

# IIGCC Net Zero Investment Framework: Portfolio Testing Results



Report prepared for IIGCC

March 2021

planetrics   
a vivid economics company

:vivid economics  
putting economics to good use

*The activity described in this report is sponsored by Brunel Pension Partnership, The Church of England Pensions Board, and the Environment Agency Pension Fund.*



*Supported by the European Climate Foundation.*



## Executive Summary

The Institutional Investors Group on Climate Change (IIGCC) launched its Paris Aligned Investment Initiative (PAII) in May 2019. Its aim is to explore how investors can align their portfolios with the goals of the Paris Agreement. More than 70 IIGCC members, representing over US\$16 trillion in assets under management (AUM), have engaged in the initiative to date.

In August 2020, IIGCC published a consultation on a Net Zero Investment Framework ('the Framework'), which was developed through the PAII. The goal of the Framework is to provide a basis for a broad range of asset owners and asset managers to define strategies for aligning their investments with the goals of the Paris Agreement.

Since the publication of the consultation, five investors have been working together to test the Framework on real-world portfolios. This report describes the testing phase and its outcomes. The investors constructed Paris-aligned portfolios using the recommendations set out in the Net Zero Investment Framework. They then tested their current and aligned portfolios by modelling their financial performance in a range of different climate scenarios. These scenarios included a baseline that sees a continuation of current policies and several scenarios with ambitious action towards meeting the goals of the Paris Agreement.

The aim of the portfolio testing phase was to support investors to apply the Framework and understand the implications of alignment. Specifically, the goals were to:

- Identify any practical challenges in applying the Framework and begin to address them in the update to the Framework and Phase II of PAII;
- Verify that the Framework succeeds in channelling capital towards Paris-aligned activities and mitigating risks for investors in scenarios with ambitious action towards achievement of the goals of the Paris Agreement; and
- Understand the drivers for the success of the Framework and implications.

Three key findings emerge from the testing phase.

**Key finding 1: The Framework succeeds in channelling capital towards Paris-aligned activities and mitigating climate-related risks for investors, and the cost of alignment can be small. Investors need not wait to act.**

The results of the testing phase indicate that the Framework achieves its intended purpose: it enables investors to successfully align their portfolios with the goals of the Paris Agreement. This is despite some limitations in existing data, methodologies, and tools.

During the testing phase, investors applied the Framework to their existing portfolios to create 'Paris aligned' portfolios. When the financial performance of those portfolios was assessed using a model across a range of scenarios, they performed significantly better in scenarios with ambitious climate action.

In addition to enabling investors to align successfully, it is possible to do so at manageable cost to portfolio performance. Investors were able to align their portfolios in ways that did not affect risk-adjusted returns, even in a scenario where there is no further climate action beyond current policies. Applying optimisation techniques offers opportunities for lowering costs even further.

Investors need not wait, then, to act on climate and align portfolios with pathways consistent with achieving the goals of the Paris Agreement. The Framework provides a practical tool for alignment, and it is possible to deploy it using existing data and without compromising on performance.

**Key finding 2: For equities and corporate bonds, climate impacts can be highly company-specific, and investors benefit from taking a company-specific approach to alignment.**

Testing showed that climate impacts can be highly company-specific, with significant differences even for companies in the same sectors and geographies. As a result, investors were able to create their Paris-aligned portfolios by tilting towards or away from a relatively small number of companies' equities and bonds, mostly in sectors that are highly exposed to climate risks. This implies that investors have an opportunity to improve alignment and manage risks by taking individual companies' climate exposure and transition strategies into account, and by engaging actively and constructively with companies around their climate strategy, particularly in highly exposed sectors.

**Key finding 3: By testing the Framework, investors learnt several useful lessons on data and methodology which will form the basis for further collaboration and inform the use and development of the Framework.**

Testing also revealed that existing tools and datasets do not fully capture drivers of climate risk for individual companies, sovereign bonds, and real estate. Investors are now taking steps to continue sharing knowledge and collecting new data in these areas.

Work is also continuing to address other limitations of the approach taken in this testing phase. The Framework in its current form covers four major asset classes: equities, corporate bonds, sovereign bonds, and real estate. Phase II of PAII will expand coverage to include infrastructure and private equity. For this testing phase, the modelling focused on the transition risks arising from climate-related policies and did not quantify physical risks arising from climate change. All modelling results presented in this report are subject to the assumptions and limitations of the modelling methodology.

As well as informing individual IIGCC members' investment strategies, risk & compliance, and external engagement, the IIGCC investor community is working together to take this initiative further. The Framework will be updated taking into account feedback received during the consultation and lessons from the portfolio testing phase. Phase II of PAII will also take forward further work to:

- Analyse methodologies and approaches for two additional asset classes – infrastructure and private equity – and add these into the scope of the Framework.
- Consider how investors can align portfolios to support the adaptation and resilience goals of the Paris Agreement.
- Address key analytical gaps identified during Phase I, including:
  - Identifying and measuring material scope 3 emissions;
  - Addressing treatment of offsetting and negative emissions technologies in more detail;
  - Assessing the potential for methodologies that capture relative impact of climate solutions investment (e.g. avoided emissions), and clarifying methodologies to assess emissions reductions achieved at the asset level;
  - Identifying pathways for increasing investment in climate solutions.
- Develop additional guidance to support implementation of the Framework.

# Contents

1	Introduction.....	7
2	Testing phase overview .....	10
3	Alignment methodology and implementation .....	12
4	Testing methodology.....	21
5	Key findings .....	24
6	Implications .....	45
Annex 1	Alignment methodology.....	48
Annex 2	Testing methodology.....	52

## List of tables

Table 1	Asset class targets and measurement .....	12
Table 2	Alignment in equities has primarily been achieved through reducing emissions intensity and improving green economy revenues within sectors, rather than divesting from certain sectors ...	32
Table 3	Alignment benefits are relatively modest for corporate bonds and are concentrated in within-sector improvements in energy and utilities .....	35

## List of figures

Figure 1	Overview of the testing process .....	10
Figure 2	High-level alignment process for listed equities and corporate bonds .....	13
Figure 3	High-level alignment process for sovereign bonds.....	14
Figure 4	High-level alignment process for real estate .....	15
Figure 5	High-level alignment process for strategic asset allocation .....	16
Figure 6	On average across investors in the test phase, allocation changes between asset classes from Current to Aligned are limited .....	17
Figure 7	The degree of portfolio reweighting differed considerably across asset classes.....	18
Figure 8	Overview of scenarios used for alignment testing .....	22
Figure 9	Alignment benefits all PAIL investors although the scale of benefits differs by participant and scenario .....	25
Figure 11	In the Immediate scenario, all PAIL Current Portfolios face impairment, while the median PAIL Aligned Portfolio increases in valuation .....	26
Figure 10	Differences between Paris-aligned and benchmark portfolios are small even in scenarios without strong climate action .....	27
Figure 12	Alignment had a modest impact on key financial metrics for the average PAIL investor participant .....	28
Figure 13	Equity impacts for Current and Aligned Portfolios in a Paris-aligned scenario. The largest difference in value between the Current and Aligned Portfolios comes from competition effects, with the Aligned Portfolio outperforming Current Portfolio in the Immediate scenario....	30
Figure 14	Benefits exist in all asset classes and vary considerably by investor participant, but are greatest in equity.....	31
Figure 15	PAIL investors have been successful at tilting away from ‘climate losers’ and towards ‘climate winners’, although opportunities for improvement within equities remain .....	33

Figure 16 In the Immediate scenario, the majority of the rise in valuation from Current to Aligned Portfolios comes from tilting towards climate winners ..... 33

Figure 17 Corporate bond impacts differ by maturity, with long-dated bonds experiencing larger changes in valuation. In general, Alignment has improved valuations in exposed sectors relative to Current portfolios ..... 36

Figure 18 Sovereign alignment has tilted the PAll investor average portfolio towards issuers with better CCPI scores ..... 37

Figure 19 Sovereign bond impacts are modest across scenarios and are unaffected by alignment ..... 38

Figure 20 There is no correlation between an issuer’s alignment score and valuation changes for sovereign bonds ..... 39

Figure 21 Impact of Paris-alignment on real estate valuation is small, although the biggest impacts occur in the Immediate scenario ..... 40

Figure 22 Differences in real estate emissions intensity across countries and regions could be incorporated into an approach to increase alignment ..... 41

Figure 23 Differences in emissions intensity across property types could be incorporated into an approach to increase alignment ..... 42

Figure 24 Brunel’s Hypothetical Aligned UK portfolio has better energy performance than the Test Current portfolio and UK non-domestic properties ..... 43

Figure 25 Brunel’s Hypothetical Aligned portfolio experiences the least value impairment in the Delayed and Immediate scenarios, and its Test Current portfolio outperforms the typical UK portfolio ..... 44

Figure 26 Overview of testing methodology ..... 52

Figure 27 Carbon prices are highest under the Immediate 1.5°C scenario and rise rapidly due to the limited availability of CDR technologies ..... 54

Figure 28 Oil demand falls by over a third in all transition scenarios by 2050 ..... 54

Figure 29 Variable renewable power generation rises rapidly under all three transition scenarios ..... 55

Figure 30 Overview of the Climate Risk Toolkit listed equities value stream modelling approach ..... 56

Figure 31 Corporate bonds are modelled by assessing changes in the probability of default for bond issuers ..... 57

Figure 32 Sovereign bond impacts depend on country emissions and energy usage, as well as central bank response functions and current macroeconomic fundamentals ..... 58

Figure 33 Real estate impacts account for Scope 1 and 2 costs, abatement, and cost pass-through to occupiers ..... 58

## List of boxes

Box 1 Using optimisation tools to minimise costs while aligning portfolios ..... 20

Box 2 Aligned portfolios in high-carbon scenarios ..... 26

Box 3 Using the FTSE TPI Climate Transition Index to support alignment ..... 34

Box 4 Aligning a real estate portfolio using energy performance data ..... 43

# 1 Introduction

## 1.1 Context

As institutional investors, IIGCC members recognise the damaging impacts climate change will have on their investments but also on their beneficiaries. They therefore want to lead the way in achieving a net zero economy by 2050 as part of their fiduciary responsibilities, and recognise they must act now if they are to achieve this goal. Since the Paris Agreement, a range of innovations, methodologies and tools have emerged to help investors take action on climate change. But these efforts have been fragmented, and none has provided a comprehensive, systematic, and forward-looking approach to guide investor action and deliver impact in the real economy.

This is why, in May 2019, the Institutional Investors Group on Climate Change (IIGCC) established the Paris Aligned Investment Initiative (PAII) to explore how investors can align their portfolios with the goals of the Paris Agreement, and to translate the Paris Agreement of governments into a Net Zero Investment Framework for asset owners and asset managers. The aim of PAII is to establish a common understanding of effective approaches and methodologies to guide the ambitious action required, and to provide clarity to market participants and stakeholders. PAII has addressed these issues through a collaborative process involving more than 70 IIGCC members representing over US\$16 trillion in assets under management (AUM).

PAII is led and coordinated by IIGCC, with a steering group of leading asset owners.<sup>1</sup> Four working groups were established to look at alignment methodologies for strategic asset allocation (SAA), sovereign bonds, real estate, and listed equity and corporate fixed income.<sup>2</sup>

The first phase of PAII aimed to:

- Develop working definitions of key concepts and terms, and clarify pathways relevant to Paris alignment, in order to build understanding and consensus around these concepts (stage 1).
- Analyse potential methods that could be used to assess alignment of different asset classes, determine the make-up of an aligned portfolio, and assess approaches for transitioning portfolios, in order to provide a menu of practical options for transitioning and assessing alignment with the Paris goals (stage 2).
- Test the approaches for transitioning portfolios and methodologies for assessing alignment using real-world portfolios, in order to understand financial characteristics, risks, issues, and opportunities associated with the transition of portfolios to a Paris aligned pathway (stage 3).

In August 2020, IIGCC published a draft Net Zero Investment Framework for consultation. This was informed by the work completed in stage 1 and stage 2 and was the first public output from the PAII. The goal of the Framework is to provide a basis for a broad range of asset owners and asset managers to define strategies for aligning their investments with the goals of the Paris Agreement, in the context of their individual mandates and starting points. It sets out several components for an effective net zero investment strategy, with recommendations on the key actions and methodologies that can be used to implement such a strategy.

Following the publication of the draft, investors have moved forward to test the Framework on ‘real-world’ portfolios (stage 3). This testing phase had two aims. The first was to learn valuable practical lessons about data and methodologies from applying the Framework in practice. The second was to test the implications of

<sup>1</sup> PAII Phase I steering group members include APG Asset Management, Church of England Pensions Board, Brunel Pension Partnership, PKA, AP2 (Second Swedish National Pension Fund), TPT Retirement Solutions, LGPS Central, and Lloyds Banking Group Pensions Trustee Limited.

<sup>2</sup> Working groups are led by Aberdeen Standard Investments, BMO Global Asset Management (EMEA), UBS Asset Management, PIMCO LLC, PKA, Scottish Widows (part of Lloyds Banking Group), DWS, and Brunel Pension Partnership.

aligning portfolios with Paris Agreement goals. This included assessing the impact on key financial metrics and risk exposure for investors in scenarios with ambitious action towards achieving the goals of the Paris Agreement.

This report shares the lessons learnt from the testing phase to support other investors as they act to align their portfolios with climate goals.

## 1.2 Testing phase

Five investors participated in the testing phase: APG Asset Management, PKA, Church of England Pensions Board, Phoenix Group, and Brunel Pension Partnership. The aims of this testing phase were to help investors to apply the Framework and understand its implications. Specifically, the goals were to:

- **Identify any practical challenges in applying the Framework, and begin to address them.** Portfolio alignment is a relatively new activity for most investors, and as a result there are inevitably new requirements for data, tools, and knowledge. Testing allowed investors to discover and start filling these gaps, and for relevant updates to be made to the Framework.
- **Verify that the Framework succeeds in channelling capital towards Paris-aligned activities and mitigating risks for investors in scenarios with ambitious action towards achievement of the goals of the Paris Agreement.** By modelling the performance of investors' portfolios after they had applied the alignment Framework, it was possible to test the degree to which the framework achieved its objectives. This also enabled investors to test the implications of portfolio alignment on key financial metrics to understand costs and trade-offs arising from alignment.
- **Understand the drivers for the success of the Framework and implications.** Using a detailed, asset-level modelling technique also permitted IIGCC to understand why the Framework had been successful, which in turn can inform the actions that investors take to effectively and efficiently shape their climate-alignment approaches in future.

The remainder of this report provides an overview of the way in which the investors tested the Framework on their portfolios (Section 2), the methodology they used to align their portfolios (Section 3), the methodology for testing and its key limitations (Section 4), key findings from the testing activity phase (Section 5), and implications for future work (Section 6).

## 1.3 Next steps and further work

Since publishing the draft Framework for consultation, IIGCC has received 90 consultation responses and engaged with more than 780 stakeholders through a series of webinars and roundtables to gather feedback on the Framework. Taking into account this feedback alongside lessons learned during the testing phase, IIGCC has updated the draft Framework in order to publish a final version. The published Framework is intended to provide the basis on which investors can make commitments to achieving net zero emissions, and implement effective strategies to align portfolios which support delivery of real-world emissions reductions. The outcomes from the consultation and the final Framework will be published in January 2021.

IIGCC is also launching Phase II of PAII, in which it will work with members and partner organisations to:

- Expand the Framework to include two additional asset classes – private equity and infrastructure – and incorporate methodologies and approaches for aligning to the adaptation and resilience goals of the Paris Agreement.
- Develop additional components of the Framework and guidance, including an approach to measuring Scope 3 emissions; clarify appropriate use of offsetting for alignment; and provide analysis to support target-setting for investment in climate solutions.

- Work with members to develop further guidance to support implementation of different components for the Framework, share best practice, and provide case studies to demonstrate effective implementation approaches.

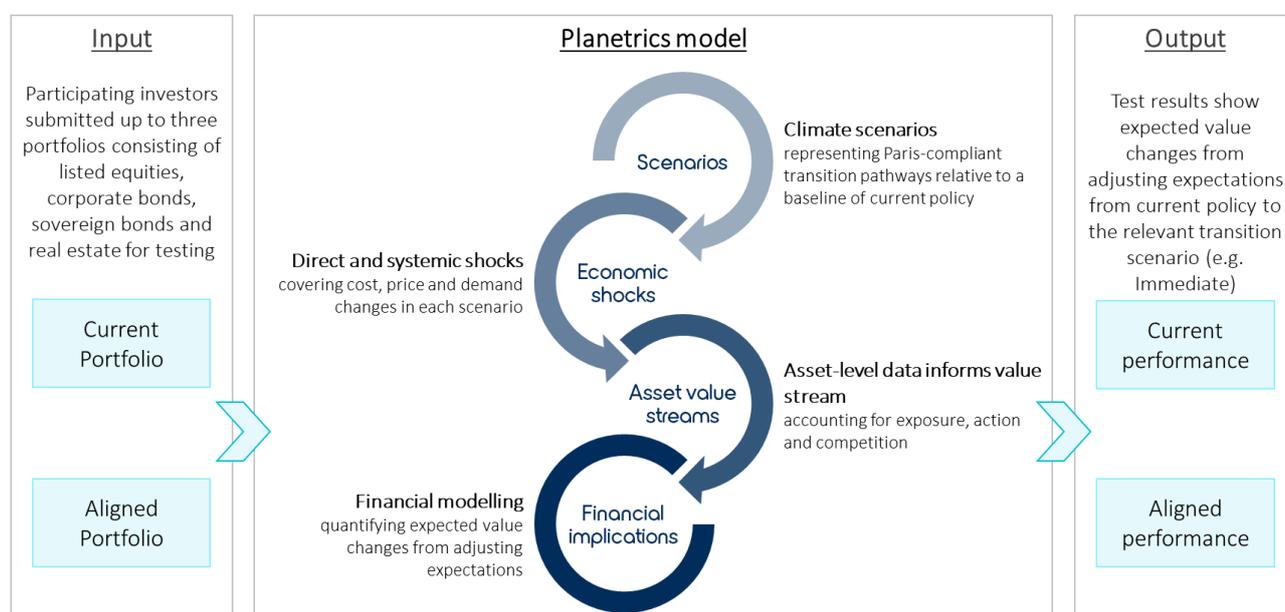
As part of Phase II, IIGCC may also undertake further portfolio testing given that the next iteration of the Framework is expanding to additional asset classes.

## 2 Testing phase overview

The testing phase focused on portfolios consisting of four asset classes: sovereign debt, listed equities and corporate fixed income, and real estate. Each of the five investors that participated took its current investment portfolio (the ‘Current Portfolio’) as a starting point.<sup>3</sup> They then applied the methodologies recommended in the Framework to their Current Portfolio to improve its alignment with successful achievement of Paris Agreement goals as defined in the Framework. This process is outlined in Section 3 and described in detail in Annex 1. This resulted in a new portfolio for each investor, the ‘Aligned Portfolio’.

To test the effectiveness of the Framework, IIGCC worked in partnership with Planetrics, a Vivid Economics company, to model the performance of each investor’s Current Portfolio and Aligned Portfolio under a range of climate scenarios (Figure 1). Section 4 gives an overview of the modelling process and its limitations and Annex 2 gives a full description.

Figure 1 Overview of the testing process



Source: Planetrics, Vivid Economics

For several investors, their Current Portfolio already includes some climate-aware and/or sustainability-focused strategies due to their existing investment approach. As a result, for these investors the modelling in the testing phase tends to understate the alignment benefits of applying the Framework relative to a portfolio that is completely unaligned. These investors also tend to have lower costs associated with alignment.

The five investors operate with different mandates and objectives. They hold different assets and asset classes, including asset classes outside the four categories modelled in this analysis. They also applied the alignment Framework in different ways, depending on their resources and data. For the testing phase, the investors applied the Framework to their portfolios and examined the immediate results. This involved achieving targets that would constitute an ‘aligned’ portfolio in 2020 (achieving a 20% CO<sub>2</sub>-equivalent emissions reduction against the baseline year, and reweighting based on assets climate performance

<sup>3</sup> The test phase focused only on equities, corporate bonds, government bonds, and real estate assets in investors’ portfolios, see Section 3.

currently). In practice, alignment is a dynamic process, and the Framework makes recommendations for investors on applying alignment continuously over time in line with science-based net zero pathways.

Given the differences in the investors' treatment of climate risk in their Current Portfolios, differences in the specific ways in which they applied the Framework, and the nature of the testing phase, IIGCC did not seek to compare results between investors and draw conclusions from the differences between them. Instead, the focus of the testing phase was on the lessons learnt across investors, to inform future work in this maturing field.

With this in mind, this report presents data in an aggregated form throughout, and focuses on results and outcomes that are likely to be relevant to a wide range of investors. The specific results are of course not necessarily reflective of other investors' portfolios. Investors should conduct their own alignment and modelling to understand particular challenges and implications for their specific portfolios.

### 3 Alignment methodology and implementation

Investors currently face a range of challenges in applying alignment methodologies to their portfolios. Some of these are specific to individual investors, and others are shared by many or all of them. Testing the Net Zero Investment Framework in practice allowed investors to learn how they could apply the Framework successfully despite the challenges, and to understand which aspects were most difficult and therefore to work to overcome those difficulties.

For the testing phase, the investors followed a common recommended approach for implementing the alignment Framework for each asset class. Within the scope of the recommended approach, investors could apply the methodology in different ways depending on their individual circumstances, including availability of relevant data and tools.

#### 3.1 Alignment methodology

To construct the Aligned Portfolios, investors implemented several recommended Framework components. This includes ‘top down’ portfolio emissions reduction and investment targets, achieved through ‘bottom up’ increase in investment in assets aligned or aligning to net zero pathways. Table 1 and sections 3.1.1 to 3.1.4 outline the recommended approach. Annex 1 provides a full description.

Table 1 Asset class targets and measurement

Framework component	Sovereign Bonds	Listed Equity / Corporate Fixed Income	Real Estate
<b>Targets/objectives</b>	<ul style="list-style-type: none"> <li>• Increase average climate performance/AUM (maximum extent possible), exceeding the average benchmark score.</li> <li>• Increase allocation to green or Sustainable Development Goals (SDG) climate bonds, if possible.</li> </ul>	<ul style="list-style-type: none"> <li>• Set target for % in AUM in net zero or aligned assets.</li> <li>• Set target for increase % climate solutions revenues/AUM.</li> </ul>	
<b>Asset alignment and climate solutions assessment criteria</b>	<ul style="list-style-type: none"> <li>• Past and future expected territorial production emissions /capita or /GDP against net zero pathway.</li> <li>• Past and future performance on key sectors (energy use, renewables).</li> <li>• Other national and international policy positions.</li> <li>• Allocation to green or SDG climate bonds</li> </ul>	<ul style="list-style-type: none"> <li>• Current emissions intensity performance (Scope 1, 2, and material Scope 3).</li> <li>• A long term 2050 goal consistent with global net zero.</li> <li>• Short- &amp; medium-term emissions reduction targets.</li> <li>• A credible investment plan for achieving targets.</li> <li>• Revenues and capital expenditure consistent with achieving targets.</li> <li>• Clear governance responsibilities for targets/transition.</li> <li>• Executive remuneration linked to delivering targets/investment plan.</li> <li>• Disclosure of Scope 1, 2 and material Scope 3 emissions.</li> <li>• Revenues from EU mitigation taxonomy activities.</li> </ul>	<ul style="list-style-type: none"> <li>• Current alignment of building carbon emissions and energy use in line with regional/building type net zero pathway.</li> <li>• Future expected alignment based on plan for retrofit, demand management and renewable energy use.</li> </ul>
<b>Recommended methodologies</b>	Germanwatch Climate Change Performance Index	Transition Pathways Initiative; Science Based Targets initiative; Climate Action 100 benchmark	Carbon Risk Real Estate Monitor (CRREM)

Source: Adapted from IIGCC PAII: Net Zero Investment Framework for Consultation

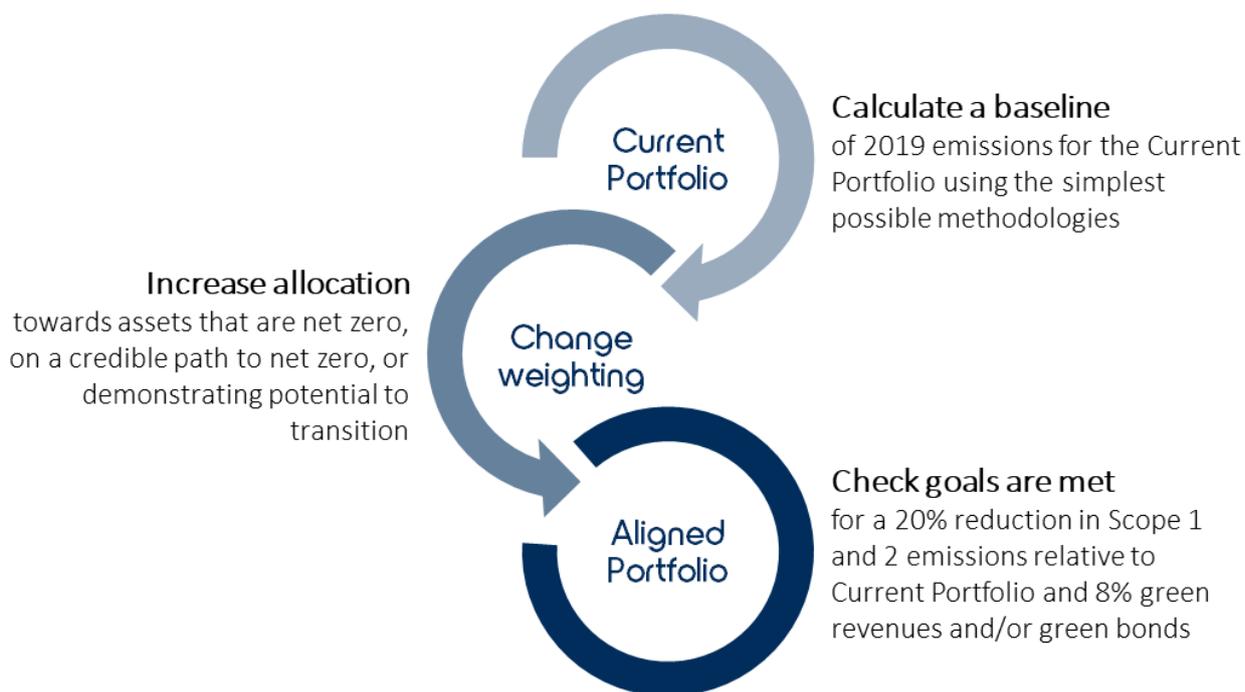
### 3.1.1 Listed equities and corporate bonds

For listed equities and corporate bonds, the first two components of the Framework recommend setting targets for portfolio emissions intensity and investment in climate solutions. Investors were expected to achieve a 20% reduction in Scope 1 and 2 emissions in their Aligned Portfolios compared with 2019 levels, and a minimum of 8% green revenues and/or green bonds.<sup>4,5</sup> These levels were defined during the PAII working group roundtables. The EU Taxonomy for sustainable finance was the recommended reference for defining green revenues in this context.<sup>6</sup>

For both asset classes, investors used the simplest possible methodologies to establish a baseline of 2019 emissions. They then increase the portfolio’s allocation or weighting towards assets that are either already at or very close to net zero greenhouse gas (GHG) emissions, are on a credible path to net zero, or are demonstrating potential to transition against a defined set of criteria. Investors can use several criteria to determine whether companies demonstrate potential to transition, including whether the company has set a forward-looking emissions goal or target, if it has a policy on reducing its own emissions, and if it discloses its Scope 1, 2 and material Scope 3 emissions. Investors can use a range of resources and datasets to assess companies against these criteria.

Having completed this reweighting, investors were required to verify that the Aligned Portfolio achieved the desired reduction in Scope 1 and 2 emissions and increase in green revenues and/or green bonds. If this was not achieved, investors further reweighted their portfolio (Figure 2).

Figure 2 High-level alignment process for listed equities and corporate bonds



Source: IIGCC, Planetrics, Vivid Economics

<sup>4</sup> In its current form, the Framework accounts for the climate impact of bonds based on the carbon footprint of the issuer. This is currently being reviewed (Section 3.3.1).

<sup>5</sup> Given the data challenges and different starting points regarding green revenues, investors could alternatively aim to achieve 150% of Current Portfolio levels in their Aligned Portfolio.

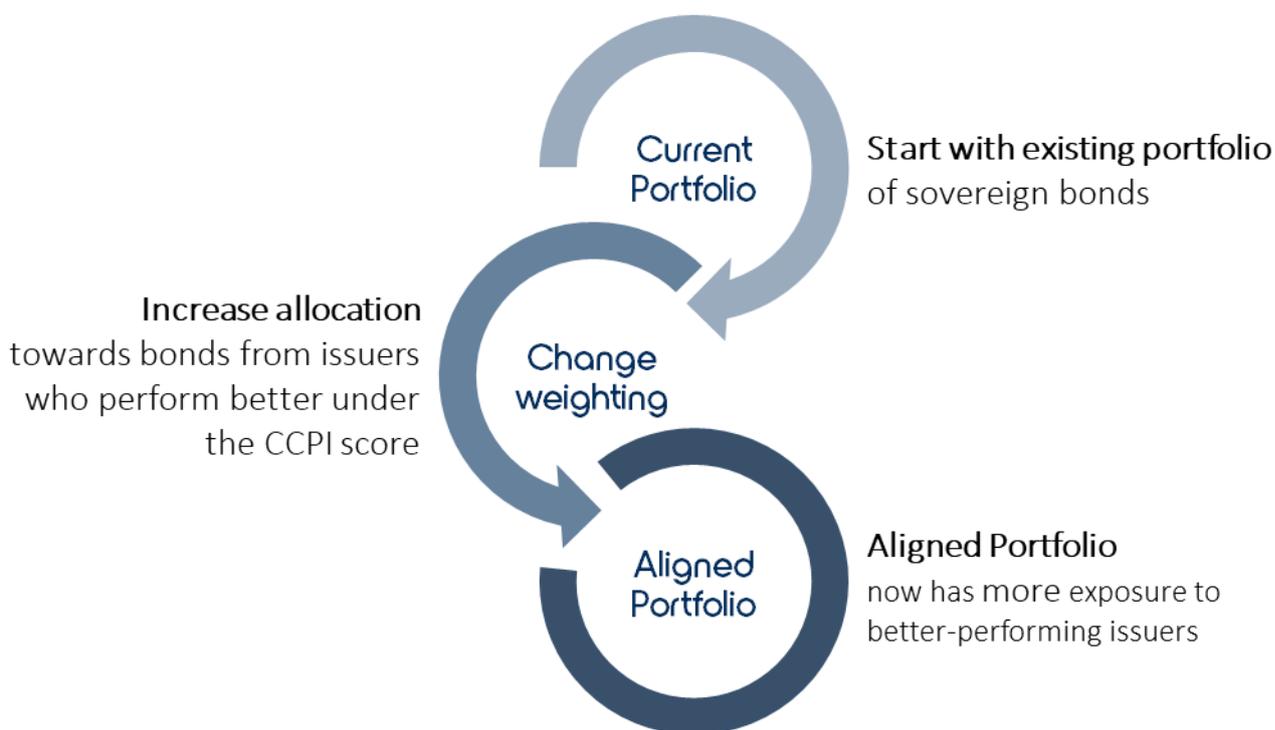
<sup>6</sup> The EU Taxonomy is still under development; at the time of the testing phase technical screening criteria had not yet been finalised and were available for only two of the Taxonomy’s six environmental objectives – climate mitigation and adaptation. Data against the Taxonomy is nascent and not broadly available. Investors were able to use allocations to green bonds and existing green revenues data to measure their allocations in this testing phase.

### 3.1.2 Sovereign bonds

For sovereign bonds, the approach recommends increasing allocation or weighting towards sovereigns that score highly against a set of climate performance metrics that reflect current and future potential alignment with a 1.5°C pathway. The recommended available methodology that investors can use as the scoring framework and underlying data is Germanwatch’s Climate Change Performance Index (CCPI).<sup>7</sup>

To construct the Aligned Portfolio, investors include or increase the weighting of bonds from better-performing issuers, to achieve the maximum increase in climate performance that is possible while meeting other aspects of their mandate, such as requirements for liability matching, diversification; and risk-return profile (Figure 3).

Figure 3 High-level alignment process for sovereign bonds



Source: IIGCC, Planetrics, Vivid Economics

### 3.1.3 Real estate

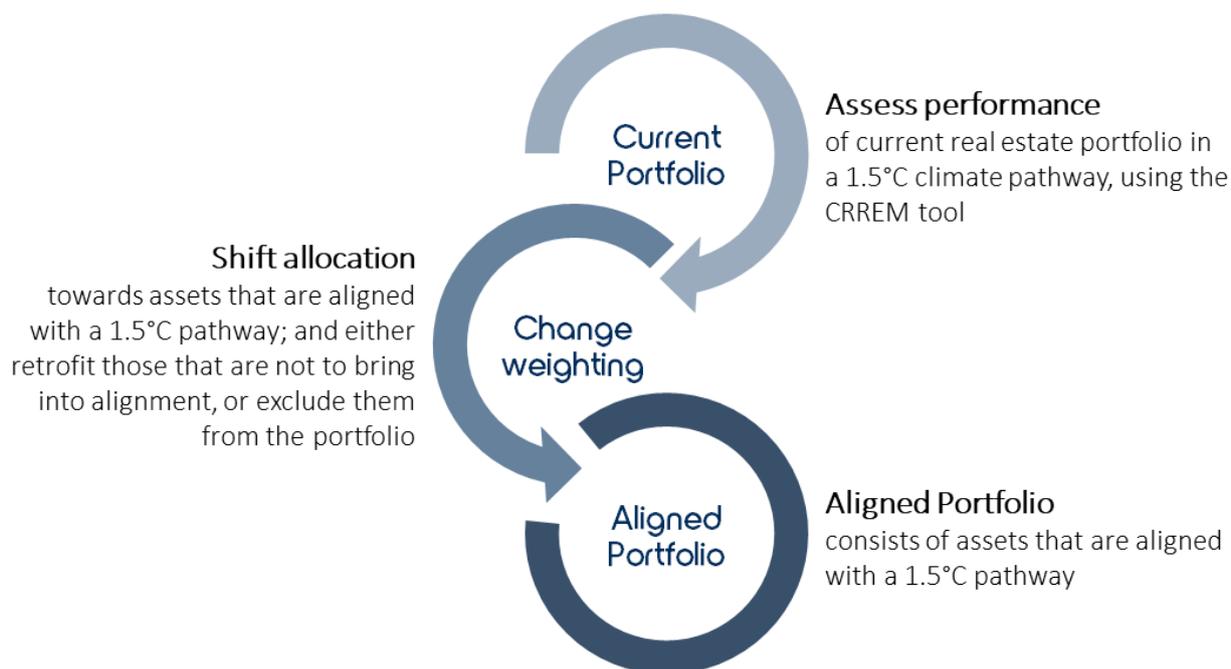
For real estate, the recommended approach is to use the Carbon Risk Real Estate Monitor (CRREM) tool,<sup>8</sup> which was launched in February 2020. CRREM has been developed to measure and manage climate risks associated with real estate. Due to its recent launch, at the time of the testing phase, the tool was fully functional only for EU commercial real estate, so it was recommended that both Current and Aligned Portfolios should include only this type of asset.

Under the recommended approach, investors enter asset-level information on their current European commercial real estate portfolio into the tool, and use the tool to understand the performance of those assets on a 1.5°C climate pathway. Based on this insight, investors then align their real estate portfolio through a combination of measures: shifting their exposure towards assets that are aligned with a 1.5°C pathway; excluding assets that are not aligned; and introducing retrofit or other investment plans and actions to bring non-aligned assets into alignment (Figure 4).

<sup>7</sup> <https://germanwatch.org/en/CCPI>

<sup>8</sup> <https://www.crrem.eu/>

Figure 4 High-level alignment process for real estate



Source: IIGCC, Planetrics, Vivid Economics

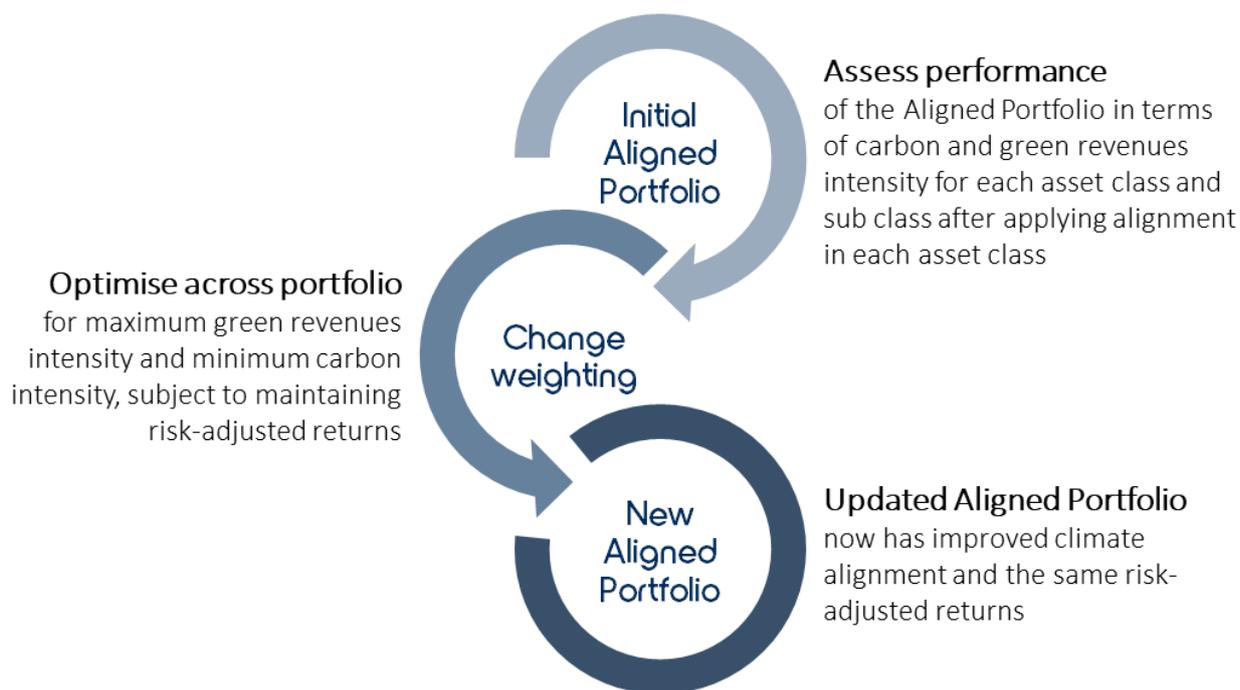
### 3.1.4 Strategic asset allocation

In addition to tilting portfolios within asset classes, for example by shifting from oil and gas equities to low-emissions utilities, the recommended methodology also gives the option for investors to use strategic asset allocation (SAA) to improve their alignment by shifting investments between asset classes.

To exercise this option, investors assess the relative carbon and green revenues intensity for each asset class and subclass. In addition, they can add climate-focused asset class variants to their opportunity set, such as green bonds, listed renewable infrastructure, and green real estate.

They then optimise across their portfolio to maximise the intensity of green revenues and minimise carbon intensity, subject to delivering the same expected risk-adjusted returns as in the Current Portfolio (Figure 5).

Figure 5 High-level alignment process for strategic asset allocation



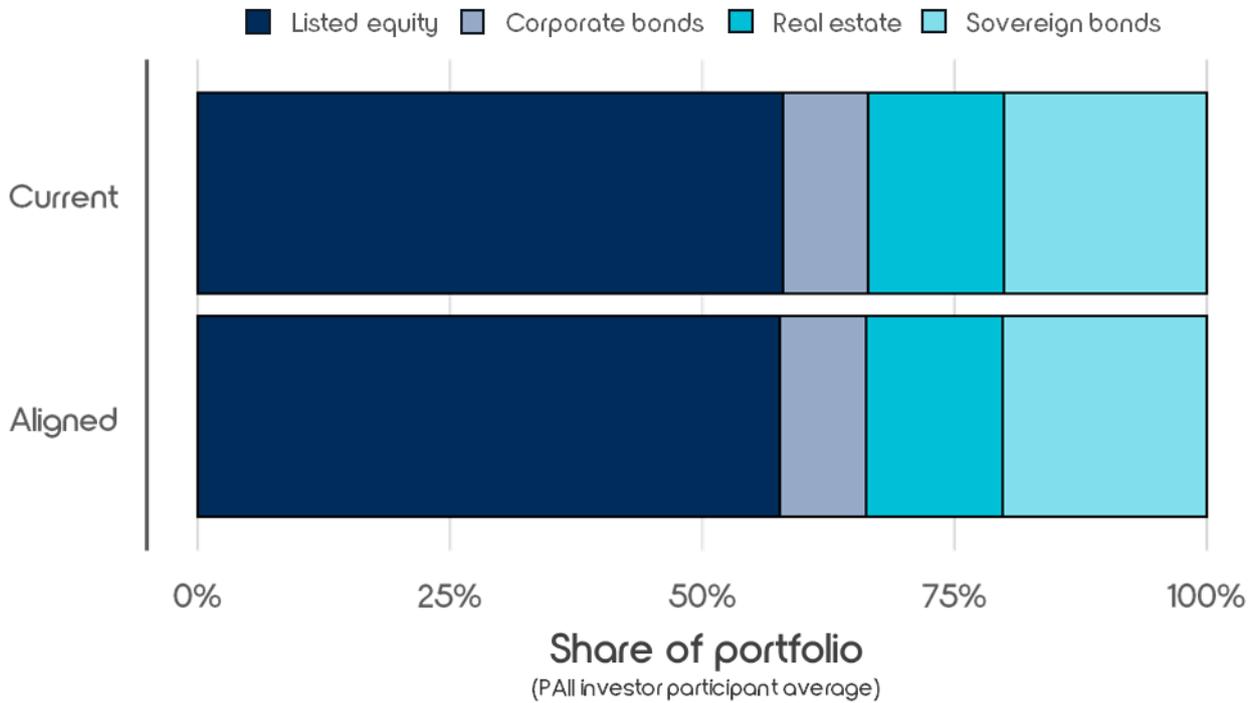
Source: IIGCC, Planetrics, Vivid Economics

### 3.2 Impact of alignment on asset allocation

When applying the Framework, investors made significant adjustments to their portfolios. The size of the adjustment varies from investor to investor. There are differences in the way in which they constructed their Current Portfolios, reflecting different investment mandates and differences in investors’ existing policies for incorporating climate-aware and/or sustainability-focused strategies. There are also differences in the tools and datasets investors chose to use when applying the Framework.

On average across the investors’ portfolios, equities were by far the largest share of the assets held, followed by sovereign bonds, real estate, and corporate bonds. Most of the reweighting happened *within* asset classes rather than between asset classes. As a result, the average mix of asset classes for Current and Aligned Portfolios is almost identical (Figure 6). This is partly due to significant alignment opportunities within asset classes, and because most investors did not seek to move assets between the four asset classes when applying the Framework to their portfolios (section 3.3.3). Some SAA changes by investors do not appear as asset class weight changes in Figure 6. This is due to the high-level asset class definitions used in the figure. For instance, tilting from oil & gas equities into listed renewable infrastructure lies within equities, as does switching to a climate-aligned equity index.

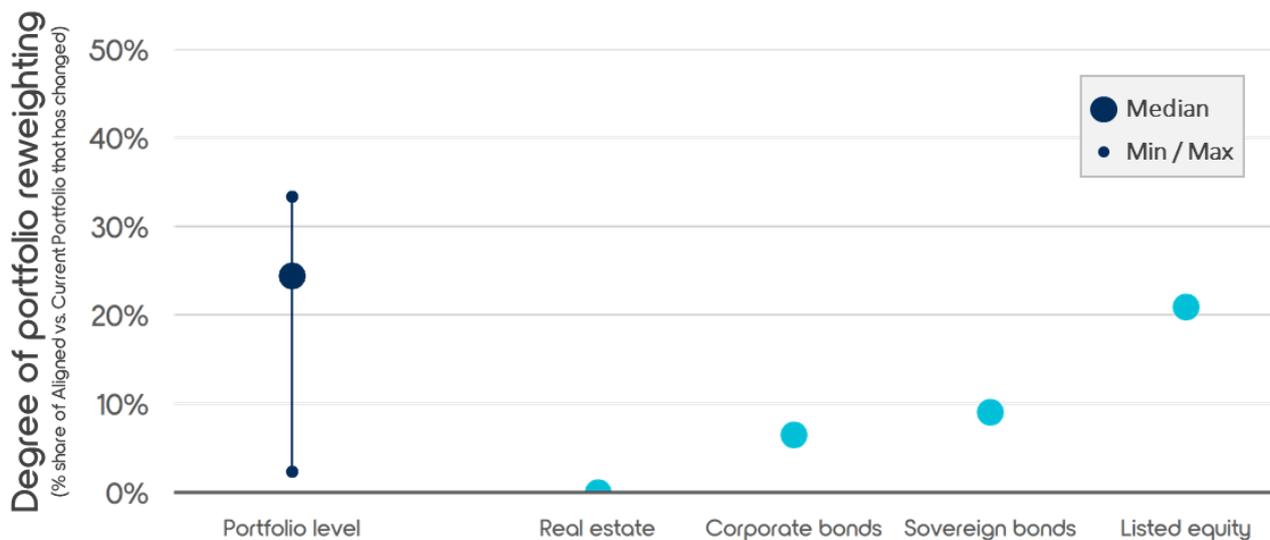
Figure 6 On average across investors in the test phase, allocation changes between asset classes from Current to Aligned are limited



Source: Planetrics, Vivid Economics, based on PAI investor participant portfolios

The extent of portfolio reweighting was quantified by summing the gross increases in holdings of specific securities within the investors’ Aligned Portfolios relative to their Current Portfolio (Figure 7). Among the four asset classes, the largest mean portfolio adjustments were in equities. As well as reflecting significant alignment opportunities within equities, this also reflects some of the challenges that investors encountered in aligning other asset classes (sections 3.3.1–3.3.3).

Figure 7 The degree of portfolio reweighting differed considerably across asset classes



Note: Degree of portfolio reweighting defined as the sum of security or asset-level increases in portfolio weighting across the investor portfolio or asset class.

Source: Planetrics, Vivid Economics, based on PAII investor participant portfolios

### 3.3 Lessons from creating Paris-aligned portfolios in practice

One of the objectives of the testing phase was for investors to identify the practical challenges they encountered when applying the Framework. Investors came across several challenges in applying the Framework, many of which relate to the availability of data.

#### 3.3.1 Lessons from alignment of listed equities and corporate bonds

**Green revenue data:** The methodology recommends that investors use the EU Taxonomy to assess the share of revenues derived from climate solutions. As this is a relatively new framework, very limited datasets based on this approach existed when the testing phase took place. Investors therefore used existing assessment tools or proxies for green revenues. Since the Taxonomy now forms part of the regulatory framework for sustainable finance in Europe, relevant datasets are likely to become more readily available, both through the efforts of data providers and additional regulatory requirements for companies to report this data.<sup>9</sup> However, ensuring that reliable equivalents exist for non-EU assets is important to enable full and comparable application of the Framework across developed and emerging market portfolios, since companies based outside the EU may face fewer requirements and incentives to report on their performance against the Taxonomy.

**Green revenue levels and trajectories:** The investors found it challenging to reach the objective of achieving 8% green revenues in their equity and corporate bond portfolios. This was particularly true for corporate bonds since these are issued by both listed and non-listed issuers, and green revenue data is far more limited for non-listed companies. Investors’ geographic exposure also influenced their ability to increase their green revenue exposure. In view of these challenges, the recommended methodology was modified during the

<sup>9</sup> The EU Taxonomy Regulation (EU Regulation 2020/852 on the establishment of a framework to facilitate sustainable investment, and amending regulation (EU) 2019/2088) requires companies that are subject to the EU Non-Financial Reporting Directive to report on the extent to which their activities are environmentally sustainable as defined by the Taxonomy. This requirement will apply from 2022 for some of the Taxonomy’s Environmental Objectives, and from 2023 for the rest.

testing phase to allow investors that were unable to reach the 8% threshold to increase green revenues by 50% relative to their Current Portfolio instead.

As noted in Phase I of PAII, there are no decision-useful trajectories available for expected increases in investment in climate solutions to guide target-setting. As a result, it is difficult for investors to plan to grow their exposure to green revenues. Future work in Phase II of PAII will include refining recommendations for target-setting for investment in climate solutions, taking into account different regional and sectoral exposures. In addition, private markets and infrastructure are the primary way for some investors to gain exposure to climate solutions. These asset classes were not included in this testing phase, and their contribution could therefore not be included. Phase II of PAII will begin to address this by analysing methodologies for infrastructure and private equity to bring these asset classes into the Framework.

**Coverage of alignment indicators for companies:** Only a limited number of companies are represented in the two key datasets used for evaluating companies' alignment – the Science Based Targets initiative (SBTi) and the Transition Pathways Initiative (TPI) assessments. GHG emissions data, by contrast, is much more widely available for listed companies. Investors found it was feasible and relatively straightforward to use a combination of emissions data, supplemented with company-specific alignment indicators wherever available, to align their portfolios. Investors' ability to assess alignment will grow as the coverage of alignment indicators like SBTi and TPI expands in future. It is expected that assessments will continue to be built using available data only, while datasets and coverage develop.

**Green bonds:** In its current form, the Framework accounts for the climate impact of bonds based on the carbon footprint of their issuer. But it also recommends that investors increase their allocations to green bonds. This creates a potential conflict of objectives. For example, a utility might issue green bonds to invest in low-carbon renewable energy, while having a high carbon footprint today due to existing fossil fuel generation that will be retired in the near future. Because of the utility's high carbon footprint, investors would face an incentive to exclude the green bond from their portfolios, despite the low-carbon nature of the investment associated with the bond. To avoid this perverse incentive, the investor group discussed potential carve-outs in the Framework for green bonds, or creating a target for green bonds that is separate from their issuers' carbon footprint. These questions are being resolved through the review of the response to the consultation on the Framework that the steering group and working group leads are conducting, and the outcome will be reflected in the final Framework (see section 1.3).

### 3.3.2 Lessons from alignment of real estate

Data availability for real estate portfolios was a significant constraint and it was not possible for most of the investors to gather comprehensive data in the timeframe of the exercise. The CRREM tool was launched in February 2020, a few months before the testing phase began, and since property data is usually gathered annually, there is an inevitable lag in the tool's coverage. At the time of the testing activity, the CRREM tool enabled only assessment of commercial real estate in Europe. In some cases this was only a very small proportion of investors' portfolios. Because of this, some investors used proxies such as relative EPC (Energy Performance Certificate) performance or energy-use data to align portfolios, instead of the CRREM tool. CRREM is expanding to include all types of real estate in a larger range of geographies, and investors are therefore expected to be able to use this in a more systematic manner in the near future. Data availability should also improve rapidly with relevant data being incorporated in GRESB<sup>10</sup> reporting. Even then, the use of estimations will continue to present a challenge. The investor group noted that, in some cases, the CRREM estimation data resulted in more favourable outcomes than using actual data. It is therefore important that use of estimations is treated cautiously, and to ensure that there are no perverse incentives to use estimated data.

---

<sup>10</sup> <https://gresb.com/about/>

In addition to the limitations of the CRREM tool at the time of the test phase, at least one investor was unable to use this approach as it holds real estate indirectly through a real estate fund-of-funds.

### 3.3.3 Lessons from alignment of other asset classes and strategic asset allocation

Due to the scope of Phase 1 of PAII, the investors included only listed equities and bonds, sovereign debt, and real estate in the testing phase. This meant that other asset classes with potential for improving alignment were excluded. For example, infrastructure is an asset class with significant potential to contribute to portfolio alignment, but analytical tools for assessing infrastructure alignment are yet to be incorporated into the Framework. This will be done in Phase II of PAII. One investor used a shift towards 'green'-listed infrastructure in its equity portfolio to improve its exposure to low-carbon infrastructure within the bounds of the existing Framework.

For non-listed companies, there is less data available in the public domain on emissions and green revenues. Improvements in data availability for non-listed companies would help to strengthen the quality of alignment for these firms. Some asset classes such as hedge funds and diversified growth funds lack visibility on their carbon and other characteristics; improved data is also needed for these asset classes.

One investor used optimisation techniques to achieve better alignment at the lowest possible cost to performance in its portfolio during the testing phase. This yielded successful climate alignment outcomes and strong financial performance (Box 1). Other participants did not choose to apply optimisation, in some cases due to lack of time to deploy new methodologies during the testing phase.

#### Box 1 Using optimisation tools to minimise costs while aligning portfolios

Most investors gain exposure to equities and other asset classes using standard benchmarks like MSCI World or FTSE 100. These indices may either be tracked by passive index funds or used as the benchmark for active managers.

One important way that investors can achieve net zero portfolios is to replace these benchmarks with low-carbon, high climate solution alternatives. When making this switch, it is important for investors that the replacement benchmarks demonstrate similar financial characteristics to their standard equivalents.

Phoenix Group asked Aberdeen Standard Investments (ASI), its asset manager, to generate Paris-aligned test portfolios with these twin climate and financial goals in mind for the testing phase.

To implement this, ASI used portfolio-optimisation tools, which employ historical security-level returns and correlation data to generate portfolios with low deviation in returns, or 'tracking error', relative to the standard index, but substantial improvements to carbon performance.

ASI found that it is possible to achieve the required Paris-aligned tilts away from carbon-intensive companies, towards climate transition leaders (as measured by the SBTi) and climate solutions, while maintaining very similar sector exposures, and within a tracking error budget of 50 basis points.

As expected, these portfolios had very similar financial characteristics in terms of historical returns, risk and valuation multiples.

This optimisation method is used by index providers like FTSE and MSCI to generate their own climate-aligned indices. The historical performance of these indices has been extremely close to the standard equivalent, but slightly better.

## 4 Testing methodology

IIGCC worked with Planetrics, a Vivid Economics company, to model the behaviour of the Current and Aligned Portfolios for each investor under four climate scenarios.

### 4.1 Scenarios

The four scenarios used in the testing phase (Figure 8) are:

**Current Policy Scenario:** This scenario was used as a baseline for the analysis. It assumes that assets are currently priced with a continuation of general macroeconomic trends and technology developments but almost no carbon pricing. This scenario is not aligned with the goals of the Paris Agreement, and leads to an expected temperature increase of 3.7°C by 2100. It is drawn from the set of climate scenarios prepared by the Network of Central Banks and Supervisors for Greening the Financial System (NGFS), which were developed to support a starting point for understanding climate risks for the economy and financial system<sup>11</sup>.

**Immediate Action Scenario:** In this scenario, climate policies are implemented from 2020 in line with the long-term target of keeping temperature increases below 1.5°C. This scenario assumes limited availability of carbon dioxide removal (CDR) technologies such as bio-energy with carbon capture and storage (BECCS) or Direct Air Capture (DAC). This is the most stringent climate scenario used in the testing phase, and leads to an expected temperature increase of 1.3°C by 2100. The scenario is drawn from the NGFS scenario set<sup>12</sup>.

**Delayed Action Scenario:** This scenario applies climate policies in line with the long-term target of keeping temperatures below 2°C, but these are implemented with a delay, starting in 2030. The assumption of limited CDR is also applied in this scenario. This scenario leads to an expected temperature increase of 1.6°C by 2100. This scenario is drawn from the NGFS scenario set<sup>13</sup>.

**Forecast Policy Scenario:** Disruptive policy action is implemented from 2025 to reduce global emissions. This is a normative scenario which considers what policies are likely to be implemented in practice rather than the least-cost measures required to achieve a given temperature. This leads to an expected temperature increase of 1.9°C by 2100, making it the least-stringent of the three Paris-aligned scenarios used in the testing phase. This scenario is taken from the UN Principles for Responsible Investment's Inevitable Policy Response, which focuses on policy action and climate risks that are likely to emerge in the short and medium term<sup>14</sup>.

<sup>11</sup> The Current Policy Scenario corresponds to the REMIND-MAGPIE 'Hot House World' scenario in the NGFS scenario set.

[https://www.ngfs.net/sites/default/files/medias/documents/820184\\_ngfs\\_scenarios\\_final\\_version\\_v6.pdf](https://www.ngfs.net/sites/default/files/medias/documents/820184_ngfs_scenarios_final_version_v6.pdf)

<sup>12</sup> The Immediate Action Scenario corresponds to the REMIND-MAGPIE 'Orderly' scenario in the NGFS scenario set.

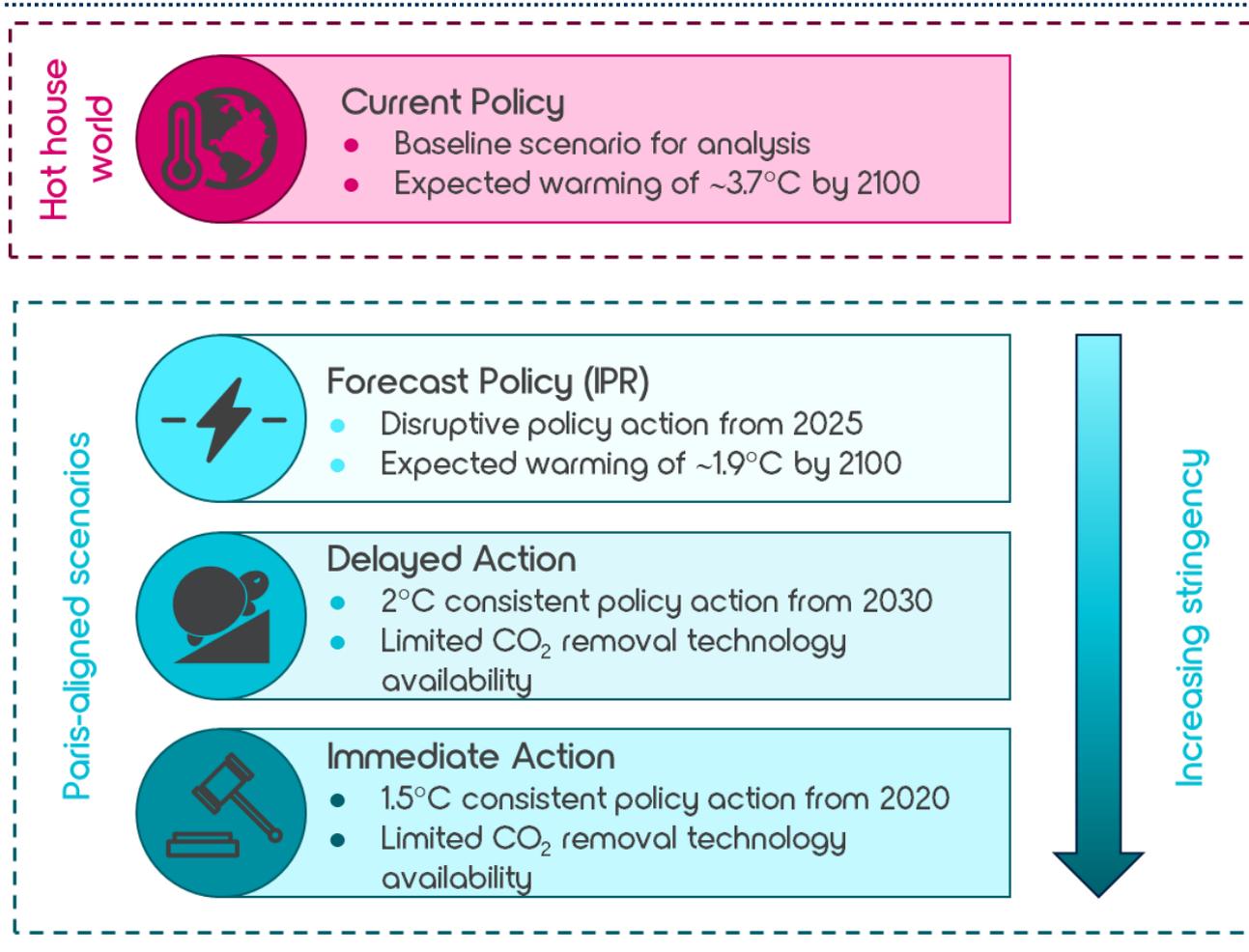
[https://www.ngfs.net/sites/default/files/medias/documents/820184\\_ngfs\\_scenarios\\_final\\_version\\_v6.pdf](https://www.ngfs.net/sites/default/files/medias/documents/820184_ngfs_scenarios_final_version_v6.pdf)

<sup>13</sup> The Delayed Action Scenario corresponds to the REMIND-MAGPIE 'Disorderly' scenario in the NGFS scenario set.

[https://www.ngfs.net/sites/default/files/medias/documents/820184\\_ngfs\\_scenarios\\_final\\_version\\_v6.pdf](https://www.ngfs.net/sites/default/files/medias/documents/820184_ngfs_scenarios_final_version_v6.pdf)

<sup>14</sup> UN PRI: Inevitable Policy Response: policy forecasts. <https://www.unpri.org/the-inevitable-policy-response-policy-forecasts/4849.article>

Figure 8 Overview of scenarios used for alignment testing



Source: Planetrics, Vivid Economics

## 4.2 Modelling approach

The Planetrics model uses advanced modelling tools developed for private and public sector analysis of climate impacts. It deploys leading, quality-assured datasets, and is regularly used by financial institutions to conduct scenario-based risk assessments.

The Planetrics model takes a specific climate scenario and simulates its impact on energy, climate, land use, and the wider economy. It then applies the economic outcomes of the scenario and calculates the impact on individual assets. From this it calculates the financial implications for securities in a portfolio, using a specific methodology for each of the four asset classes modelled.

For listed equities and corporate bonds, the toolkit uses data on individual firms to model the scenario’s impact on companies’ earnings over time. This includes the impacts of growth in demand for low-emissions products, reductions in demand for high-emissions products, carbon pricing, and use of abatement technologies such as energy efficiency (these are outlined in more detail in Section 5.3). It also includes gains or losses in companies’ market share and margins resulting from competition dynamics and pass-through of costs to consumers and other businesses.

After calculating impacts on earnings in a scenario, the model applies discounted cash-flow modelling, using security-specific discount rates and growth outlooks, to assess the impact on equity values. For corporate bonds, the model uses the same changes in earnings as for equities, and then applies default risk modelling using a ratings-based Altman approach.

For sovereign bonds, the model assesses the macroeconomic impacts of each scenario for individual countries, and the resulting impact on fiscal and monetary policy. Estimated interest rate and sovereign risk factor changes are used to model changes in sovereign bond valuations.

For real estate, the model estimates changes in rental income for buildings based on changes in carbon costs, abatement investments (such as energy efficiency improvements), and pass-through of costs to entities other than the building owner.

Annex 2 provides a more detailed description of the modelling methodology.

### 4.3 Key limitations

While the model's capabilities and datasets are advanced, it has limitations that are relevant when interpreting its outputs.

**The testing phase modelled only transition risks, and not physical risks.** Since the alignment approaches currently included in the Framework relate to promoting the carbon transition, the modelling in the test phase included only the risks arising from this transition (described in section 4.2)<sup>15</sup>. Phase II of PAII will consider physical risk and incorporating adaptation and resilience into the Framework as a component of Paris alignment.

**The toolkit does not consider companies' commitments to transform business models** but rather relies on observed financial and environmental, social, and governance (ESG) data to model future performance. As a result, the model does not reward companies that have set ambitious targets which have not yet translated into changes in revenues or assets.

**The toolkit assesses all bonds based on their issuer** and does not distinguish between green bonds and other bonds. This means that portfolios holding green bonds issued by companies with a high carbon footprint today may appear to carry high climate risk.

**Data quality and company disclosure varies**, and this means that the model uses sector averages instead of company-reported data in some places. The situation is improving over time as disclosures and ESG datasets improve, and Planetrics is committed to ensuring that inputs into its analytics remain at the leading edge.

**Cleantech 'unknown unknowns'**, such as companies and technologies not yet listed in markets, are not captured within this analysis. Demand creation analysis in the model captures growth in demand for mature and high-growth cleantech products which are already in commercial production or proven at scale. It does not capture demand growth for technologies which have not reached scale or achieved widespread deployment, such as CCS. These technologies also often have more uncertain demand in climate scenarios, with considerable differences in deployment levels across publicly available scenarios.

**Scenario-based analysis tests for a limited number of plausible futures.** The purpose of the testing phase was to explore impacts on investor portfolios in plausible futures where the goals of the Paris Agreement are achieved. The three Paris-aligned scenarios do not represent all possible pathways for reaching these goals, and it is possible that actual future policy could be weaker than in the aligned scenarios, despite current momentum towards tightening climate policy in many regions.

**The model is subject to a continuous update cycle** which improves the granularity of results, and reflects new developments in climate science, climate policy, company reporting and activity.

---

<sup>15</sup> While this is appropriate for this testing activity, investors should in general consider the impact of both transition and physical risks for their portfolios.

## 5 Key findings

The modelled behaviour of the portfolios under different climate scenarios yields several findings for investors on the success of the Framework in improving portfolio alignment with climate goals. The modelling also explains the drivers for that success, both at a portfolio level and for individual asset classes, and creates insights that investors will use when further developing and applying the Framework.

### 5.1 Alignment creates significant reductions in risk in scenarios where there is strong climate action

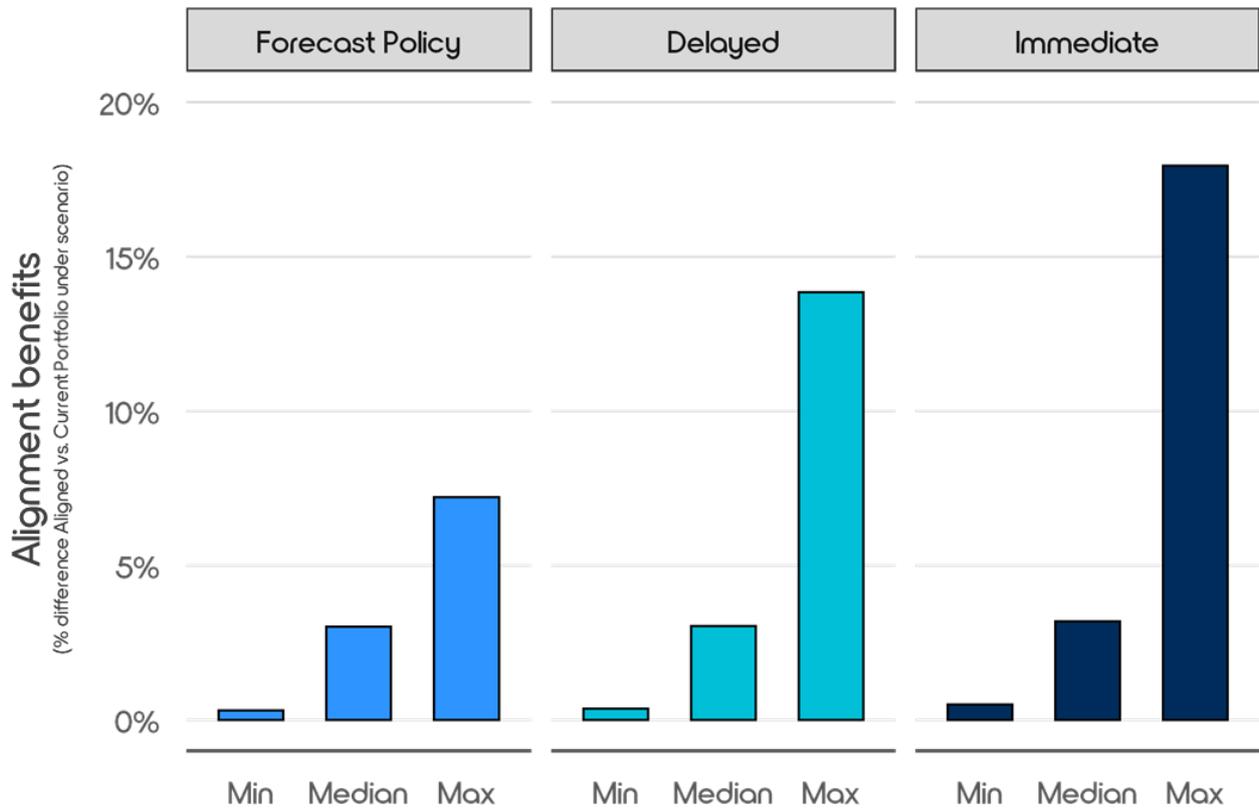
To test the effectiveness of the alignment Framework in scenarios that are aligned with the goals of the Paris Agreement, the modelled value of each investor's Current Portfolio and Aligned Portfolio were compared in each of the Paris-aligned scenarios. For each investor, the Aligned Portfolio outperformed the Current Portfolio in all three scenarios (Figure 9).

This indicates that the Framework succeeds in improving investors' performance in scenarios with strong climate action, and correspondingly reduces investors' climate risks<sup>16</sup>. The improvement is strongest in the most stringent climate scenario ('Immediate').

---

<sup>16</sup> Specifically, climate risks here refers to impairments to current assets due to impacts described in section 4.2.

Figure 9 Alignment benefits all PAIL investors although the scale of benefits differs by participant and scenario

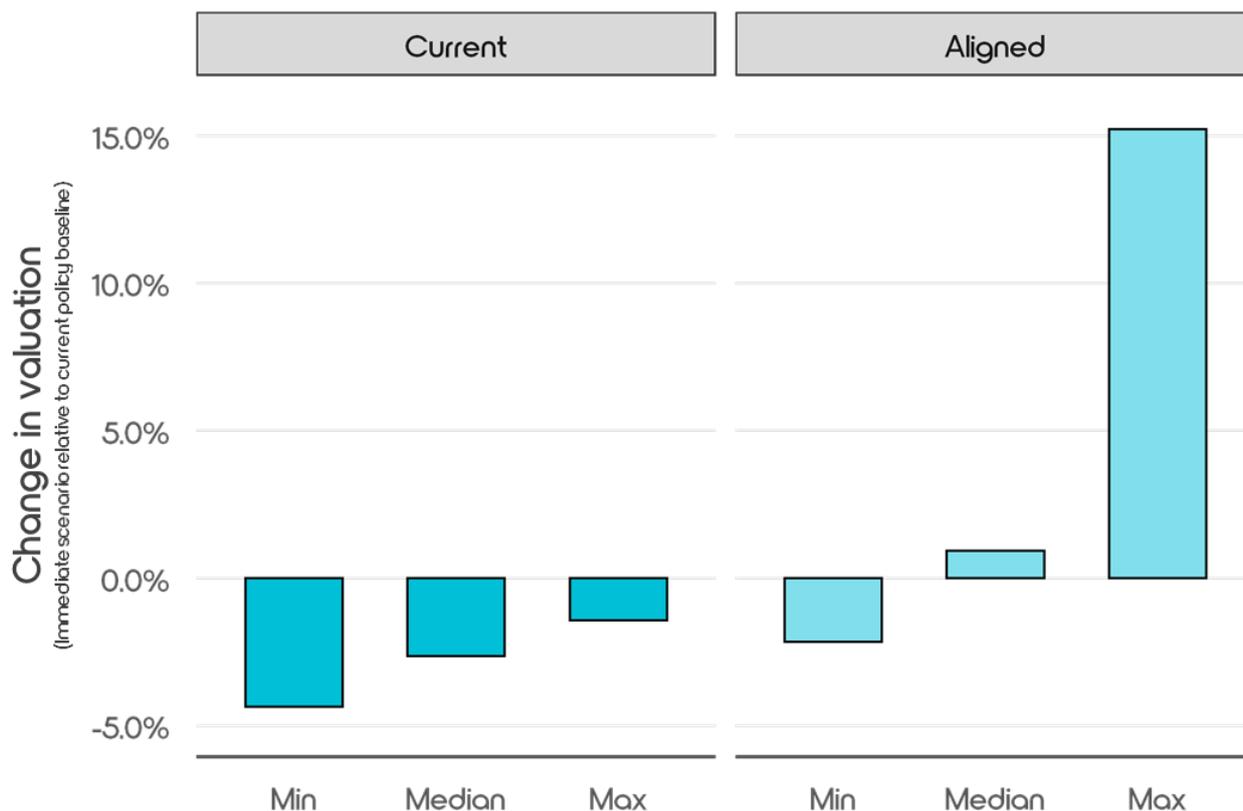


Source: Planetrics, Vivid Economics, based on NIESR, FactSet financial data and analytics, Refinitiv Eikon and others

The extent of the improvement varies by investor and, due to differences in the extent to which climate risks are already being managed in their Current Portfolio and variations in the way in which investors have applied the methodology, their results are not directly comparable.

Although Aligned Portfolios outperform Current Portfolios in climate-constrained scenarios, they can still lose value in absolute terms in those scenarios: aligning does not in itself eliminate climate-related risks (Figure 10). This implies that both investors and investee companies may need to take more action to reduce or remove these risks. This could include investors engaging with companies in exposed sectors to strengthen their plans for transition to low-carbon business models.

Figure 10 In the Immediate scenario, all PAII Current Portfolios face impairment, while the median PAII Aligned Portfolio increases in valuation



Source: Planetrics, Vivid Economics, based on NIESR, FactSet financial data and analytics, Refinitiv Eikon and others

One investor tested the performance of its Aligned Portfolio in scenarios where climate policy relaxed rather than tightened over time, and found the impact on performance to be small (Box 2). This suggests that investors can improve their portfolios’ climate alignment without significantly risking performance if climate policy is weaker or later than anticipated in the Paris-aligned scenarios.

**Box 2 Aligned portfolios in high-carbon scenarios**

The test phase focuses on the performance of Paris-aligned portfolios in scenarios where governments move to implement more aggressive climate policies. It should perhaps be expected that Paris-aligned portfolios perform well in these scenarios. But what about scenarios where governments fail to fulfil their Paris commitments? How will Paris-aligned portfolios perform?

ASI commissioned Planetrics to run a range of scenarios in addition to those supplied for the IIGCC testing phase, including scenarios where some parts of the world move faster than others, and others where governments fail to keep even their current commitments.

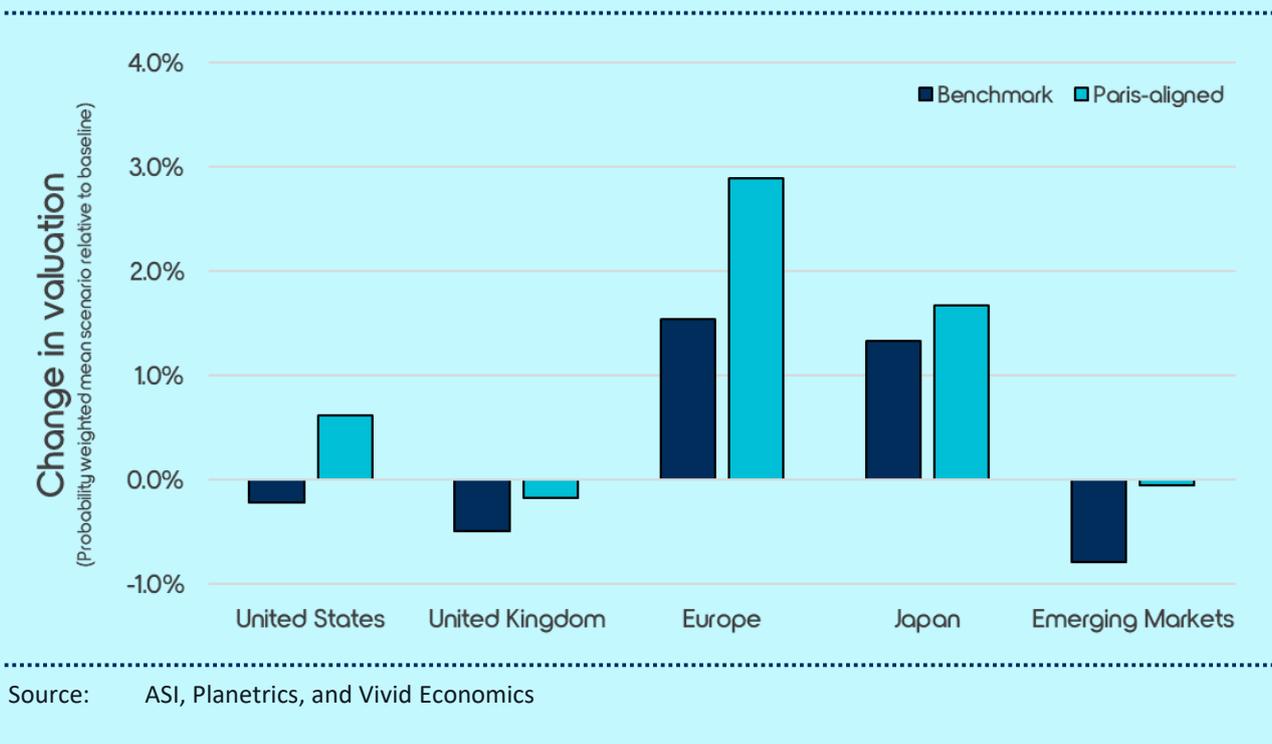
ASI ran Paris-aligned regional equity test portfolios and their standard benchmark comparators (e.g. Paris-aligned US equity vs standard S&P 500 equity) through these alternative scenarios – 14 scenarios in all – to see whether Paris-aligned portfolios would continue to perform positively.

This approach gave 70 results (14 scenarios for 5 equity regions). In 59 out of 70 cases (85%), the climate-enhanced index outperformed its benchmark. This was also the case in the probability-weighted mean of the scenarios (Figure 11). Paris-aligned portfolios underperform their benchmarks only in scenarios where

governments make no further efforts to strengthen climate policy, or where they backtrack on current commitments. Even then the underperformance is small.

The difference between Paris-aligned portfolios and benchmarks is never very large (+0.8% on average, with a range of -2.6% to +3.4% total impact, equivalent to 20–30 basis points on annualised returns). This small impact is a design feature (as Box 1 explains): ASI designed the tilted portfolios to have a very low tracking error to their benchmark.

Figure 11 Differences between Paris-aligned and benchmark portfolios are small even in scenarios without strong climate action



## 5.2 Cost of alignment is manageable even without climate action

The analysis evaluated the impact of alignment on five metrics of portfolio performance. This is based on the securities’ historical characteristics, and calculated as an average across the five investors’ portfolios.

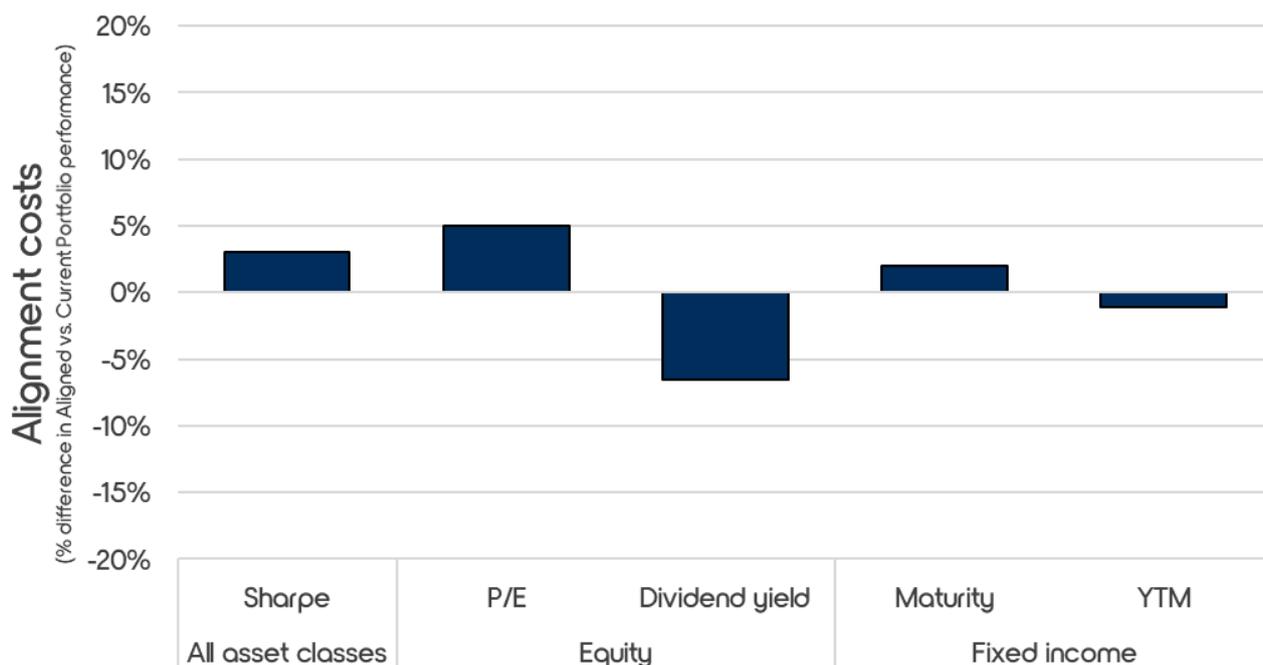
For each Current and Aligned Portfolio the impact on the Sharpe ratio, a risk-adjusted measure of the portfolio’s return, was calculated. For bonds, the impact on yield-to-maturity – a measure of their total expected return over their lifetime – and the average maturity of bonds held was calculated. For equities the dividend yield – the ratio of stocks’ annual dividend to the price of the stock – and the ratio of companies’ stock price to earnings per share (the price-to-earnings (P/E) ratio) was calculated.

Across the five investors’ portfolios, the average impact of alignment on most of the key metrics was modest (Figure 12). This suggests that the costs of aligning can be manageable, irrespective of what climate policies are pursued in future. The mean Sharpe ratio across the five investors was very slightly higher for the Aligned Portfolios than the Current Portfolios. In equities, investors experienced a reduction in their dividend yield and an increase in their P/E ratio in their Aligned Portfolio. One of the drivers for the change in P/E ratio is that many cleantech stocks are ‘growth’ stocks which carry lower dividend yields and higher P/E ratios than incumbents, but which also have a high expected growth trajectory relative to other stocks.

The difference in the performance of the Aligned and Current Portfolios across these metrics varies between investors. There were significant differences between investors’ performance arising both from differences

in their Current Portfolios and the ways in which they applied alignment. As outlined in Section 3.3.3 and Box 1, one investor applied optimisation techniques to each of its asset classes when aligning to create a portfolio with similar risk-return characteristics but significantly better climate performance. This yielded changes to the key financial metrics that were smaller than those obtained by other investors. This suggests that by using a similar approach, other investors could achieve alignment at even lower costs than were incurred in the testing phase (Figure 12).

Figure 12 Alignment had a modest impact on key financial metrics for the average PAII investor participant



Source: Planetrics, Vivid Economics, based on PAII investor participant portfolios

For some investors, alignment costs are also relatively small as they had already taken advantage of alignment techniques in their Current Portfolios, including by developing and using climate-aligned indices. (Box 3). This reduced the amount of portfolio tilting required to achieve alignment for these investors, and lower costs as a result.

### 5.3 Demand creation, abatement, and cost pass-through limit transition risks significantly, highlighting the need for company engagement

Companies face a set of climate-related risk channels. These include demand destruction, where companies lose revenue because of lower sales volumes for carbon-intensive products such as fossil fuels; and demand creation, where companies gain revenue through higher sales of low-carbon products such as electric vehicles and solar panels.

Companies also face direct carbon costs, which are increases in the cost of consuming fossil fuels or fossil-based electricity due to carbon pricing. Companies can offset these costs by investing in abatement measures, such as improving the energy efficiency of their operations or switching to renewables.

Finally, they also face competition effects, where they gain or lose market share relative to their rivals. For example, a more emissions-intensive manufacturer may lose market share to its rivals in a Paris-aligned scenario, as consumers move to rival suppliers rather than accept increased prices resulting from the manufacturer’s carbon-price-driven cost increases.

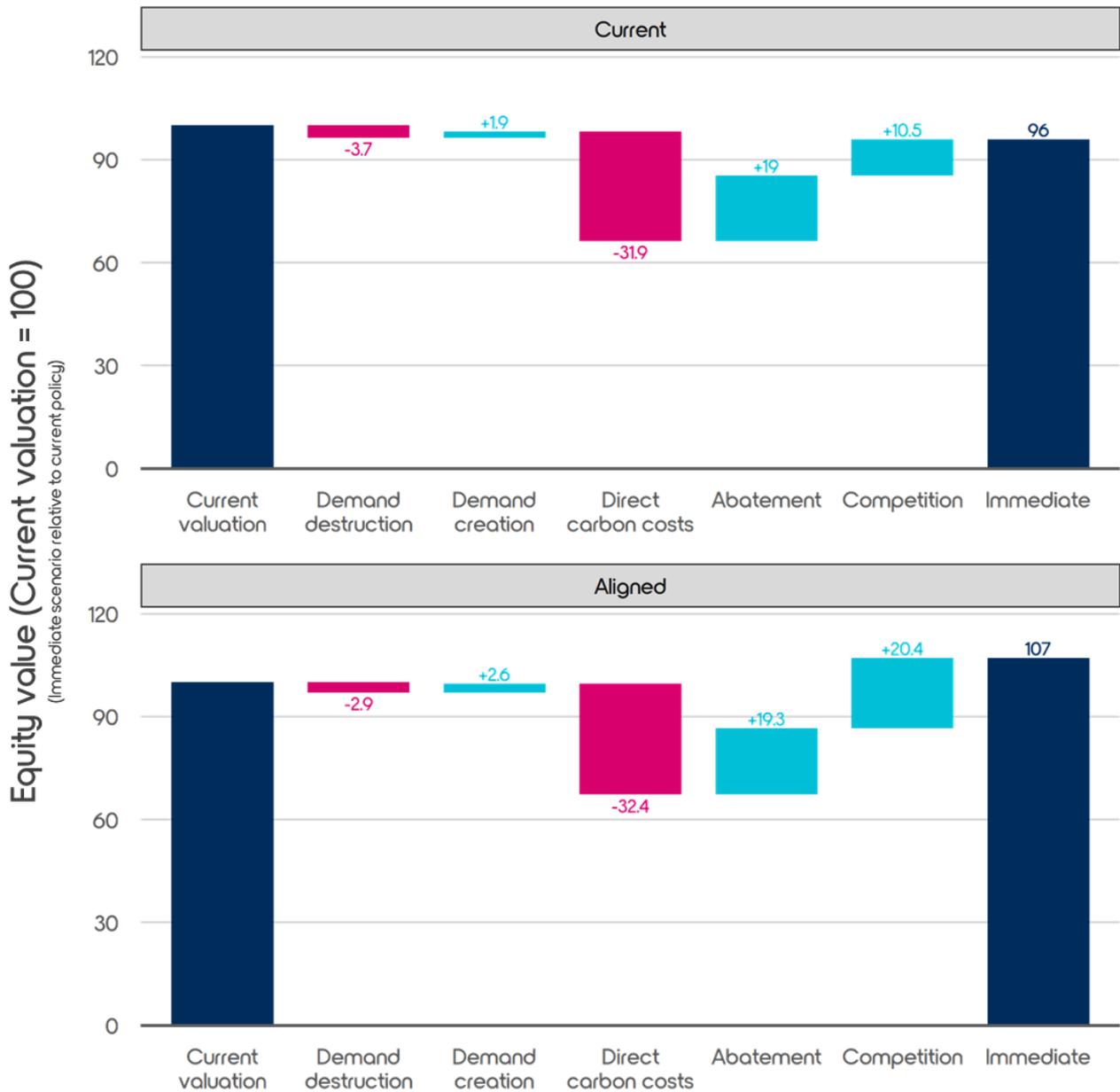
Focusing on equities, Figure 13 shows that both Current and Aligned Portfolios experience relatively little change in value due to demand destruction or demand creation in Paris-aligned scenarios in the model. By contrast, both Current and Aligned Portfolios experience significant gross loss of value from direct carbon costs, which is partly offset by abatement measures. The magnitude of these effects is similar for both Current and Aligned Portfolios.

The difference in the average equity performance in investors' portfolios results mainly from competition effects (Figure 13). In aligning, investors have successfully tilted towards companies that outcompete rivals in Paris-aligned scenarios. Because of this tilt, the equity in the investors' Aligned Portfolios increases in value in the Immediate action scenario and other scenarios with strong action towards the goals of the Paris Agreement. By contrast, the average Current Portfolio does not benefit from these competition effects, and as a result loses value in Paris-aligned scenarios.

Investors' ability to tilt towards outperformers reflects the considerable variation in climate risks between companies within the same sectors and geographies. Even in relatively emissions-intensive sectors, holding equity in the best-performing companies from a climate perspective can be an effective alignment strategy.

Through tools such as the Transition Pathway Initiative, investors are analysing, engaging and making investment decisions on the basis of the forward-looking climate commitments that companies make. As noted in Section 4.3, neither these commitments nor the engagement that supports them are within the scope of the modelling conducted for this testing phase. By implication, holding the equity of companies with credible and ambitious targets for moving to a low-carbon model could improve investors' alignment performance beyond the modelled results described here. Investors can also improve alignment by engaging with companies who currently stand to lose market share in Paris-aligned scenarios, and encouraging them to adopt stronger climate strategies.

Figure 13 Equity impacts for Current and Aligned Portfolios in a Paris-aligned scenario. The largest difference in value between the Current and Aligned Portfolios comes from competition effects, with the Aligned Portfolio outperforming Current Portfolio in the Immediate scenario.

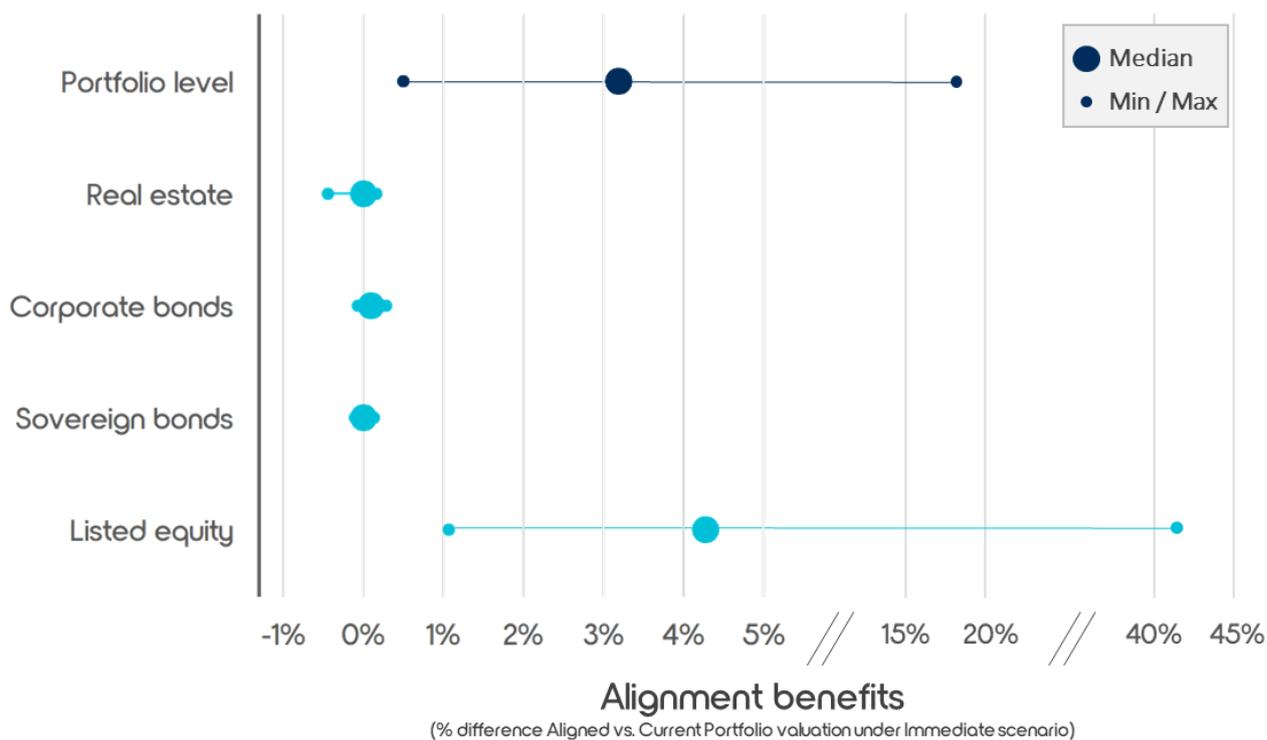


Note: Current valuation is defined as today’s market value of the portfolio normalised to 100.  
 Source: Planetrics, Vivid Economics, based on FactSet financial data and analytics, Refinitiv Eikon and others

### 5.4 Alignment mitigates transition risks differently across asset classes and investors show the need for knowledge-sharing and new data collection

Most of the alignment benefits in this testing phase arise from re-weighting of equities within investors’ portfolios (Figure 14). As discussed in Section 3.3, alignment in some of the other asset classes is more limited due to challenges with methodology and lack of data. Investors have already started to address some of these gaps and challenges, but further efforts will be needed to fully resolve these.

Figure 14 Benefits exist in all asset classes and vary considerably by investor participant, but are greatest in equity



Note: Median impacts across asset classes do not sum to portfolio level as each asset class is treated as a portfolio with 100% weight for alignment benefit calculation purposes.

Source: Planetrics, Vivid Economics, based on NIESR, FactSet financial data and analytics, Refinitiv Eikon and others

## 5.5 Findings by asset class

### 5.5.1 Listed equities

On average across investors, some of the shift from Current to Aligned Portfolios reflects reweighting between sectors, although these changes typically represent no more than 1 or 2 percentage points for any individual sector. For example, energy-sector equities make up 4% of Current Portfolios on average but only 3% of Aligned Portfolios. The change in valuation for individual sectors' equities in the Aligned Portfolios relative to the Current Portfolios is considerably larger than the change in their weighting in the portfolios. For example, utility-sector equities represent 3% of Current Portfolios and 5% of Aligned Portfolios. Because of within-sector adjustments, the gain in valuation of utility equities is approximately five times greater for the Aligned Portfolios than the Current Portfolios in the Immediate Action scenario (Table 2).

This reflects the fact that there is a wide range of potential outcomes for individual companies within the same sectors. As a result, investors' success in aligning their equity portfolios using the Framework relies on changes in a relatively small proportion of equities. Of the individual equities held by the five investors, 3% were significant 'climate winners', which gained more than 25% in value in the Immediate scenario. Another 14% were significant 'climate losers': stocks that lost more than 25% of their value in the Immediate scenario. The value of the remaining 83% of stocks changed by less than 25%.

The investors kept their holdings unchanged for most of the 'climate winner' and 'climate loser' stocks. They did, however, tilt towards over 22% of 'climate winners' and away from 28% of 'climate losers'. Investors

also tilted away from a much smaller set of ‘climate winners’ (10%) and towards ‘climate losers’ (7%)<sup>17</sup>. The net effect is a successful tilt towards ‘climate winner’ equities and away from ‘climate loser’ equities as expected – despite each investor using different tools in aligning their portfolios within the guidelines of the Framework.

**Table 2** Alignment in equities has primarily been achieved through reducing emissions intensity and improving green economy revenues within sectors, rather than divesting from certain sectors

Variable	Level	All sectors	Industrials	Materials	Consumer Cyclicals	Energy	Utilities	Other sectors
PAll investor average share	Current	100%	8%	6%	5%	4%	3%	75%
	Aligned	100%	9%	6%	5%	3%	5%	74%
	Change	0%	1%	0%	0%	-1%	1%	-1%
Valuation change under Immediate scenario	Current	-4%	-1%	-19%	-13%	-57%	38%	-2%
	Aligned	7%	3%	-14%	-12%	-55%	196%	-2%
	Change	11%	4%	5%	1%	2%	158%	0%
Climate risk characteristic changes	Scope 1 GHG intensity	-23%	-30%	-18%	-18%	-17%	-44%	-14%
	Scope 2 GHG intensity	-12%	-2%	-24%	-1%	10%	-12%	-7%
	Scope 3 GHG intensity	-5%	3%	-6%	-3%	-5%	-27%	-2%
	Cleantech revenue share	0.3%	2.1%	0.2%	-0.1%	0.5%	0.7%	0.0%

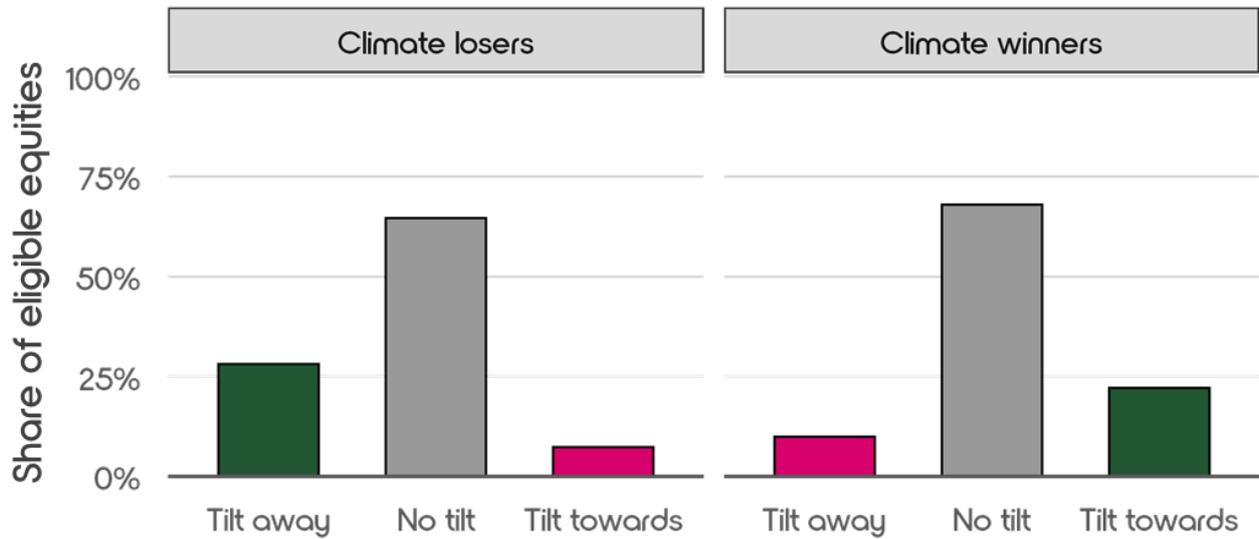
Source: Planetrics, Vivid Economics, based on FactSet financial data and analytics, Trucost Environmental Register, FTSE Russell Green Revenues, S&P Global Market Intelligence Metals & Mining and others

The fact that applying the Framework led investors to tilt overall towards ‘climate winners’ and away from ‘climate losers’ indicates that the Framework is successful overall in tilting investors’ portfolios towards companies that perform well in a world with strong carbon action, and by implication that it shifts capital in a direction that is consistent with meeting the goals of the Paris Agreement.

The existence of a large set of equities whose weightings are unchanged in investors’ Aligned Portfolios suggests that stronger data and methodologies could yield further opportunities for alignment within equities. The modelling in this testing phase does not account for investor expectations of individual companies’ transition potential. This could also play an important role in portfolio alignment.

<sup>17</sup> As outlined in Section 4.3, companies’ future performance in the model does not account for commitments made by individual companies to achieve emissions reductions or transition their business towards lower-carbon activity. Some investors did consider this when aligning their portfolios, and this may explain some of these tilts in the ‘incorrect’ direction.

Figure 15 PAII investors have been successful at tilting away from ‘climate losers’ and towards ‘climate winners’, although opportunities for improvement within equities remain

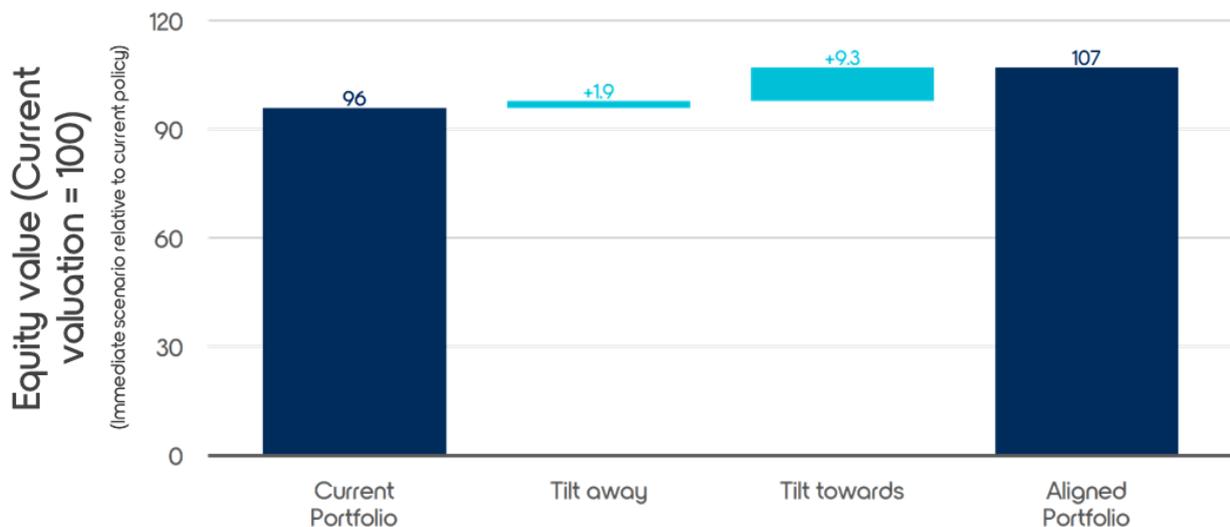


Note: Statistics are for the PAII investor average; ‘climate losers’ are defined as securities with value impairment under the Immediate scenario of at least 25%; and ‘climate winners’ as securities with value creation of at least 25% under the same scenario.

Source: Planetrics, Vivid Economics

While investors tilted away from a larger number of ‘climate loser’ stocks than ‘climate winner’ stocks, the impact of ‘climate winners’ on portfolio value is considerably larger than that of ‘climate losers’ (Figure 16). A relatively small number of ‘climate winner’ stocks have potential for very large outperformance in Paris-aligned scenarios; for example, electric carmakers’ equity value might increase by several hundred percent, while losses from individual ‘climate losers’ are bounded since they cannot fall by more than one hundred percent of their original value. Investors can therefore benefit from a relatively small number of stocks with extremely high growth potential relative to other equities when aligning.

Figure 16 In the Immediate scenario, the majority of the rise in valuation from Current to Aligned Portfolios comes from tilting towards climate winners



Note: Valuation of the Current Portfolio is 100 in the Current Policies and 96 in the Immediate scenario.

Source: Planetrics, Vivid Economics

Some investors had already introduced a degree of climate alignment into their Current Portfolio. Climate-tilted indices, such as the FTSE TPI Climate Transition Index, are one tool for doing so (Box 3).

### Box 3 Using the FTSE TPI Climate Transition Index to support alignment

The Church of England Pensions Board wanted an approach that aligns with their view of climate change and the need for active ownership, even in passive investments. It worked with FTSE Russell and the Transition Pathway Initiative (TPI) to develop the FTSE TPI Climate Transition Index. In 2020 the Board moved all of its passive investments to track this index.

The Index is the first forward-looking equity index that enables passive funds to capture company alignment with climate transition. It combines FTSE Russell's climate data and expert index design, with TPI's unique analysis of how the world's largest and most carbon-exposed public companies are managing the climate transition. The index takes into account:

- **Coverage:** Derived from the FTSE Developed index, representing large and mid caps in Developed markets, excluding Korea.
- **Liquidity:** Stocks are screened to ensure that the index is tradable.
- **Transparency:** Using FTSE Russell's tilt-based multi-factor methodology. Company engagement on climate change improves their TPI score, which leads to their weight in the index increasing and consequently more investment in-flows.
- **Climate parameter adjustments:** Fossil fuel reserves, carbon emissions, green revenues, TPI Management quality, TPI Carbon performance.

The result is an index that captures the risks and opportunities arising from the climate transition, while also adjusting exposure to companies based on their TCFD-aligned climate governance, and commitments to two-degrees Celsius (2°C) carbon emission pathways.

Leading and lagging company behaviour is clearly reflected in the areas of climate governance and (separately) 2°C/below 2°C pathways. In particular, companies identified as not aligned to 2°C/below 2°C are removed from the index (but remain eligible for inclusion and can be re-admitted once 'Paris aligned' commitments are evident – based on TPI analysis). In this way, the index embeds forward looking carbon data and supports engagement objectives, including those of Climate Action 100+.

Adopting this index for its passive allocation has meant the Fund will achieve a 49.1% lower carbon intensity than the benchmark, a reduction of approximately 70% in fossil fuel reserves exposure, as well as being invested in companies generating significantly increased green revenue.

## 5.5.2 Corporate bonds

As with equities, investors relied heavily on within-sector changes in corporate bond holdings to create their Aligned Portfolios. And as with equities, this reflects a range of exposures within key sectors that exceeds differences between sectors (Figure 17). In general, bonds with long maturities (over 15 years) are particularly exposed to losses in Paris-aligned scenarios. In the most exposed sectors – energy and utilities – shorter maturity bonds (including those with less than five years' maturity) also experience material reductions in value.

In investors' Current Portfolios, bonds tend to have relatively short maturities (the average bond maturity is 2028 across investor portfolios), which limits current exposure. This represents a window of opportunity for

investors to improve alignment and reduce their exposure to climate risk, by shifting their bond holdings as they mature, rather than rolling over exposure to risky firms.

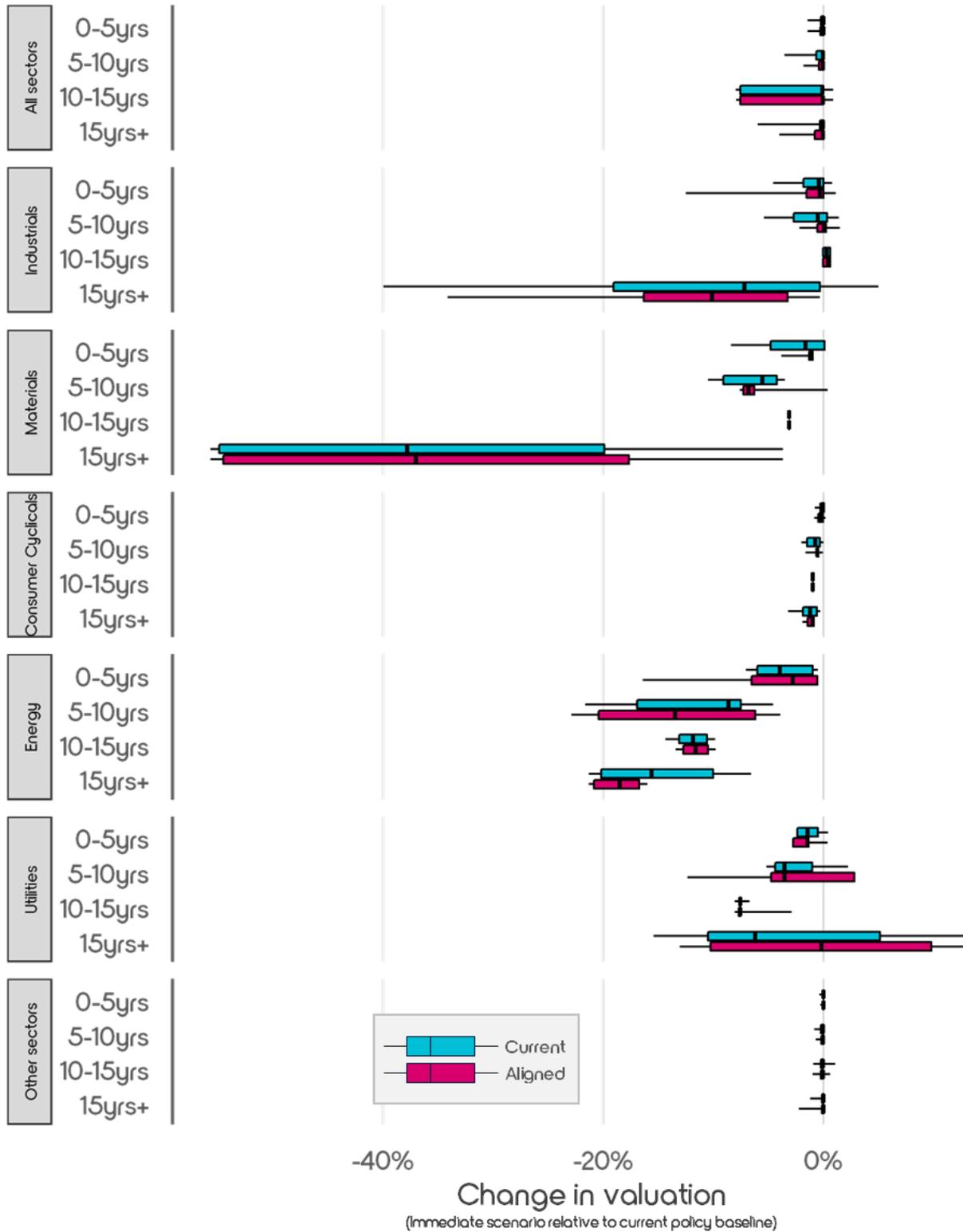
**Table 3** Alignment benefits are relatively modest for corporate bonds and are concentrated in within-sector improvements in energy and utilities

Variable	Level	All sectors	Industrials	Materials	Consumer Cyclicals	Energy	Utilities	Other sectors
PAll investor average share	Current	100%	7%	2%	2%	2%	9%	79%
	Aligned	100%	8%	4%	2%	2%	9%	76%
	Change	0%	1%	2%	0%	0%	0%	-2%
Valuation change under Immediate scenario	Current	-1%	-2%	-3%	-1%	-7%	-3%	0%
	Aligned	-1%	-2%	-4%	-1%	-5%	-2%	0%
	Change	0%	0%	-1%	0%	2%	1%	0%
Climate risk characteristic changes	Scope 1 GHG intensity	-8%	14%	-28%	-42%	-27%	-9%	-33%
	Scope 2 GHG intensity	-2%	25%	-3%	-40%	6%	-19%	-3%
	Scope 3 GHG intensity	-3%	9%	35%	-26%	-42%	-7%	-5%
	Cleantech revenue share	0.2%	-0.3%	-0.5%	-0.1%	-0.1%	1.4%	0.0%

Note: Emissions intensities and cleantech revenues are shown only for listed issuer corporate bonds due to data limitations; listed issuer bonds represent 75% of the Current and Aligned PAll investor average portfolio.

Source: Planetrics, Vivid Economics, based on FactSet financial data and analytics, Trucost Environmental Register, FTSE Russell Green Revenues, S&P Global Market Intelligence Metals & Mining and others

Figure 17 Corporate bond impacts differ by maturity, with long-dated bonds experiencing larger changes in valuation. In general, Alignment has improved valuations in exposed sectors relative to Current portfolios



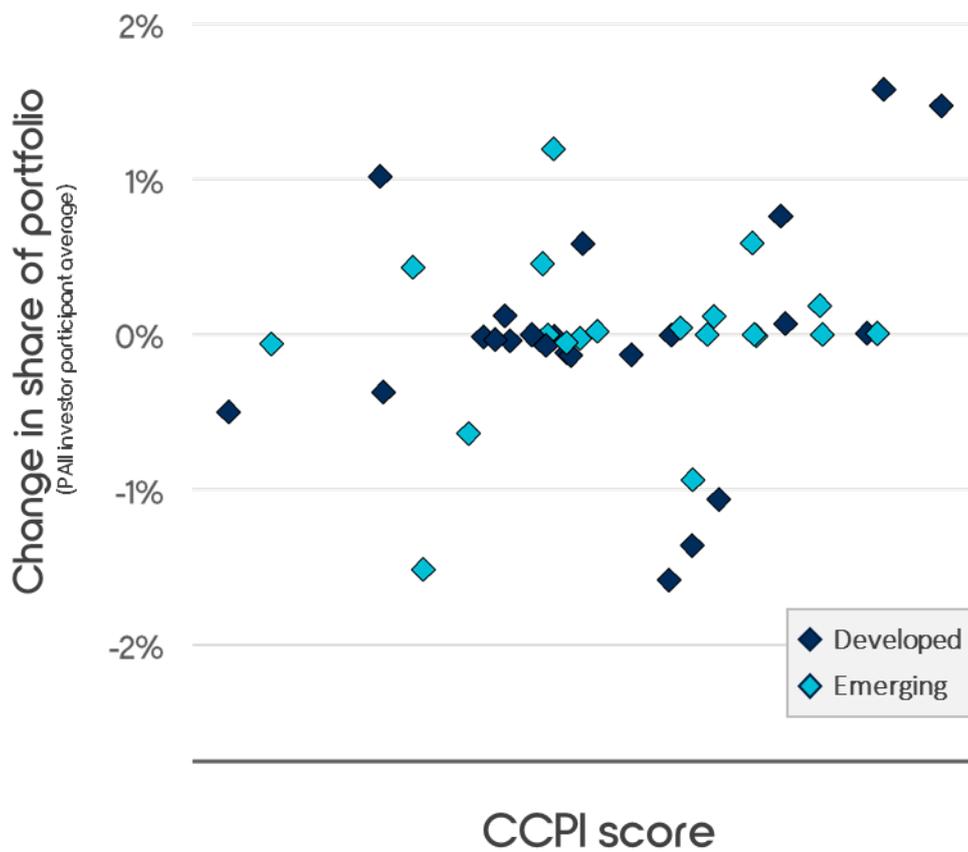
Note: 10th, 25th, 50th, 75th, and 90th percentiles in each sector-maturity-portfolio combination shown.

Source: Planetrics, Vivid Economics

### 5.5.3 Sovereign bonds

Most investors successfully applied the Framework to their sovereign bond portfolios. The average Germanwatch Climate Change Performance Index (CCPI) score of issuers in their Aligned Portfolios was higher than in the Current Portfolios (Figure 18). Since the CCPI consists of a range of indicators, including climate policy, energy intensity, emissions intensity, shares of renewable energy – and targets for future improvements in these, this indicates that the investors have aligned their sovereign portfolios towards issuers who are taking stronger climate action.

Figure 18 Sovereign alignment has tilted the PAII investor average portfolio towards issuers with better CCPI scores

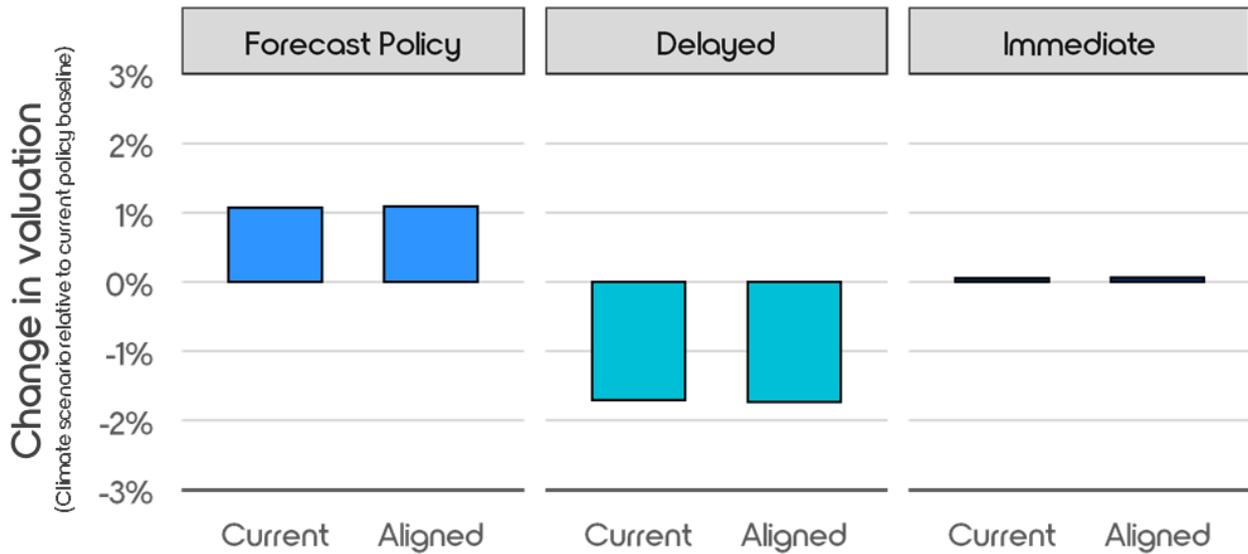


Note: Results shown are for issuers with available CCPI scores (over 90% of the PAII investor average portfolio).  
 Source: Planetrics, Vivid Economics

Changes in the value of sovereign bonds reflect the macroeconomic shocks arising from changes in energy intensity and costs, and the response of governments and central banks to those shocks. These factors influence interest rates and default risk premia, which in turn affect bond valuations. The influence of transition risks on interest rates and default risk premia is relatively modest for most countries because these factors are largely determined by macroeconomic conditions. This means that sovereign bond valuations are generally less sensitive to climate-related shocks than listed equities or corporate bonds.

As a result, the change in valuation of sovereign bonds is small (less than  $\pm 2\%$ ) in all three Paris-aligned scenarios. In addition, despite investors' successful realignment of their sovereign bond portfolios, the difference in value between the Aligned Portfolio and the Current Portfolio is very small in all three scenarios (Figure 19).

Figure 19 Sovereign bond impacts are modest across scenarios and are unaffected by alignment



Source: Planetrics, Vivid Economics and NIESR

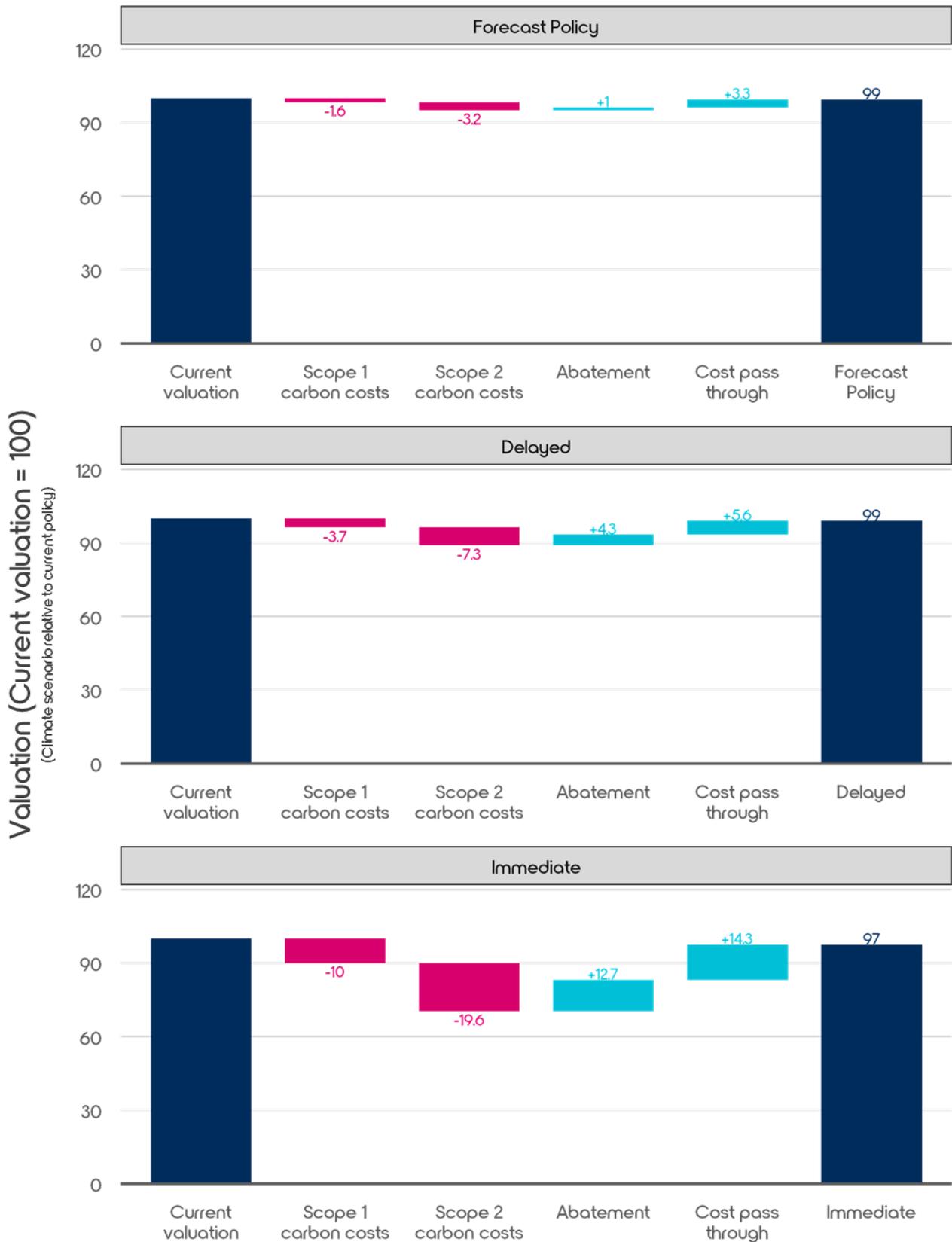
The lack of difference in value for sovereign bonds in the Aligned and Current scenarios is due to the use of the CCPI. While capturing a range of relevant climate-related metrics, it does not capture factors such as countries’ central bank policies and macroeconomic strength. These factors are important in determining the impact of macroeconomic shocks, including climate shocks, on inflation, interest rates, and sovereign bond valuation. For example, countries with strong macroeconomic fundamentals may be able to weather significant climate transition shocks by lowering interest rates and issuing more debt, without significantly compromising the market’s view of their creditworthiness.

In addition, the components of the CCPI and their relative weighting within the Index are not necessarily optimal as a measure of countries’ climate risk in this context. The CCPI is composed of a combination of metrics, including per-capita emissions and energy use, climate policy, and use of renewable energy. The economy’s reliance on carbon-intensive energy per unit of GDP – which is not directly included in the CCPI – is a main driver of shocks to production and inflation, which in turn drive central bank responses and sovereign bond valuation changes. Since this does not necessarily align with the CCPI, there is no clear correlation between countries’ CCPI scores and the change in valuation of their sovereign bonds under Paris-aligned scenarios (Figure 20). To overcome this limitation when applying the Framework in future alignment activities, investors may wish to integrate additional climate risk indicators, such as the energy intensity of the economy, into sovereign alignment methodologies.

For both Current and Aligned Portfolios, there is a difference in the impact on sovereign bond values between the Delayed and Immediate scenarios, implying that sovereign bonds are more vulnerable to disorderly and delayed climate policies. The negative impacts for the Delayed scenario are driven by the inflationary pressure of carbon prices. The Delayed scenario requires a sharp increase in carbon prices after 2030, which can lead to a greater inflationary shock than in the Immediate scenario, where carbon prices grow more smoothly from 2020, with a more gradual shift away from fossil fuels. Although GDP impacts of carbon prices are negative in all scenarios, a smooth evolution of carbon prices can allow central banks to cut rates to soften the contraction in GDP.



Figure 21 Impact of Paris-alignment on real estate valuation is small, although the biggest impacts occur in the Immediate scenario



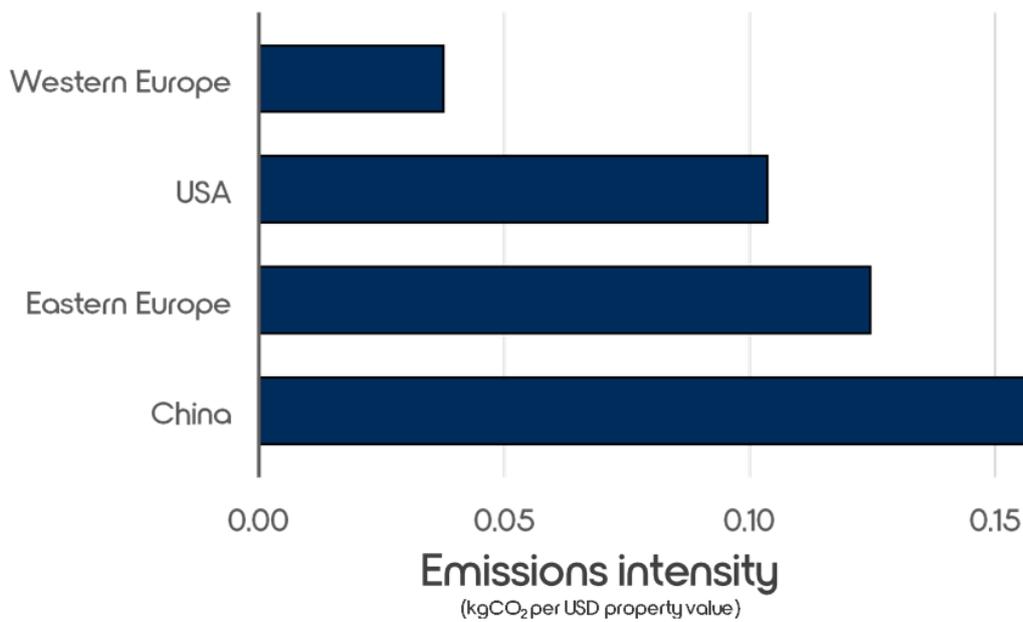
Note: Results shown are for the PAII average investor Current Portfolio.

Source: Planetrics, Vivid Economics

Most investors were unable to apply the recommended methodology to real estate in their portfolios as a result of the limitations of the newly released CRREM tool and lack of data at the time of the testing phase, or due to indirect holdings of real estate (Section 3.3.2). There are significant differences in real estate emissions intensity across countries and regions (Figure 22), and property types (Figure 23). This suggests that as data availability with a functional tool and coverage of multiple regions and property types improves, there is potential for investors to increase alignment in their real estate portfolios.

One investor did succeed in applying an alignment methodology based on building efficiency (Box 4).

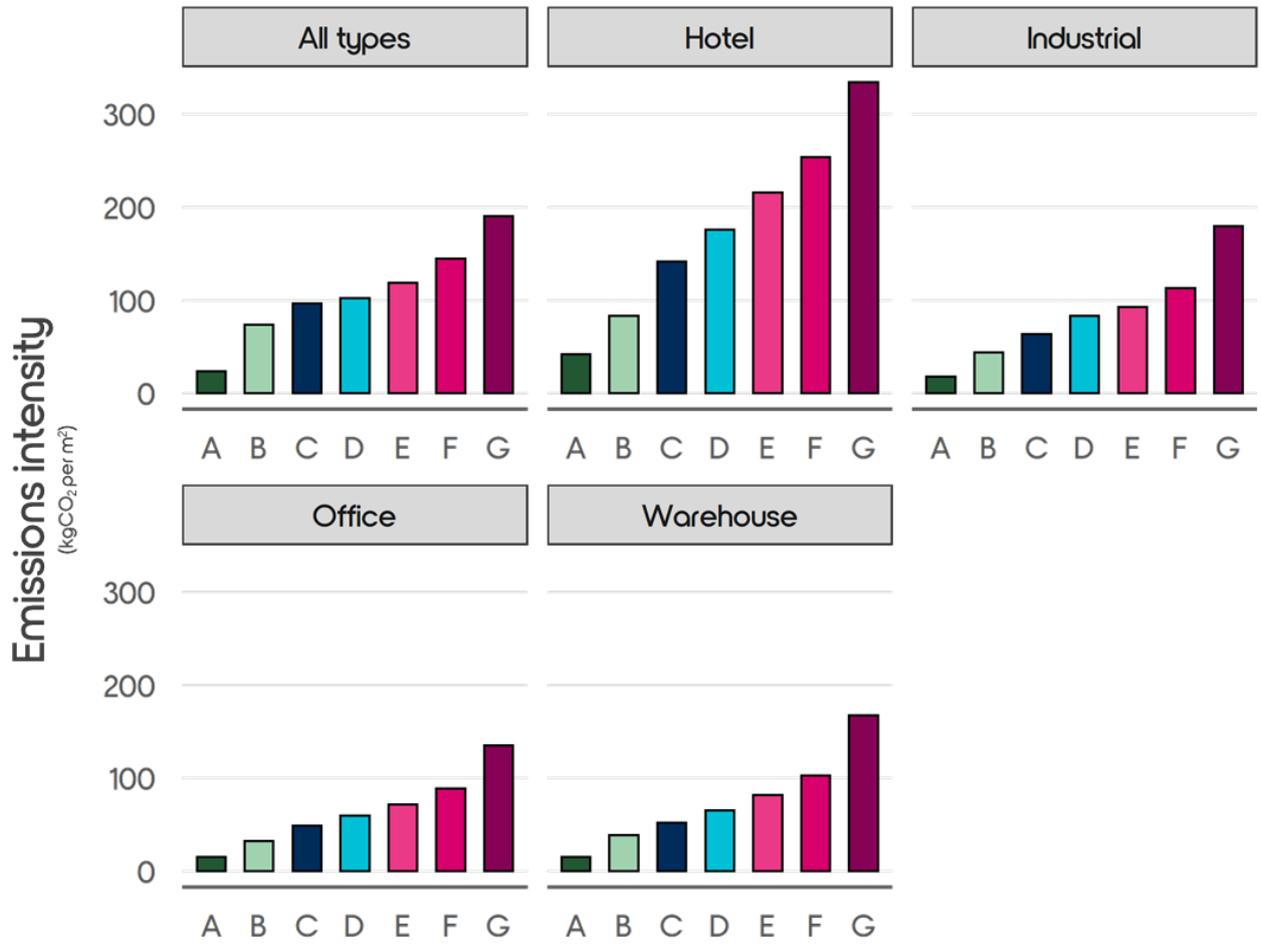
Figure 22 Differences in real estate emissions intensity across countries and regions could be incorporated into an approach to increase alignment



Note: CO<sub>2</sub> emissions include Scope 1 and 2 and are based on fuel combustion only.

Source: Planetrics, Vivid Economics, based on Savills and IEA

Figure 23 Differences in emissions intensity across property types could be incorporated into an approach to increase alignment

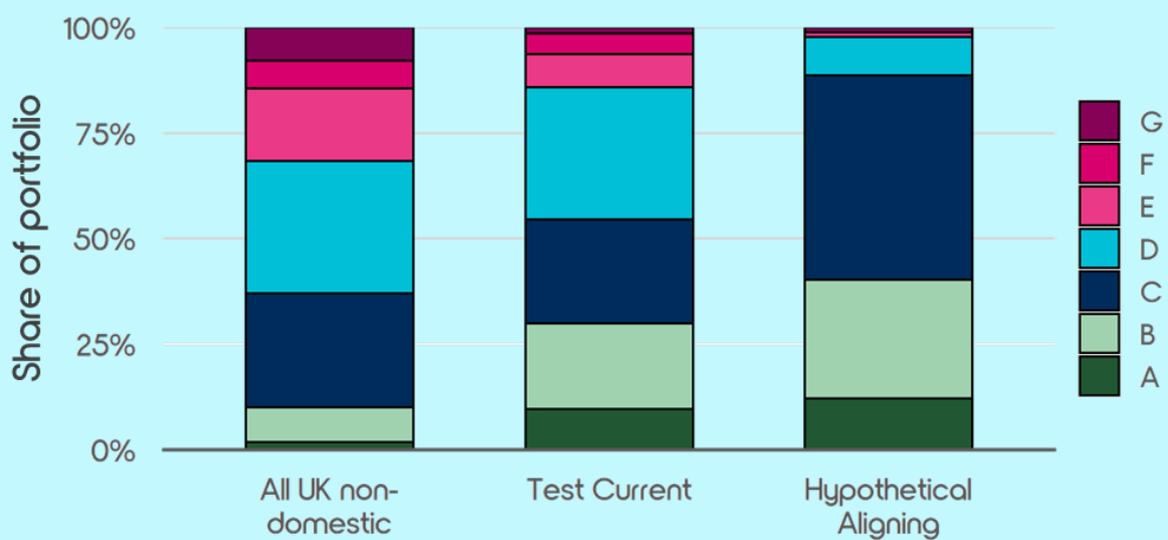


Note: A–G refer to UK non-domestic EPC rating bands, where A is most efficient and G is least efficient.  
 Source: Planetrics, Vivid Economics, based on UK MHCLG Non-Domestic Energy Performance Register

**Box 4 Aligning a real estate portfolio using energy performance data**

One investor participating in the test phase, Brunel Pension Partnership (Brunel), did not use the CRREM tool in applying the Framework due to the limitations set out above. Nevertheless, it did succeed in applying proxy alignment criteria to a subset of its real estate portfolio by working with three property managers who were able to provide relevant data including, but not limited to, geolocation data, EPC ratings and emissions for each property within their fund. The data from these three managers created a ‘test portfolio’. These selected managers provided data for a set of properties that represented a typical UK property portfolio (the Test Current Portfolio). Notably, those managers who captured and were able to provide data on the sustainability credentials and emissions of their properties have on average a better energy performance than a typical UK portfolio (Figure 24).

Figure 24 Brunel’s Hypothetical Aligning UK portfolio has better energy performance than the Test Current portfolio and UK non-domestic properties



Note: A–G refer to UK non-domestic EPC rating bands, where A is most efficient and G is least efficient.

Source: Planetrics, Vivid Economics, based on PAII investor participant portfolios and UK MHCLG Non-Domestic Energy Performance Register

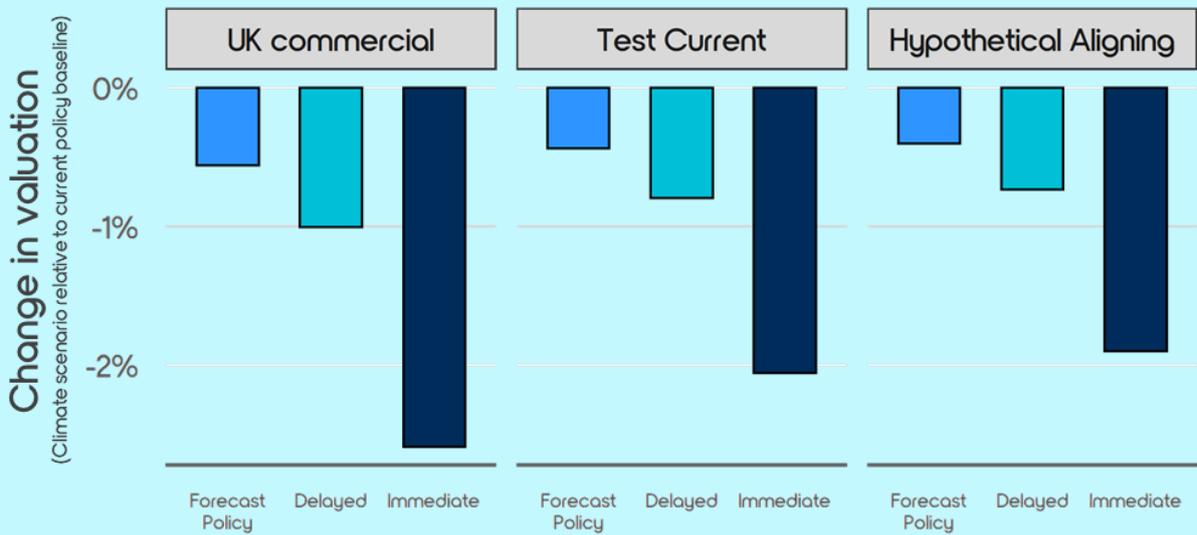
Brunel also created a Hypothetical Aligning Portfolio from the property data supplied by the three property managers. This was created by removing many of the least energy-efficient properties (those with EPC ratings of E and F), as well as by upgrading many of the D- and C-rated properties by one EPC level. This gave Brunel a crude representation of a hypothetical property portfolio that has undergone sustainability improvements and green retrofits relative to the Test Current Portfolio. (This does not necessarily imply that the Hypothetical Aligned portfolio is fully aligned with the goals of the Paris agreement; simply that it is more aligned than the Test Current portfolio).

When looking at the valuation impact under different climate change scenarios, the Test Current Portfolio performed better under all three scenarios compared with a ‘typical’ UK commercial property portfolio. The Hypothetical Aligning Portfolio saw a lower level of value impairment under all three climate change scenarios compared with the Test Current Portfolio and the typical UK commercial portfolio (Figure 25).

Nevertheless, it is important to note that despite the improvement in the energy efficiency of properties, the Hypothetical Aligning Portfolio still experienced a negative financial impact under all three climate scenarios (Figure 25) due to the increased cost of energy and costs associated with retrofits in those scenarios.

Brunel will continue to work with its property managers to increase the amount of granular data that is available for underlying properties, as well as utilising the CRREM tool in future.

Figure 25 Brunel’s Hypothetical Aligning portfolio experiences the least value impairment in the Delayed and Immediate scenarios, and its Test Current portfolio outperforms the typical UK portfolio



Source: Planetrics, Vivid Economics

## 6 Implications

### 6.1 Actions for investors

The testing phase has shown that even with the limited data available today, and with methodologies for only four asset classes, investors can successfully align their portfolios with the goals of the Paris Agreement. This means that investors do not need to wait before acting on climate change. It is possible to align effectively now – and without compromising on other financial metrics.

IIGCC members can draw on the Net Zero Investment Framework and the results of the portfolio testing exercise to improve their investment strategies, their approach to risk management and compliance, and their external engagement.

#### 6.1.1 Investment strategy

##### Improved alignment methodologies and investment strategies

Using the Framework can enable investors to support the transition to a low-carbon economy, allocating capital towards Paris-aligned activity, and at the same time reducing risks for investors. There are opportunities to achieve these outcomes with little or no cost, as measured by risk–return profiles and other relevant metrics; for example by using effective optimisation tools<sup>18</sup>.

##### Identify relative winners and losers to support within-sector security selection

The Framework’s asset-level view of equities and corporate bonds reveals significant differences between companies within the same sector. This is particularly the case in sectors that are highly exposed to carbon, such as utilities and oil and gas. An asset-level view of these differences enables investors to take significant alignment opportunities within sectors.

##### Assessment of future focus areas outside initial portfolios

The Framework’s methodology will be extended to other asset classes - infrastructure and private equity - in Phase II of PAII. As the Framework expands its asset class coverage in the next phase of work, investors will gain a broader set of tools and access additional opportunities to reallocate capital and reduce risks.

#### 6.1.2 Risk and compliance

##### Allow quantitative stress testing of potential climate scenarios

As well as supporting investors in shifting capital in directions that align with the Paris Agreement goals, the process of testing the Framework has also enabled investors to quantify and understand drivers of their climate-related risks. Investors can use this information to mitigate those risks with a range of strategies, including reducing exposure and engaging with investee companies.

##### Enable security screening for high-risk securities

Using asset-level granularity and a range of metrics enables close tracking of individual securities for sectors that are highly exposed to the low-carbon transition – such as utilities and energy. This offers a significant improvement in risk management compared with sector-level analysis or reliance on individual metrics, as there is a wide range of outcomes within these sectors, depending on specific company characteristics.

---

<sup>18</sup> This analysis has not measured the degree of alignment, nor the coherence of the steps taken with other elements of the NZIF, such as engagement.

## Facilitate risk reporting and disclosure

Along with other industries, investors are facing increasing climate-related risk reporting and disclosure requirements. Applying the Framework allows investors to respond to these increasing governance and reporting requirements robustly and coherently.

### 6.1.3 External engagement

#### Support policymaker engagement to facilitate improved regulatory environments

The Framework's approach, which encourages asset-level analysis for corporates and real estate, and country-level analysis for sovereign bonds, provides investors with an understanding of the drivers of climate risk and insights on the kinds of decarbonisation scenarios and policies that can reduce these risks. This can enable investors to engage in a constructive and informed way with policymakers, to develop policies that enable the goals of the Paris Agreement to be achieved while minimising risks for investors.

#### Enable company engagement to identify and support actions to mitigate climate impact

The Framework provides investors with an understanding of risks faced by individual companies and of the importance of those companies adopting abatement measures and pivoting their business towards lower-carbon activity in order to improve alignment and reduce risks. The understanding that investors gain from the Framework enables them to have that dialogue with companies in an informed way.

## 6.2 Actions for investor community/IIGCC

As noted, the portfolio testing exercise provided useful learning on how the Framework would operate in practice. Overall, it has demonstrated that it is possible to deliver on the recommendations of the Framework and successfully align portfolios. It has, however, highlighted areas where challenges exist. IIGCC has considered these aspects as part of its consultation response. The consultation response makes the following recommendations:

- Recognising that allocation to green bonds may be associated with high carbon emissions of the issuer in the short term, investors can report separately on emission associated with green bonds to demonstrate how these are impacting the overall performance against emissions reduction targets.
- IIGCC notes the challenges in relation to use of the CRREM tool during the testing phase. However, as the pathways against which investors can assess their assets have been expanded and now include residential and commercial pathways for over 40 jurisdictions globally, IIGCC and the investor teams consider that the CRREM tool will be able to be applied going forward. Importantly asset owners and managers should seek disclosure of relevant data from managers and companies to be able to utilise the tool as an immediate priority.
- In order to better reflect climate risk in relation to sovereign bonds, and capture 'scope 3' emissions, IIGCC proposes including metrics relating to at least fossil fuel imports and exports into assessment of sovereign alignment.
- The portfolio testing exercise has also highlighted the importance of investors assessing climate risk as a key aspect of their fiduciary responsibilities when aligning a portfolio. Moreover, the testing exercise has highlighted the company or stock specific variance in climate risk. The updated Framework therefore further emphasises the important role of updating stock level valuations, and testing valuations against different climate scenarios as part of efforts to align portfolios.

The testing exercise has also reinforced the importance of work that is already planned for Phase II. This includes development of an approach and recommended methodologies for additional asset classes, and addressing analytical gaps, such as data, to support target setting for investment in climate solutions. As highlighted in the draft Framework for consultation, the following work is planned for Phase II, which will be taken forward by IIGCC in collaboration with its members:

- Analyse methodologies and approaches for two additional asset classes – infrastructure and private equity – and add these into the scope of the Framework.
- Consider how investors can align portfolios to support the adaptation and resilience goals of the Paris Agreement.
- Address key analytical gaps identified during Phase I, including:
  - Identifying and measuring material scope 3 emissions;
  - Addressing treatment of o-setting and negative emissions technologies in more detail;
  - Assessing the potential for methodologies that capture relative impact of climate solutions investment (e.g. avoided emissions), and clarifying methodologies to assess emissions reductions achieved at the asset level;
  - Identifying pathways for increasing investment in climate solutions.
- Develop additional guidance to support implementation of the Framework.

## Annex 1 Alignment methodology

This Annex provides a more detailed description of the alignment methodology outlined in Section 3 followed by the investors when applying the Framework. The investors varied in their application of the methodology, and each deviated from the recommended methodology for at least one asset class owing to data and resource constraints.

### Steps for constructing an Aligned Portfolio for each asset class

#### Step 1: Sovereign bonds

All portfolios were required to include only sovereign bonds issued by central banks. Investors were permitted to exclude domestic sovereign issuance held for liability-matching purposes from the alignment weighting process, but were required to include it in the portfolios submitted.

The recommended approach for undertaking alignment was to increase allocation or weighting towards sovereigns that score highly against a set of climate performance metrics that reflect current and future potential alignment with a 1.5°C pathway.

Investors were recommended to use the scoring framework and underlying data provided by the Germanwatch Climate Change Performance Index (CCPI).

Investors used the CCPI indicators and data to assess the climate performance and ranking of their current portfolio. To construct the Aligned Portfolio, the investors included better-performing issuers or weighted towards these in order to reach the maximum increase in climate performance they could achieve while meeting other aspects of their mandate (such as liability matching, diversification, and risk–return profile).

Where a sovereign does not have a score in the CCPI, investors could use other available datasets to derive an appropriate indicative score.

Investors were required to aim to maintain the existing balance between developed and emerging market sovereign issuance in their portfolio, and to increase allocation to green or SDG climate-linked bonds to the extent possible.

#### Step 2: Emissions intensity data

Investors were required to gather and assess current portfolio data for:

- The Scope 1, 2 and 3 CO<sub>2</sub>-equivalent emissions of each asset in scope in the listed equity and corporate fixed income portfolio;
- Revenues from assets, and revenues associated with climate solutions activities ('green revenues') in these three asset classes.

Based on this data, investors were required to calculate the weighted average carbon intensity of their total listed equity, corporate fixed income,<sup>19</sup> and real estate portfolio, and the share of revenues from climate solutions in their portfolio.

---

<sup>19</sup> This should exclude securitised assets.

### Step 3: Real estate

Investors were asked to use the CRREM tool<sup>20</sup> to construct aligned portfolios. As the tool is fully functional only for EU commercial real estate, both Current and Aligned Portfolios were required to include only this type of asset.

The CRREM tool is able to assess real estate exposure not only today but over time. Specifically, it can identify assets that are aligned with a Paris Agreement pathway, and assets that are not aligned ('stranded'). To construct an Aligned Portfolio, investors were required to enter the asset-level information on their current European commercial real estate portfolio, and then:

- Increase exposure to assets that are Paris-aligned; and/or
- Exclude assets that are not Paris-aligned; and/or
- Include plans for retrofits and other investment and actions that bring non-aligned existing assets into alignment.

### Step 4: Listed equity and corporate fixed income

Investors' Current Portfolios should include all current assets and weightings in their listed equity and corporate fixed income portfolio. To carry out their initial assessment of asset-level alignment, investors were required to assess the extent to which companies are in these three categories:

- 'Net zero': the company is already at or close to net zero emissions;
- 'Aligned': the company's current and forward-looking carbon emissions intensity and trajectory are consistent with the level expected in a credible pathway to net zero;
- 'Transition potential': the company's emissions intensity and trajectory are not currently consistent with the net zero pathway, but the company meets a basic level of climate action equivalent to TPI management quality level 2,<sup>21</sup> specifically:
  - It has set a forward-looking emissions reduction goal or target;
  - It has a policy relating to taking action on company emissions;
  - It discloses at least Scope 1 and 2 emissions data.

The criteria that are most relevant to this assessment are, for any company:

- Its current emissions intensity performance (including Scope 1, 2 and material Scope 3 emissions) against a credible regional sector pathway;
- Any long-term 2050 goal consistent with global net zero emissions;
- Any short- and medium-term emissions reduction targets consistent with the long-term ambition;
- Any strategy and transition plans for meeting climate targets, including its investment plan;
- The nature of its governance responsibilities for targets and transition;
- Links between executive remuneration and delivery of climate targets and investment plans;

---

<sup>20</sup> [www.crrem.eu](http://www.crrem.eu)

<sup>21</sup> <https://transitionpathwayinitiative.org/sectors>

- Its disclosure and reporting against the above information.

The leading publicly available methodologies or assessments of companies recommended to assess some or all of these components are the Transition Pathways Initiative Carbon Performance<sup>22</sup> and Management Quality indicators, and the Science Based Targets initiative.<sup>23</sup> Investors were recommended to use these publicly available assessments, but they were also permitted to use commercial sources such as ISS climate scenario analysis and carbon risk ratings, and Moody's Carbon Transition Assessments. Investors could also make their own assessments where they held relevant data, provided the approach was consistent with these indicators.

PAII recognises that investors may not have the ability and/or resources to undertake action relevant to alignment for all assets in a large, diversified portfolio. For the testing phase, investors could focus on companies with a majority of activity in material sectors (NACE codes: A-H and J-L)<sup>24</sup> and could prioritise high-impact sectors within this group as the focus for alignment construction, and simply maintain exposure to other assets.

The recommended approach for creating the Aligned Portfolio was to assess all the assets in the equity and fixed income portfolios, and rank them to the extent possible.

As a first step towards alignment, investors were then expected to increase weightings for higher-performing companies to the extent possible, or to replace poorly performing assets entirely with high-performing ones. It was recommended that investors avoid reweighting between sectors where possible, since moving from highly exposed sectors to less-exposed ones results in a lower real-world impact on decarbonisation than shifting within exposed sectors.

Having completed this first step, investors were required to verify that the Aligned Portfolio achieved a 20% reduction in present-day Scope 1 and 2 emissions relative to the Current Portfolio. If this level of reduction was not achieved, investors further reweighted their portfolio, taking into account the current emissions intensity of each asset, to reach the intensity reduction required. Investors were asked to remove or underweight the companies with the highest Scope 3 emissions.

It was also intended that the construction of the Aligned Portfolio for each investor should increase allocation to climate solutions by increasing the proportion of green revenues associated with the portfolio. Investors were required to aim for a minimum of 8% green revenues and/or green bonds. Given the data challenges and different starting points regarding green revenues, investors were permitted to aim for reaching 150% of the level of the Current Portfolio in their Aligned Portfolio if they could not reach the 8% threshold.

PAII recommended using the new EU Taxonomy (mitigation) as the basis for assessing green revenues. However, this is an emerging methodology and therefore investors could choose to use simpler proxies for this exercise. This could include the criteria used by the Danish Climate Investment Coalition, or estimates of green revenues where the primary activity of the company is one of the 'green' activities referred to in the Taxonomy.<sup>25</sup>

---

<sup>22</sup> <https://transitionpathwayinitiative.org/sectors>

<sup>23</sup> <https://sciencebasedtargets.org/>

<sup>24</sup> Translation of NACE to GICS and BICS available here:

[https://ec.europa.eu/info/sites/info/files/business\\_economy\\_euro/banking\\_and\\_finance/documents/192020-sustainable-finance-teg-benchmarks-handbook\\_en\\_0.pdf](https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/192020-sustainable-finance-teg-benchmarks-handbook_en_0.pdf)

<sup>25</sup> Investments relevant to: (a) generating, storing or using renewable energy or climate-neutral energy (including carbon-neutral energy), including through using innovative technology with a potential for significant future savings or through necessary reinforcement of the grid; (b) improving energy efficiency; (c) increasing clean or climate-neutral mobility; (d) switching to use of renewable materials; (e) increasing CCS use; (f) phasing out anthropogenic emissions of GHGs, including from fossil fuels; (g) establishing energy infrastructure required for enabling decarbonisation of energy systems; (h) producing clean and efficient fuels from renewable or carbon-neutral sources.

### Step 5: Strategic asset allocation methodology

As an additional step to tilting their holdings within asset classes, investors were able to consider whether their portfolios' Paris alignment could be improved by tilting *between* asset classes as well, using the strategic asset allocation (SAA) portfolio optimisation process.

Investors therefore also had the option of using the following procedure to adjust SAA in order to align their portfolio, using the following steps:

- Define a baseline portfolio by using a standard portfolio optimisation process with existing objectives and constraints.
- Calculate asset-alignment scores for asset classes and sub-asset classes in the portfolio by evaluating the relative carbon and green revenues intensity for each asset class and sub-asset class
- Add additional climate-focused asset class variants to the opportunity set, such as green bonds, listed renewable infrastructure and green real estate. (This is an optional step.)
- Repeat the portfolio optimisation process, this time adding a secondary optimisation objective to maximise portfolio green revenues intensity and minimise carbon intensity, while delivering the same expected risk-adjusted returns as in the baseline portfolio.

Given the difficulties in comparing sovereign bonds with other asset classes from a climate perspective, the Net Zero Investment Framework proposes to exclude them from any SAA tilting for the time being, so that they retain the same weight they had in the baseline portfolio.

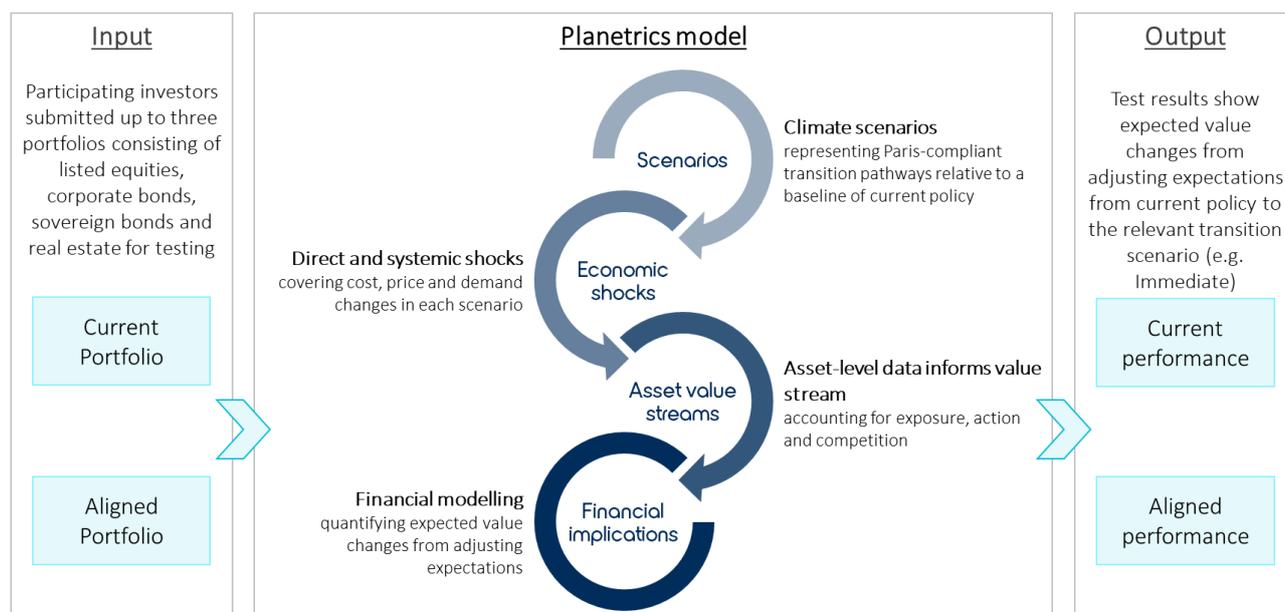
## Annex 2 Testing methodology

### Methodology overview

The test phase compared the performance of Current Portfolios with that of Aligned Portfolios across a range of climate scenarios. This enabled a comparison of the modelled performance of an investor’s Current Portfolio and Aligned Portfolio. Based on this comparison, it is possible to evaluate the effectiveness and impacts of the alignment Framework.

To do this, IIGCC partnered with Planetrics, a Vivid Economics company, to use the Planetrics climate risks and opportunities model. This is a global multi-regional deterministic model that assesses the impacts of climate scenarios on key economic variables across a number of channels, and then assesses the asset-level impacts of these economic variables using country- and company-level financial, ESG and industry-specific datasets. These bottom-up modelling outputs are then combined to assess financial implications for securities, asset classes and portfolios.

Figure 26 Overview of testing methodology



Source: Planetrics

### Scenarios

The analysis used four scenarios. One, ‘Current Policy’, fails to achieve the Paris Agreement goal of keeping temperature increases below 2°C. The remaining three are consistent with this goal (they are ‘Paris-aligned’):

- Current Policy Scenario:** This scenario was used as a baseline for the analysis. It assumes that assets are currently priced with a continuation of general macroeconomic trends and technology developments but almost no carbon pricing. This scenario is not aligned with the goals of the Paris Agreement, and leads to an expected temperature increase of 3.7°C by 2100. It is drawn from the set of climate scenarios prepared by the Network of Central Banks and Supervisors for Greening the Financial System

(NGFS), which were developed to support a starting point for understanding climate risks for the economy and financial system.<sup>26</sup>

- **Immediate Action Scenario:** In this scenario, climate policies are implemented from 2020 in line with the long-term target of keeping temperature increases below 1.5°C. This scenario assumes limited availability of carbon dioxide removal (CDR) technologies such as bio-energy with carbon capture and storage (BECCS) or Direct Air Capture (DAC). This is the most stringent climate scenario used in the testing phase, and leads to an expected temperature increase of 1.3°C by 2100. The scenario is drawn from the NGFS scenario set.<sup>27</sup>
- **Delayed Action Scenario:** This scenario applies climate policies in line with the long-term target of keeping temperatures below 2°C, but these are implemented with a delay, starting in 2030. The assumption of limited CDR is also applied in this scenario. This scenario leads to an expected temperature increase of 1.6°C by 2100. This scenario is drawn from the NGFS scenario set.<sup>28</sup>
- **Forecast Policy Scenario:** Disruptive policy action is implemented from 2025 to reduce global emissions. This is a normative scenario which considers what policies are likely to be implemented in practice rather than the least-cost measures required to achieve a given temperature. This leads to an expected temperature increase of 1.9°C by 2100, making it the least-stringent of the three Paris-aligned scenarios used in the testing phase. This scenario is taken from the UN Principles for Responsible Investment's Inevitable Policy Response, which focuses on policy action and climate risks that are likely to emerge in the short and medium term.<sup>29</sup>

Each scenario makes its own assumptions for policy and technology, and this in turn leads to differences in the rate at which emissions, carbon prices, and other economic variables change over time.

- **Cost changes:** carbon prices increase significantly in scenarios that limit warming to below 2°C. The largest increases occur in the Immediate Action Scenario (Figure 27), which also delivers the lowest level of warming among the four scenarios. Prices of other commodities including fossil fuels also change by scenario.
- **Demand destruction:** due to increases in carbon prices, demand for carbon-intensive products such as oil and coal falls in the climate-constrained scenarios (Figure 28).
- **Demand creation:** demand for cleantech products and commodities, such as renewable electricity (Figure 29) and electric vehicles, increases far more in the Paris-aligned scenarios than in the Current Policies Scenario.

---

<sup>26</sup> The Current Policy Scenario corresponds to the REMIND-MAGPIE 'Hot House World' scenario in the NGFS scenario set.

[https://www.ngfs.net/sites/default/files/medias/documents/820184\\_ngfs\\_scenarios\\_final\\_version\\_v6.pdf](https://www.ngfs.net/sites/default/files/medias/documents/820184_ngfs_scenarios_final_version_v6.pdf)

<sup>27</sup> The Immediate Action Scenario corresponds to the REMIND-MAGPIE 'Orderly' scenario in the NGFS scenario set.

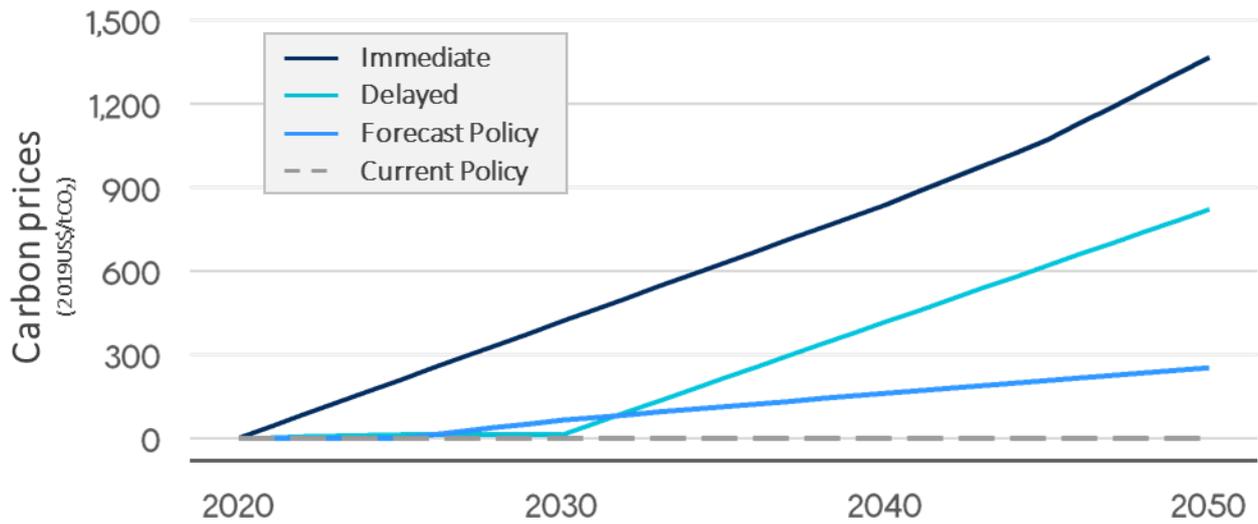
[https://www.ngfs.net/sites/default/files/medias/documents/820184\\_ngfs\\_scenarios\\_final\\_version\\_v6.pdf](https://www.ngfs.net/sites/default/files/medias/documents/820184_ngfs_scenarios_final_version_v6.pdf)

<sup>28</sup> The Delayed Action Scenario corresponds to the REMIND-MAGPIE 'Disorderly' scenario in the NGFS scenario set.

[https://www.ngfs.net/sites/default/files/medias/documents/820184\\_ngfs\\_scenarios\\_final\\_version\\_v6.pdf](https://www.ngfs.net/sites/default/files/medias/documents/820184_ngfs_scenarios_final_version_v6.pdf)

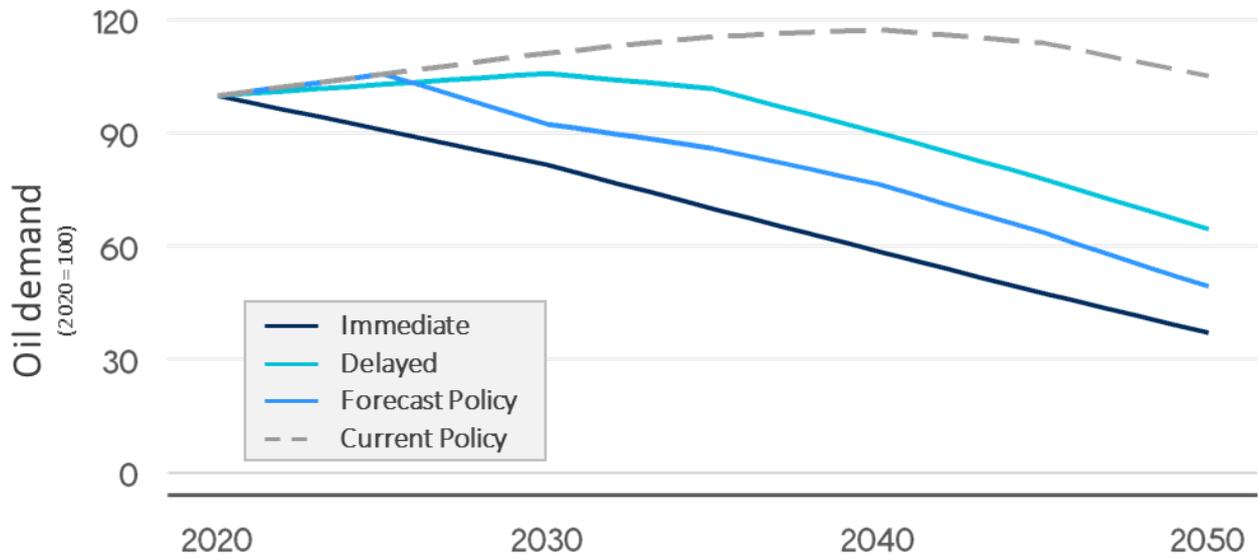
<sup>29</sup> UN PRI: Inevitable Policy Response: policy forecasts. <https://www.unpri.org/the-inevitable-policy-response-policy-forecasts/4849.article>

Figure 27 Carbon prices are highest under the Immediate 1.5°C scenario and rise rapidly due to the limited availability of CDR technologies



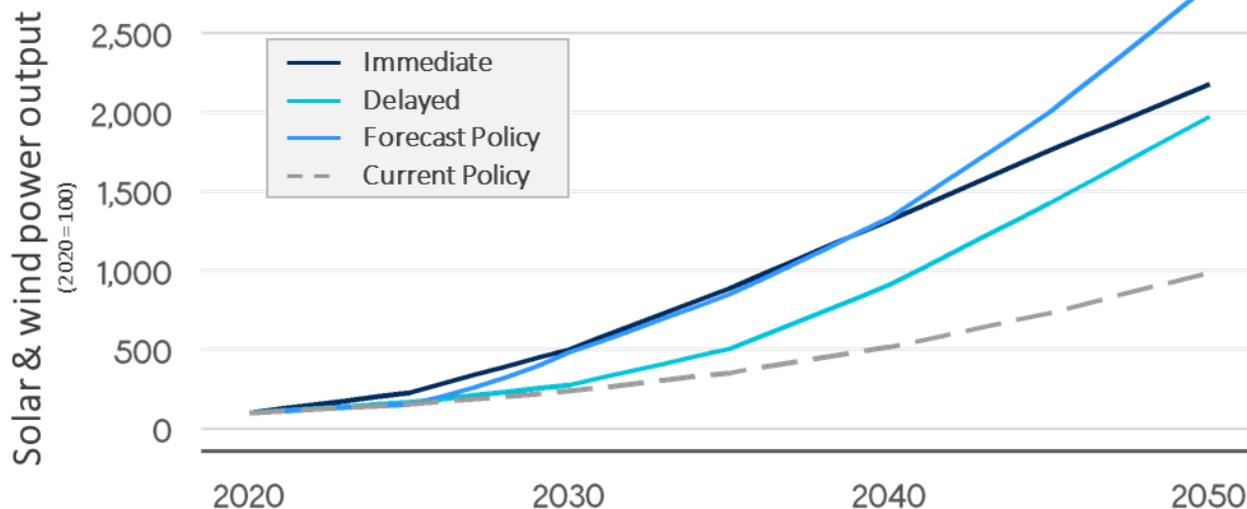
Source: Planetrics, based on NGFS Scenario Explorer (IIASA) and UNPRI

Figure 28 Oil demand falls by over a third in all transition scenarios by 2050



Source: Planetrics, based on NGFS Scenario Explorer (IIASA) and UNPRI

Figure 29 Variable renewable power generation rises rapidly under all three transition scenarios



Source: Planetrics, based on NGFS Scenario Explorer (IIASA) and UNPRI

In this testing phase, each portfolio’s performance in the Paris-aligned scenarios was compared with its performance in the Current Policy scenario as a measure of the impact of applying the alignment Framework.

While the scenarios represent plausible decarbonisation trajectories, they are not exhaustive. In applying the Framework, investors may therefore wish to test their alignment against different scenarios to build a fuller picture of the range and nature of the risks they face.

### Modelling methodology by asset class

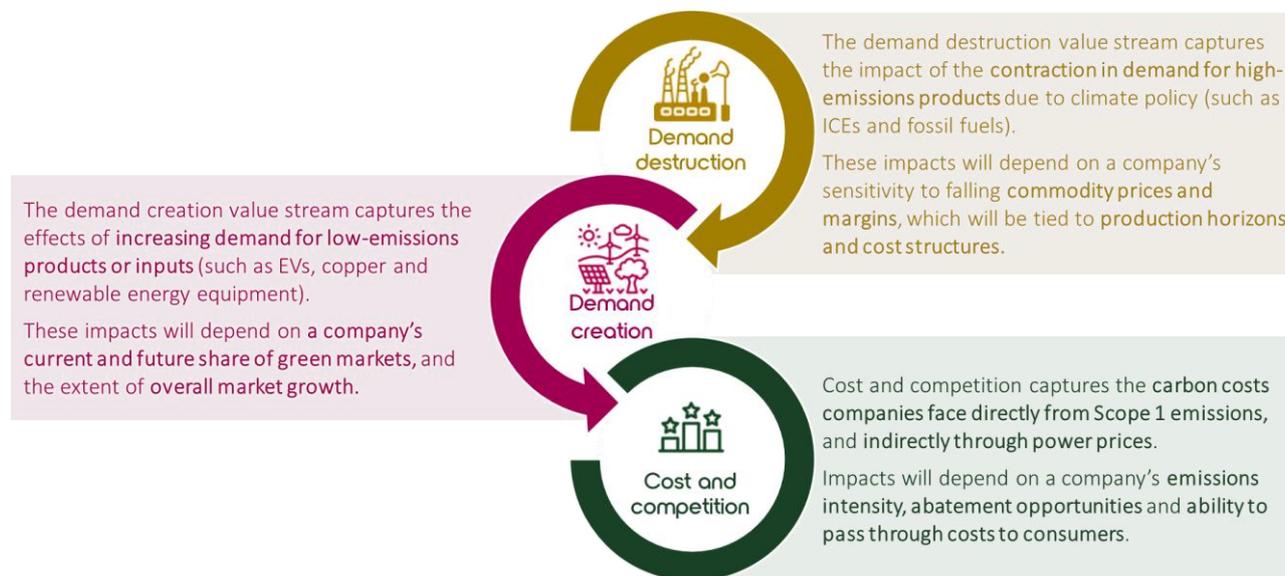
For each of the four asset classes a different modelling approach was taken to translate these risks into impact on the value of the asset classes.

#### Listed equities

To model the impact of the climate scenarios on companies, the Climate Risk Toolkit models five risk channels associated with the transition to a low-carbon economy:

- Demand destruction: lower prices and volumes for products that are carbon-intensive.
- Demand creation: higher prices and volumes for products that are low-carbon.
- Direct carbon costs: higher costs faced by entities that emit carbon due to higher carbon prices.
- Abatement: investments that companies and households can make that reduce their own emissions.
- Competition: loss or gain of market share as a result of more carbon efficiency than rivals, and ability to pass carbon-related costs on to customers or suppliers.

Figure 30 Overview of the Climate Risk Toolkit listed equities value stream modelling approach



Note: EV, electric vehicle; ICE, internal combustion engine.

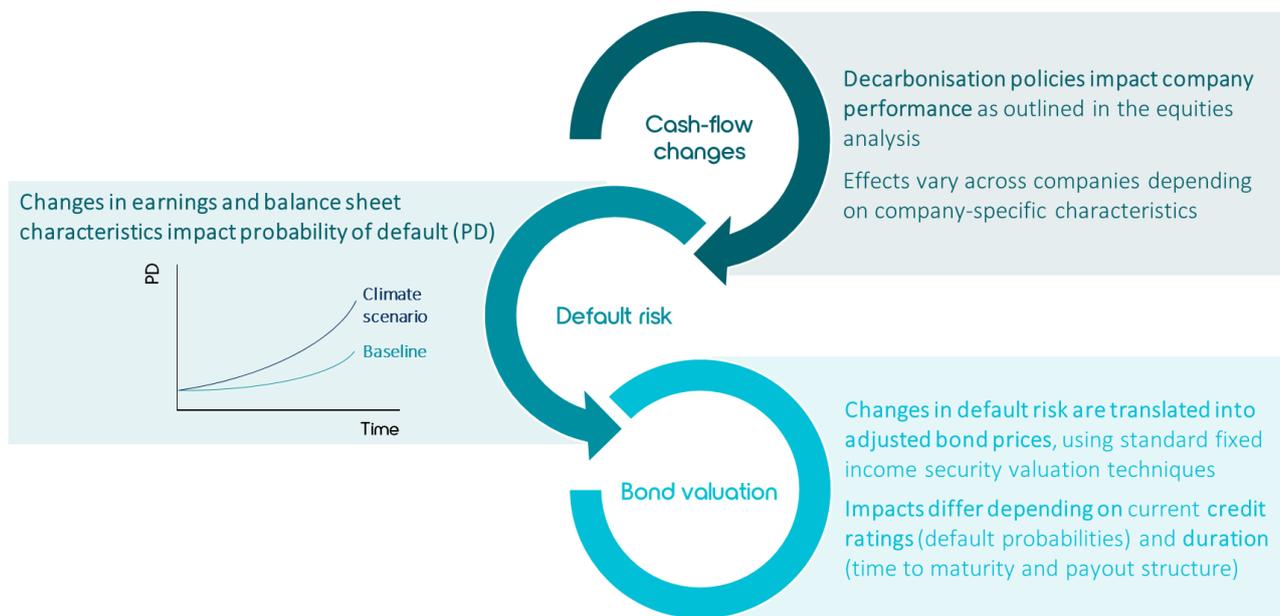
Source: Planetrics

For listed equities, the toolkit uses data on individual companies to model the impact of the five risk channels on companies' earnings over time. It then applies discounted cash-flow modelling, using security-specific discount rates and growth outlooks, to model the impact on equity values. Company-specific growth outlooks are estimated using the company's earnings, market capitalisation, and company-specific discount rate.

### Corporate bonds

For corporate bonds, the model uses the same changes in earnings as for equities, and then applies default risk modelling which draws on a ratings-based Altman modelling framework. This framework relies on indicators such as profitability, leverage, and liquidity to estimate financial strength and probability of bankruptcy, and accounts for bond duration and current creditworthiness. This is then translated into changes in bond prices.

Figure 31 Corporate bonds are modelled by assessing changes in the probability of default for bond issuers



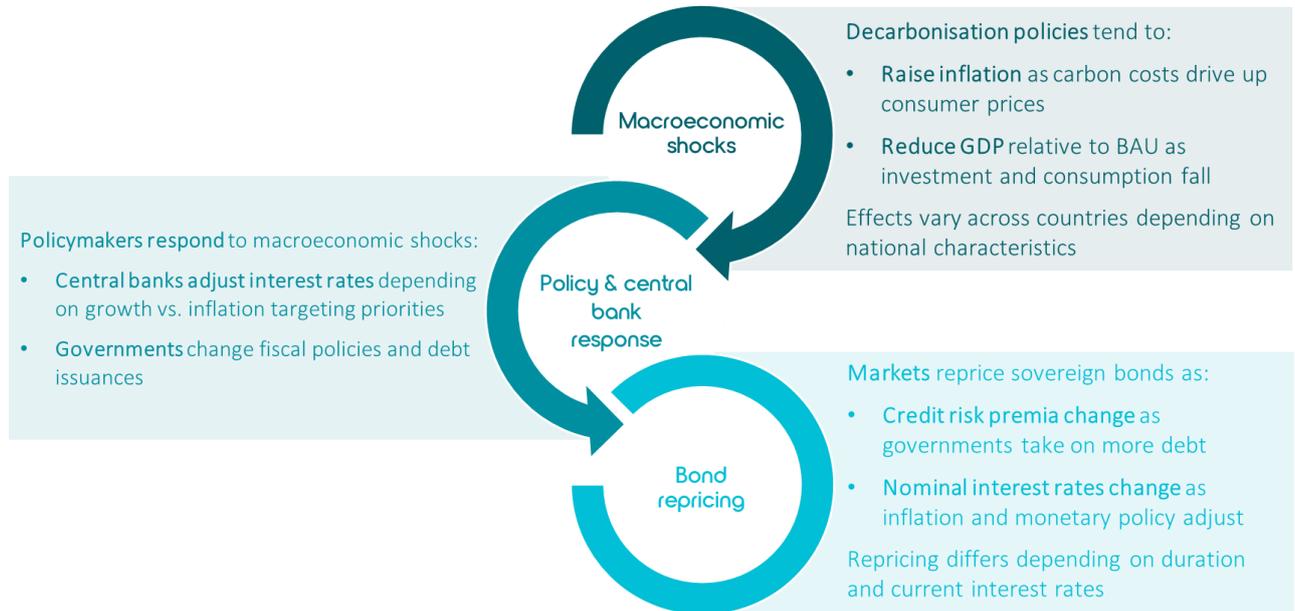
Source: Planetrics

### Sovereign bonds

For sovereign bonds, Planetrics collaborated with the National Institute for Economic and Social Research (NIESR), and used its NiGEM model to assess the macroeconomic impacts of Paris-aligned scenario transition risks, and the resulting impact on fiscal and monetary policy. This model was used by the Banque de France in its recent analysis of climate risk.<sup>30</sup> This model translates changes from climate transition risk channels into impacts on debt-to-GDP ratios, interest rates, and inflation across counties. It then calculates changes in default risks, accounting for current creditworthiness, country-specific economic characteristics, and bond duration. These changes are then translated into changes in bond valuation.

<sup>30</sup> <https://publications.banque-france.fr/sites/default/files/medias/documents/wp774.pdf>

Figure 32 Sovereign bond impacts depend on country emissions and energy usage, as well as central bank response functions and current macroeconomic fundamentals

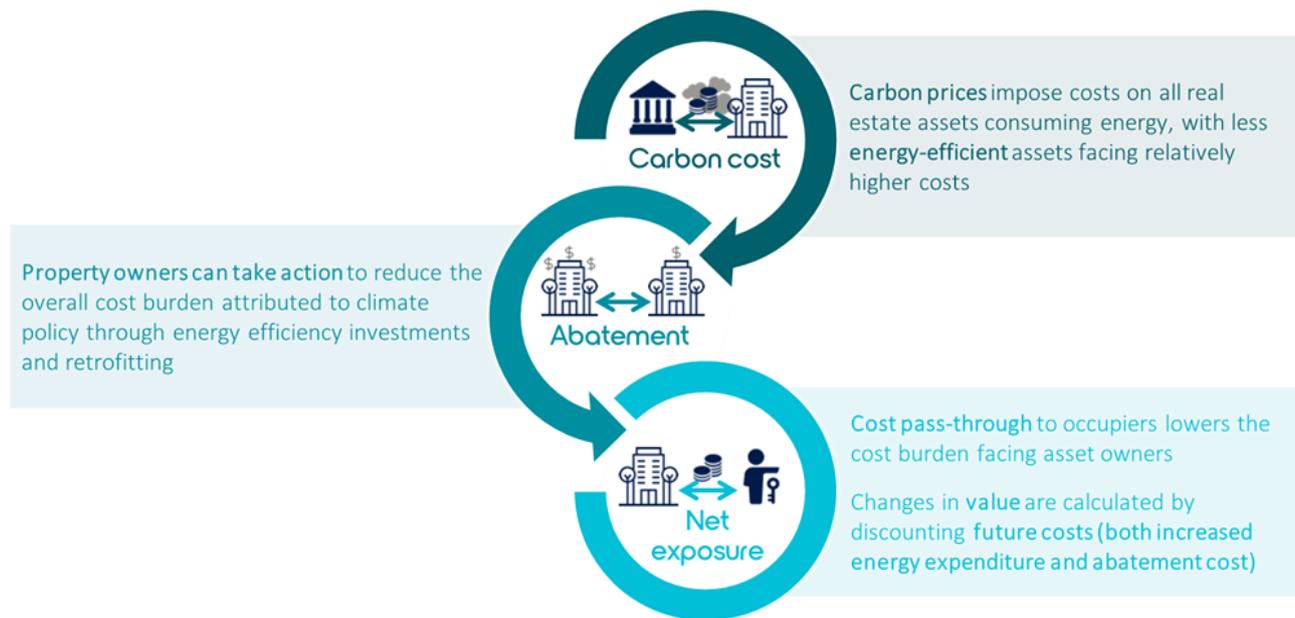


Note: BAU, business as usual.  
 Source: Planetrics and NIESR

**Real estate**

For real estate, the model estimates changes in rental income for buildings based on changes in carbon costs, abatement investments (such as energy efficiency improvements) and pass-through of costs to entities other than the building owner. Where possible, it uses property-specific data such as EPCs as an indicator of current energy efficiency. It then applies discounted cash-flow modelling to rental income and costs to determine the change in value of the property.

Figure 33 Real estate impacts account for Scope 1 and 2 costs, abatement, and cost pass-through to occupiers



Source: Planetrics

## Key limitations

The Planetrics model uses leading, quality-assured datasets, and incorporates several analytic modules used by government and industry to assess climate risks. It is regularly employed by financial institutions to conduct scenario-based risk assessments. While its capabilities and datasets are advanced, it has limitations that are relevant for investors and others when interpreting its outputs. Some of these are described in Section 4.3, including the following:

- **The toolkit does not consider companies' commitments to transform business models**, but rather relies on observed financial and ESG data to model future performance. As a result, the model does not reward companies that have set ambitious targets which have not yet translated into changes in revenues or assets.
- **The toolkit assesses all bonds based on their issuer** and does not distinguish between green bonds and other bonds. This means that portfolios holding green bonds issued by companies with a high carbon footprint today may appear to carry high climate risk.
- **Data quality and company disclosure varies**, and this means that the model uses sector averages instead of company-reported data in some places. The situation is improving over time as company disclosures and ESG datasets improve, and Planetrics is committed to ensuring that inputs into its analytics remain at the leading edge.
- **Cleantech 'unknown unknowns'**, such as companies and technologies not yet listed in markets are not captured in this analysis. Demand creation analysis in the toolkit captures growth in demand for mature and high-growth cleantech products which are already in commercial production or proven at scale. The toolkit does not capture demand growth for technologies which have not reached scale or achieved widespread deployment, such as CCS. These technologies also often have more uncertain demand in climate scenarios, with considerable differences in deployment levels across publicly available scenarios.
- **Scenario-based analysis tests for a limited number of plausible futures**. The purpose of the testing phase was to explore impacts on investor portfolios in plausible futures where the goals of the Paris Agreement are achieved. The three Paris-aligned scenarios do not represent all possible pathways for reaching these goals, and it is possible that actual future policy could be weaker than in the aligned scenarios, despite current momentum towards tightening climate policy in many regions.
- **The climate risk toolkit is subject to a continuous update cycle** which improves the granularity of results, and reflects new developments in climate science, climate policy, company reporting and activity.

## About Planetrics

Planetrics is part of the Vivid Economics group of companies, a leading strategic consultancy and data analytics provider in the climate and sustainability market.

We are specialists in the design of climate-change risk and opportunity modelling at the level of regions, sectors and assets, and in integrating this data with existing modelling and decision-making frameworks. We work with the world's leading banks, asset managers, owners, and insurers to support portfolio management, risk management, regulatory reporting, and stress testing.

## Contact us

---

Planetrics Limited  
163 Eversholt Street  
London NW1 1BU  
United Kingdom

T: +44 (0)844 8000 254  
[contact@planetrics.com](mailto:contact@planetrics.com)