technology mix. While the corporate bond portfolio will increase its stake by 4% and

<sup>18</sup> The United Nations predicts a threefold increase in the number of private cars by 2050, which could lead to an increase in CO<sub>2</sub> emissions if there is not a radical change in the industry.

the listed equity portfolio by 1% in this technology, the SDS scenario requires an increase of 15% and 14%, respectively.

**Figure 20: Current and future technology mix of automotive production of the listed equity and corporate bond portfolios as a % of the sector.**



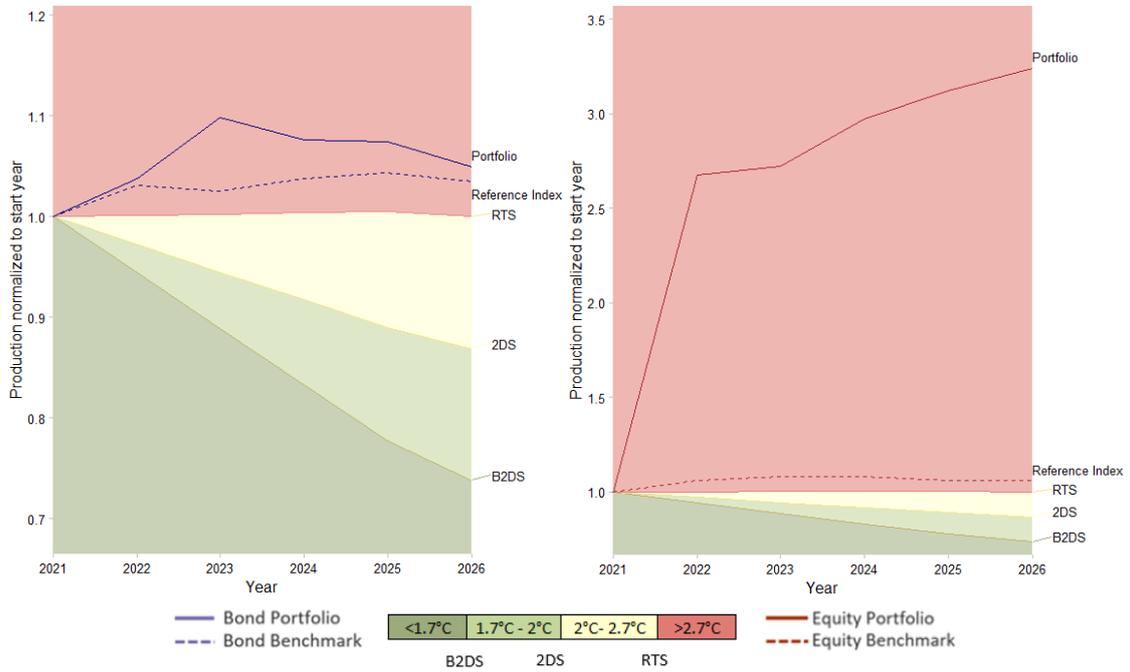
According to the SDS scenario, Peruvian pension funds' bond investments should have at least 21% exposure to hybrid vehicles and 12% to electric vehicles by 2026. For the equity portfolio, the participation in hybrid vehicles should be at least 26.4% and 6.5% in electric vehicles by 2026. This would suggest that the scenario envisions a higher increase in hybrid vehicle production compared to electric vehicle production in order to meet the remaining carbon budget required to meet the scenario's climate targets.

### Trajectory Alignment

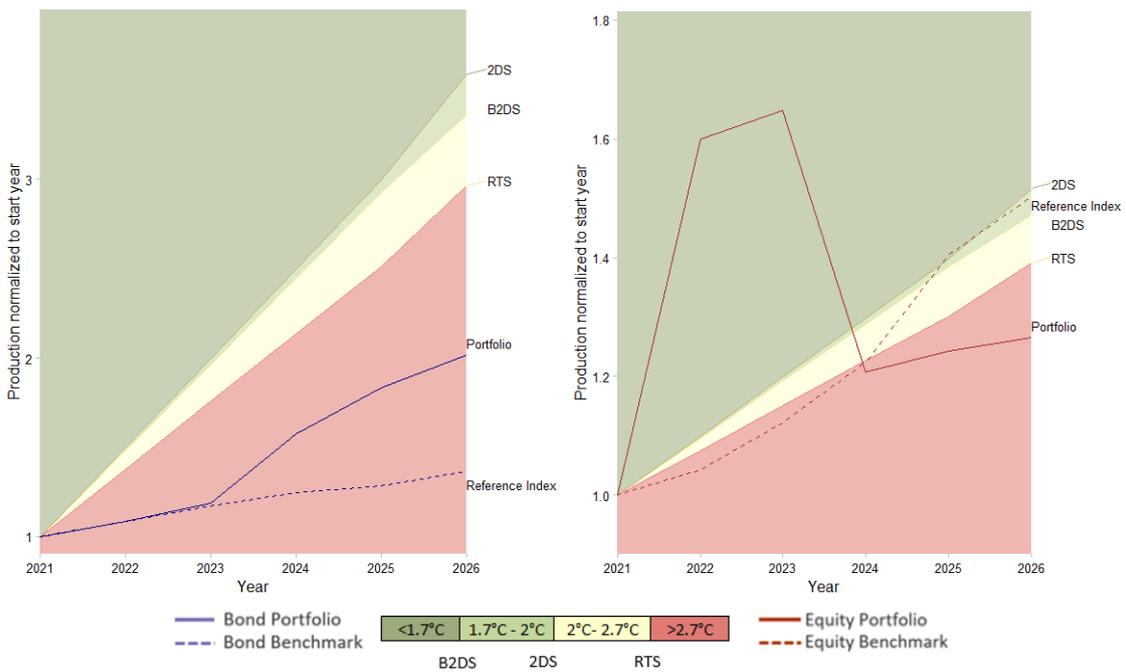
**ICE:** To align with the Paris Agreement, companies should switch their production from internal combustion engines to electric and hybrid vehicles. This implies decreasing production in internal combustion engines. The portfolio trajectory in ICEs of both the listed equity and corporate bonds portfolio is currently compatible with a >2,5°C scenario (See figure 21). The bonds portfolio is invested in companies that plan to slightly decrease their ICE production after 2023, but not enough to align with the IEA's scenarios (See Figure 21), since the decrease is not as ambitious as the one required in a <2°C scenario, the portfolios may potentially be exposed to transition risk affecting the ICE producers in the portfolio in the case of a disruptive transition. For the portfolios to be aligned with a <2°C scenario trajectory by 2026, a decrease of ICE vehicles production by 13% will be required in both type of financial assets.

**Hybrid:** Hybrid vehicles are one of the alternatives to replace conventional internal combustion engine vehicles. The IEA's climate scenarios foresee an increase in production in this technology, at least in the short term. Both fixed income and equity companies are trying to take advantage of the opportunity offered by the low-carbon transition by increasing their production of this type of vehicle. Still, the increase is not yet sufficient to align with the Paris scenario by 2026. Although the bond portfolio plans to double hybrid vehicle production within the next five years, this represents only 42% of the effort needed to achieve the B2DS technology roadmap. The investments in bonds and equity are currently compatible with a >2.5°C pathway, therefore we can infer that companies in the portfolio are not completely seizing the opportunities the transition will bring with hybrid vehicles. (See figure 22).

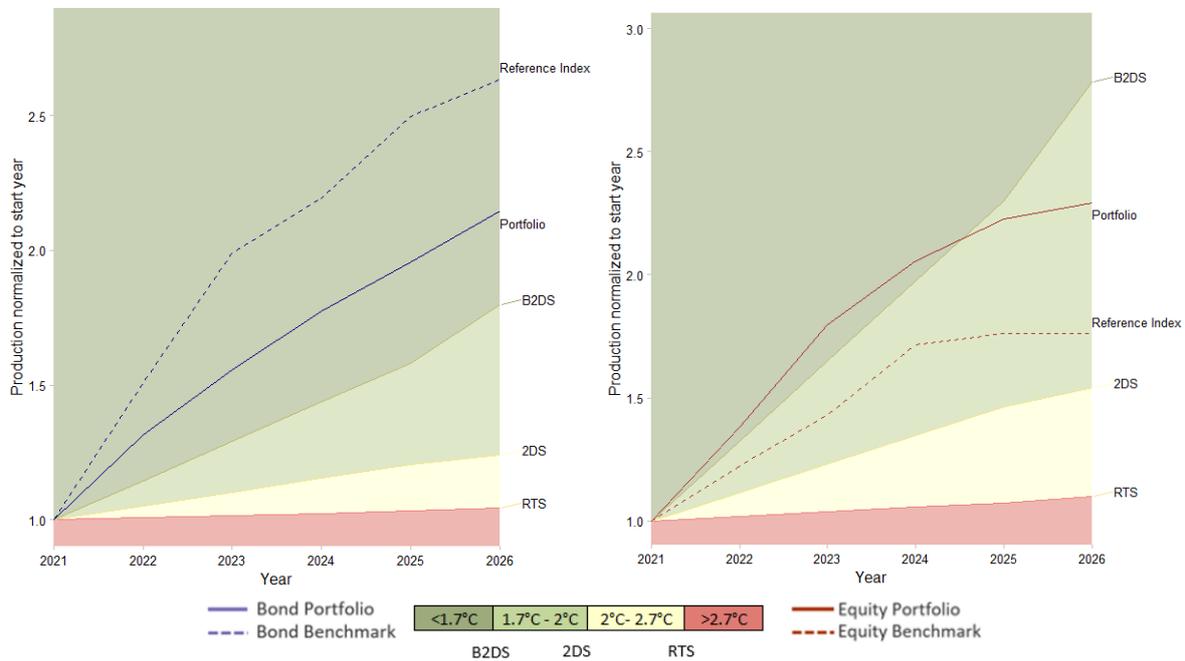
**Figure 21: Alignment of Internal Combustion Engine (ICE) production in corporate bond (left) and listed equity (right) investments relative to the IEA scenarios.**



**Figure 22: Alignment of hybrid vehicles production in corporate bond (left) and listed equity (right) investments relative to the IEA scenarios.**

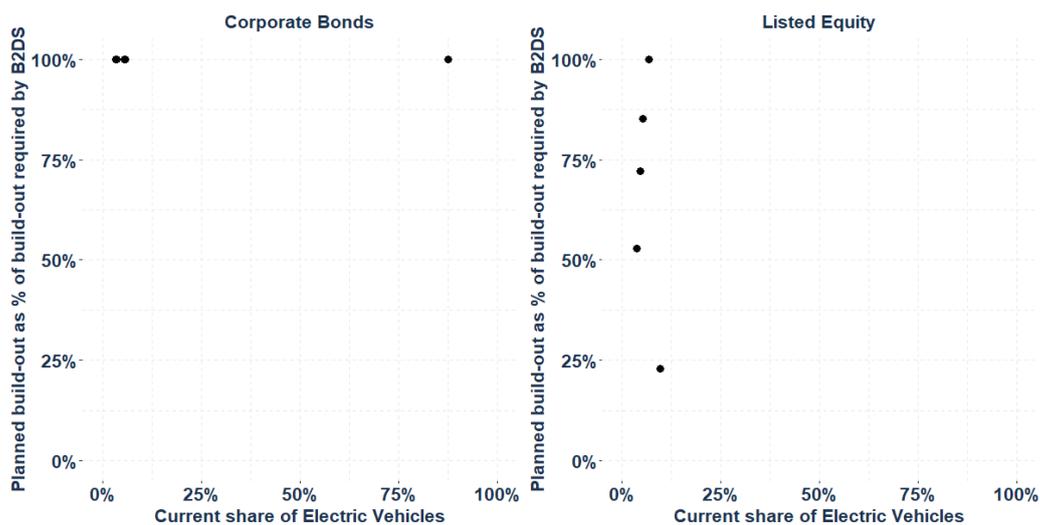


**Figure 23: Alignment of electric vehicles production in corporate bond (left) and listed equity (right) investments relative to the IEA scenarios.**



**Electric Vehicles:** Electric vehicles are another option to decarbonize the automotive industry and also require a major production increase to meet the Paris Agreement target. Portfolio companies are clearly seizing this opportunity. Bonds and equity issuers will increase electric vehicle manufacturing at a faster pace than requested by the B2DS scenario, therefore being aligned with a <1.7°C scenario. (See figure 23)<sup>19</sup>

**Figure 24: Current exposure vs future build out in electric vehicles production for both equity and bond portfolio**



<sup>19</sup> Alignment of electric vehicles was plotted using the portfolio weight approach. Considering that it is not possible to generate this chart using the ownership approach, due to the limited exposure to the technology and the sector.

### Peer comparison for low carbon technology for automotive

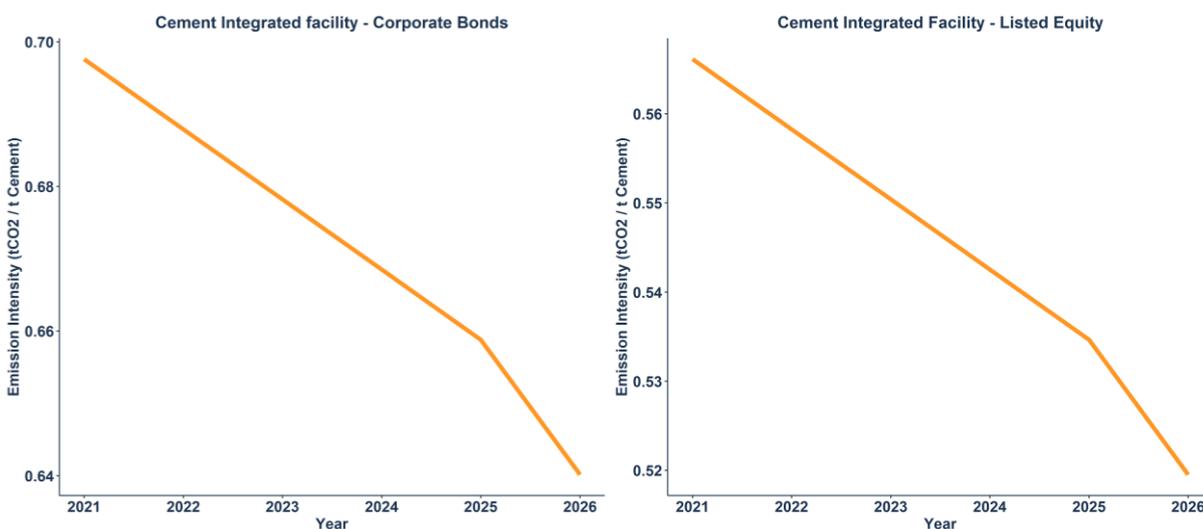
Regarding the performance of each pension fund compared to its peers in terms of low carbon technology investments in the automotive sector (Electric Vehicles), bond issuers will overperform the B2DS scenario, as could be observed from the trajectory alignment analysis. Figure 24 shows that their outperformance with respect to the B2DS scenario is not only due to the action of one pension fund, but that of all pension funds. In equity investments, one of the participants will reach the B2DS scenario target; three other portfolios will reach at least half of the target needed to meet the B2DS path according to their investment plans for the next five years. The other participant, despite currently having the largest share of electric vehicle production, has investment plans that are not yet ambitious enough to be aligned with the B2DS scenario.

## Cement

Cement is an important industrial CO<sub>2</sub> emitter and accounts for 5% of the value invested in the Peruvian bonds portfolio and 17% of the investments in the listed equity portfolio (See figure 25). According to the IEA, cement demand is expected to increase in the coming years due to economic expansion in markets other than China. In this context, a reduction of CO<sub>2</sub> emissions remains a major challenge. Various strategies, such as the promotion of more efficient materials, technological and process innovations, improved energy efficiency, and the transition to lower-carbon fuels, are expected to reduce CO<sub>2</sub> emissions in cement production.<sup>20</sup>

The graph below shows the current emissions intensity alongside the reduction needed to meet the B2DS remaining carbon budget for cement. Companies in the equity portfolio are more efficient than those in the corporate bond portfolio since they emit a lower amount of CO<sub>2</sub> per ton of cement produced. For their portfolios to be aligned with a <1.75°C scenario, pension funds could review the dynamics of this sector in order to seek a decrease in the emissions intensity by approximately 15% by 2026 for equity investments and 19% for bonds portfolio, in relation to 2020 Q4 levels..

**Figure 25: Cement emissions intensity of the corporate bond (left) listed equity (right) portfolios under a B2DS (<1.75°C) scenario.**



<sup>20</sup> <https://www.iea.org/reports/cement>

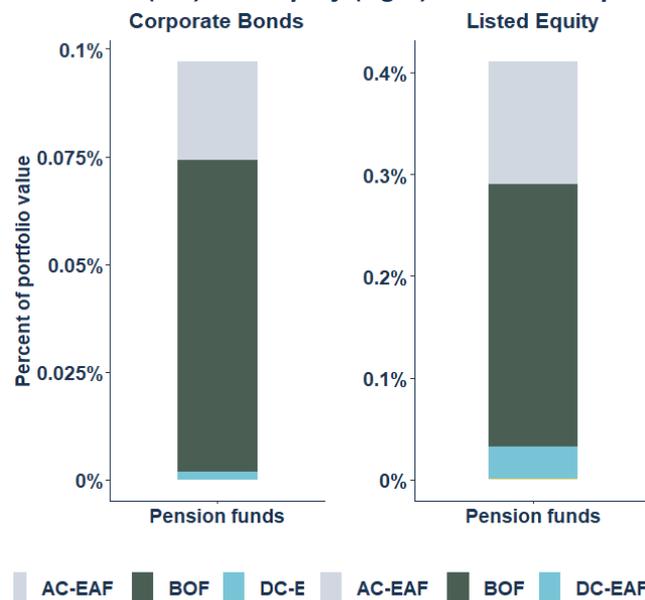
## Steel

The steel industry accounted for around 8% of global anthropogenic greenhouse-gas emissions in 2018<sup>21</sup>, emitting more than 3bn tons of carbon dioxide per year to produce 2bn tons of steel in the same time frame.<sup>22</sup> This analysis is focused on the most relevant part of the value chain from the climate point of view, which is the midstream. Since there is no information on available technologies in this sector, as in the analysis of the cement and aviation sectors, the emissions intensity metric will be used.

As for cement, potential ways to decarbonize the steel industry are mainly based on the improvement of existing technologies. There are two ways of producing steel with various inputs and methods: Electric Arc Furnace (EAF) and open-hearth (OHF) or basic oxygen furnace (BOF). EAF is generally the most efficient way of producing steel. It is based on scrap steel (around 30%) and relies on power generation. Decarbonization effort for this technology depends on electricity grid improvements. OHF or BOF are less effective technologies, but as the input differs and scrap availability can't meet the demand, scenarios do not plan to shift from one technology to another. Instead of shifting from those technologies, scenarios ask to build more efficient production based on innovative technology that is still not ready to be commercialized. According to the B2DS scenario, emission intensity for steel needs to decrease 21.6% over the next five years.

Figure 26 shows the different production methods being used by the companies in the portfolio to manufacture steel. Although exposure to this sector is higher in the equity portfolio, there is a higher proportion of steel manufacturing through the EAF (23.7%) compared to the corporate bond portfolio (19%). However, there is a significant share of steel manufacturing through BOF, 74% and 81% in equities and bonds, respectively, which makes no difference in terms of the emission intensity efficiency between the equity and corporate bond portfolio.<sup>23</sup> (See figure 27).

**Figure 26: Steel exposure in bonds (left) and equity (right) for Peruvian pension funds.**

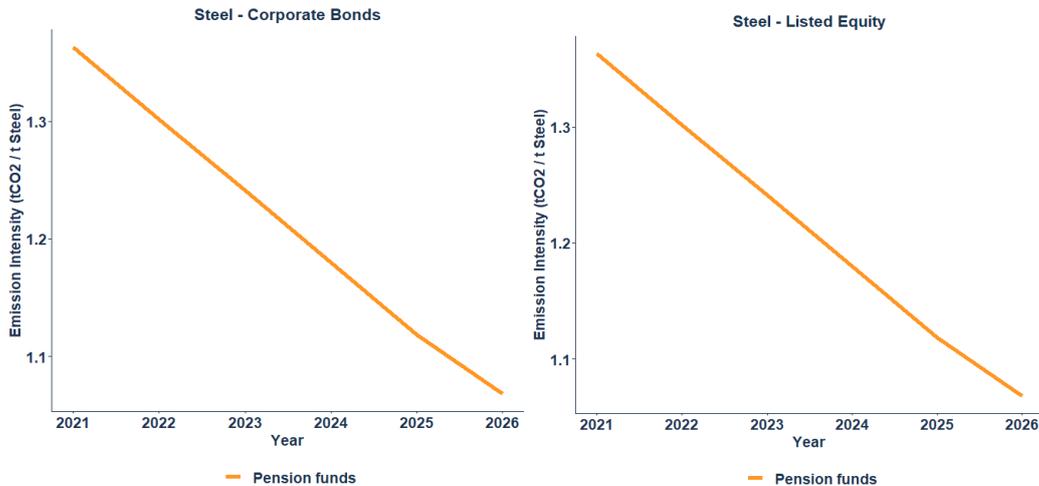


<sup>21</sup> World Energy Outlook 2019, 2019. , World Energy Outlook. International Energy Agency

<sup>22</sup> <https://www.newyorker.com/news/annals-of-a-warming-planet/the-promise-of-carbon-neutral-steel>

<sup>23</sup> Emission intensity for Electric Arc Furnace is 0,28 tCO<sub>2</sub>/ t Steel, and 0,21 tCO<sub>2</sub>/ t Steel for equity and bond portfolio respectively. BOF is 1,63 tCO<sub>2</sub>/ t Steel for bond portfolio and 1,71 tCO<sub>2</sub>/t Steel for the companies in the equity portfolio.

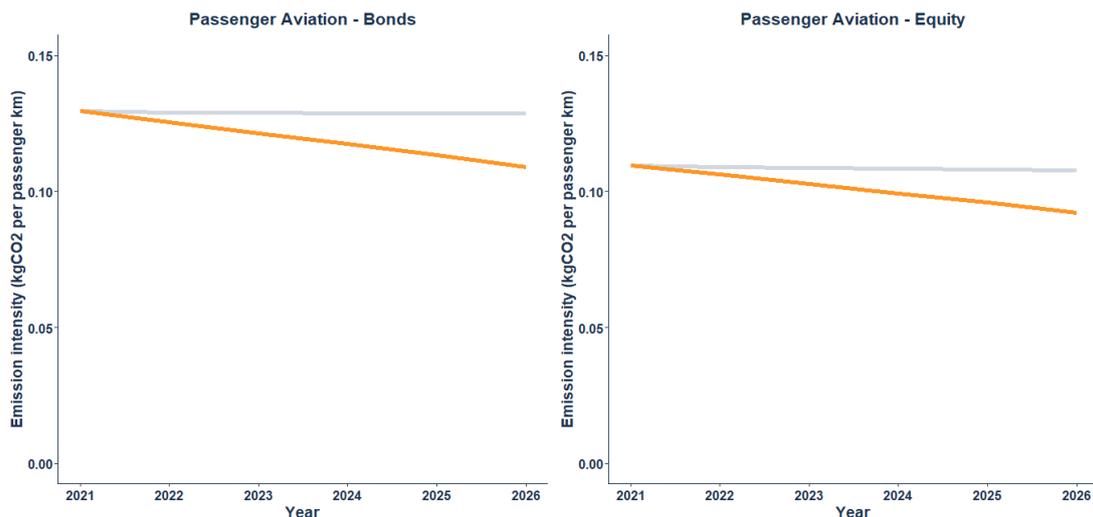
**Figure 27: Steel emissions intensity of corporate bond (left) and listed equity (right) portfolios under a B2DS (<1.75°C) scenario.**



## Aviation

Although aviation fuel efficiency has increased by 1.9% each year over the previous decade, aviation still has to reduce its intensity by 24% in 2030 from its pre-pandemic level to follow the zero-emissions pathway outlined by the IEA.<sup>24</sup> The orange line in the graph below shows the path that the portfolio must follow to reach the expected level of the IEA B2DS scenario. Due to the pandemic, the grey line does not provide forward-looking information as it does not have a load factor. This information was affected by the covid downturn, and any change in this value will depend on the recovery of the sector after the pandemic. Based on figure 28, it can be deduced that the companies in the equity portfolio are more efficient than those in the bond portfolio since the emissions intensity of the bond portfolio is 129gCO2/pkm and 109gCO2/pkm for the equity portfolio.

**Figure 28: Aviation emissions intensity of corporate bond (left) listed equity (right) portfolios under a B2DS (<1.75°C) scenario.**



<sup>24</sup> <https://www.iea.org/reports/aviation>

# Conclusions and recommendations

The analysis presented in this report provides a first group assessment of the compatibility of Peruvian Pension fund portfolios with decarbonization pathways that could limit the global average temperature increase in 2100 to below 2°C and reaffirms the interest and commitment of pension funds in their efforts to fight climate change. Through the use of information publicly available and information submitted by participating entities, PACTA was applied to examine the extent to which pension fund investments in Peru are compatible with climate scenarios that aim to limit global temperature rise below 2°C, and to identify the potential exposure of pension funds' equity and corporate bond portfolios to transition risks.

It is important to note that the results of this analysis should be interpreted taking into account the regional context or country-specific factors, which are not necessarily included in the assumptions of the climate change scenarios, which are global, and therefore cannot be included in the results. This methodological limitation could be overcome in the future if regional scenarios were to become available.

The tables below provide an overview of the alignment results for different sectors and technologies in 2026. Please notice that 'alignment results' and 'exposure' to climate-relevant sectors are different concepts. The tables reflect the alignment of the 2026 production plans of investee companies to different climate scenarios. Technologies aligned with scenarios highlighted in green are on a trajectory consistent with an average global temperature rise of < 2°C, in yellow on a trajectory consistent with a temperature rise of between 2.7°C - 3.2°C, and red > 3.2°C for Fossil Fuels and Power, analyzed with the IEA World Energy Outlook 2020 scenarios publication, and 2.7°C for the automotive sector which was analyzed with scenarios from the Energy Technology Perspectives 2017.

**Table 5 : Overview of the climate alignment of different sectors and technologies.**

	Fossil fuels			Power					
	World Energy Outlook 2020			World Energy Outlook 2020					
	Oil	Gas	Coal	Hydro	Renewables	Nuclear	Gas	Oil	Coal
Listed Equity	< 2°C	< 2°C	> 3.2°C	> 3.2°C	> 3.2°C		< 2°C	> 3.2°C	< 2°C
Corporate Bonds	< 2°C	< 2°C	> 3.2°C	< 2°C	> 3.2°C	> 3.2°C	< 2°C	> 3.2°C	2.7°C – 3.2°C

	Automotive		
	Energy Transition Pathway 2017		
	ICE-LDV	V. Hybrid	V. Electric
Listed Equity	>2.7°C	>2.7°C	1.7°C - 2°C
Corporate Bonds	>2.7°C	>2.7°C	< 1.7°C

The risk and opportunity dynamics in each portfolio are different and call for pension funds to examine how climate risks can be mitigated and opportunities can be maximized. The analysis finds at an aggregated level the following:

**Risks.** While both portfolios are potentially exposed to transition risks, the corporate bond portfolio has a higher exposure to climate-sensitive sectors that might be affected by the transition to a low carbon economy than the listed equity portfolio (1.8 times, in terms of AUM).

**Power:** Both the equity and bond portfolios have considerable exposure to the power sector; therefore, the performance of each of the technologies should be analyzed more closely to identify which of them require prompt action. Although the portfolios currently have low exposure to oil-fired power capacity, equity and fixed income portfolio issuers should decrease oil extraction, as they are on a trajectory compatible with a temperature of  $>3.4^{\circ}\text{C}$  and thus could potentially be exposed to transition risks.

**Automotive:** Although investments in this sector come mostly from indirect fund investments, 97.2% in the case of shares and 100% in the case of bonds, it is important that issuers in this sector decrease the production of ICE vehicles and transition to green technologies in order to align with the SDS scenario. Although there is a significant increase in the production of electric cars, to comply with the carbon budget proposed by the scenario, this increase in the production of electric vehicles must be accompanied by a decrease in the production of internal combustion vehicles. Otherwise, the remaining carbon budget would not be met, and alignment with the scenario would not be possible.

### Opportunities.

**Power:** There is a high exposure to hydropower generation in the sector, indicating that issuers are taking advantage of the transition opportunities in this technology. Corporate bond issuers outperform equity issuers, as they plan to increase hydropower generation capacity in the coming years to a greater extent than equity issuers. Given the current hydropower capacity and the progress being made in the country in terms of renewable energy, there are opportunities in these two areas to have a constructive influence on investee companies through impactful engagement in this sector. Pension funds should promote an increase of investment in renewable energy generation capacity through engagement.

**Automotive:** The transition by some issuers has already begun, and evidence of this is the alignment with the B2DS and SDS scenarios in the manufacture of electric vehicles in the corporate bond and listed equity portfolio, respectively. However, there are still opportunities to explore hybrid production since the production levels of the coming years are not yet in line with those proposed by the SDS scenario. As mentioned above, most of the investments in this sector are indirect. Still, it is essential to send a message to fund managers that climate factors should be included in the selection criteria for the assets they will invest in to encourage the transition from brown to green technologies in indirect investments.

### Current strategies for mitigation of transition risks and maximization of opportunities.

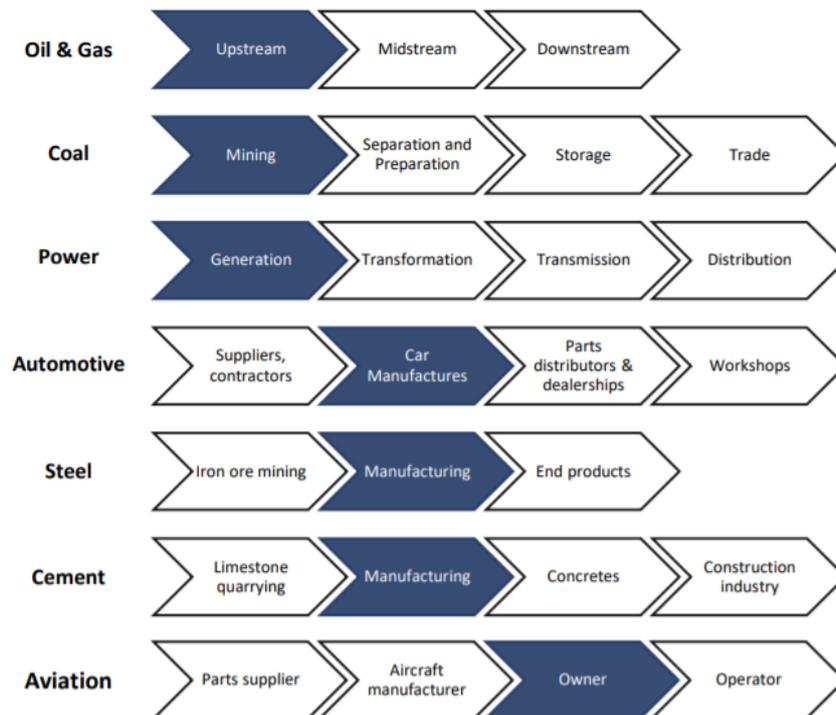
In order to prevent the materialization of climate-related risks, investors can carry out different actions. Although the scope for implementation of these actions depends to a great extent on existing regulation, the investment strategy of each fund, and its capacity, below are the most common ones chosen by institutional investors globally:

- i. carry out individual or collective engagement actions to persuade companies to integrate climate change in their business strategies (notably, for oil & gas companies, the strategy will include business diversification);
- ii. reallocate or condition direct investments in companies to fulfilment of climate change goals in the short to medium term, including investment or alignment commitments;
- iii. reallocate direct investments to companies of the same sector with better climate performance or to companies from less carbon-intensive sectors; and
- iv. reallocate passive investments to instruments with allocations to companies with better climate performance or that exclude high-carbon sectors.

Options i.) and ii.) can potentially mitigate climate-related risks at both, the real economy and portfolio level. All pension funds can carry out this action with both local investees as well as with some international ones as part of collective engagement platforms. Options iii.) and iv.) will only contribute to portfolio-level mitigation.

# Annex

## Annex 1: Segments of the value chain Covered by PACTA Model (shaded in blue)



## Annex 2: Limitations of the Analysis

As in any other model, there are a number of limitations to the PACTA climate scenario analysis for equity and corporate bonds conducted in this report.

1. Data received from financial institutions: To perform the exercise, the entities were asked to upload all their investments, except their cash portfolios, however 2DII does not perform any validation or audit of the data, so we rely on the commitment of the entities to upload the requested portfolio information.
2. Climate scenario assumptions: The climate scenarios used present one possible manifestation of how the energy transition aligned with the Paris climate agreement could look like. Even though the necessary actions are not controversial (expansion of renewables, retirement of high-carbon technologies), the precise way in which a remaining carbon budget is distributed across sectors will be achieved in different ways by different scenarios. Furthermore, different models will include different assumptions about the future development and potential of certain technologies. This analysis therefore focuses on those technologies that are proven and available to the market. As a result, this analysis does not consider investments in R&D or early stage private equity, which represent an important way for financial institutions to help bring new solutions to the market. Additionally, while scenarios are

expected to incorporate all socioeconomic considerations, they don't take into account regionally-specific policies or regulation. For this reason it is expected that in some technologies alignment may be more difficult or even unfeasible.

3. Asset based company level data used: Although the data is sourced from reliable, third-party data providers, errors are possible, either in the production plans themselves, or in mapping the ownership structure of a companies. Furthermore, planned production plans do not necessarily materialize and production forecasts should be interpreted baring this in mind.
4. Current fund coverage in the PACTA analysis. Whenever institutions report funds in their portfolios they are converted into equities and bonds assigned to that fund ISIN. To complete this conversion, we count with external sources of data containing information on funds and their compositions.
5. Scope of the analysis. PACTA does not cover certain sectors, such as agriculture and forestry, even though they are highly relevant for limiting future GHG emissions, due to lack of available data. Furthermore, asset classes such as sovereign bonds or private equity are also not included in the analysis.