Managing Climate Risk in Investment Portfolios: PIMCO's Approach

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Executive Summary

- Climate change will likely have a profound impact on the global economy, financial markets, and issuers. We believe it is critical to incorporate climate risk evaluations in our investment decisions. As active asset managers, we look to consider material risks on the horizon, not just those immediately affecting issuers.
- PIMCO's climate research is led by sector credit analysts, working in close coordination with our ESG (environmental, social, and governance) specialists. Climate risk now features in our proprietary ESG scores for the issuers we evaluate.
- To help analysts evaluate climate risk, PIMCO's ESG specialists designed seven proprietary tools, looking within and across markets globally at the potential impact of extreme weather events, the transition to a low-carbon economy, and other factors. The insights these tools provide are intended to help portfolio managers to better manage and mitigate climate-related credit risks. By harmonizing analysis across asset classes and sectors, we aim to ensure our ESG-focused investment approach as well as broader portfolios take climate risks into consideration.
- Even as risks are mounting, opportunities are also arising as people around the world shift from climate awareness to action. Our proprietary climate-related analysis helps us evaluate and harness these investment ideas.

ECONOMIC AND MARKET IMPACT OF CLIMATE CHANGE

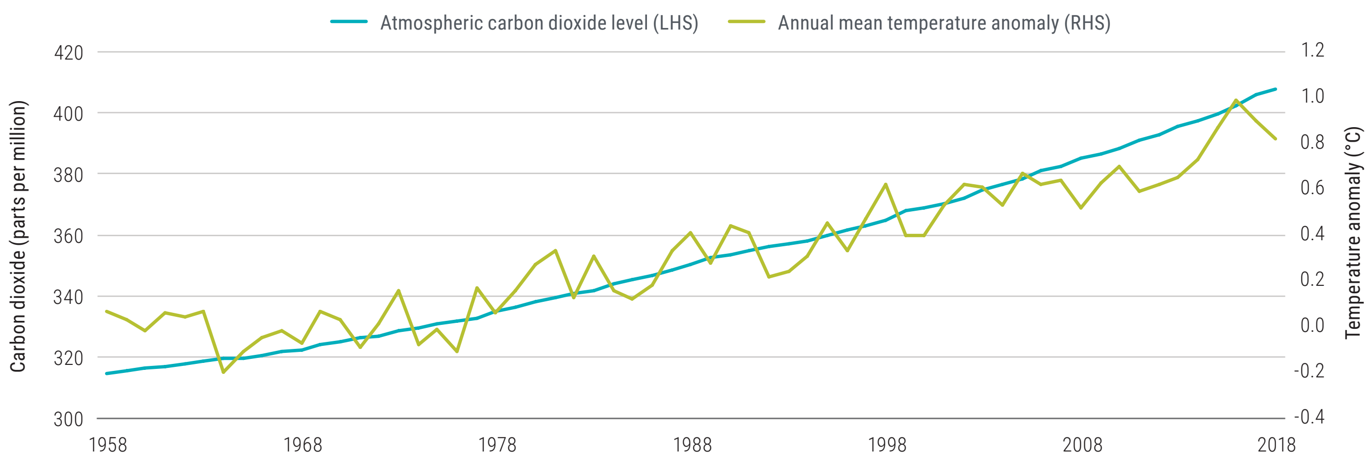
Climate change is likely to be a disruptive force in the global economy over the very long term. Average temperatures around the globe continue to rise, and the consensus across the scientific community is that human activity is the driving force – largely in the form of greenhouse gas emissions (source: Intergovernmental Panel on Climate Change (IPCC)). Many investors, companies, organizations, and nations are starting to hear the alarms about climate-related threats and seeing dramatic, sometimes devastating impact on economies and markets in addition to communities and ecosystems.

In 2018 alone, there were notable instances when markets felt the consequences of deadly wildfires, hurricanes, typhoons, and other climate-related catastrophes across the globe. Climate change can affect investments across asset classes, including a wide range of fixed income securities: corporate credit, mortgage-backed securities, sovereigns, and municipalities.

Therefore, as a steward of our clients' assets, PIMCO believes it is critical to incorporate climate risk evaluations in our investment decisions. As active asset managers, we must be forward-looking – considering material risks on the horizon, not just those immediately affecting issuers. And in our view, those long-term risks are significant, systemic, and rising. Even while many dedicated groups work hard to limit climate change and mitigate or adapt to its effects, the window of opportunity to prevent lasting global damage may be closing, according to recent reports from the IPCC and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES).

As risks mount, many issuers around the world are shifting from climate awareness to action, giving rise to new investment opportunities. Many investors are monitoring government responses to climate risks in the form of regulation, carbon taxes, and public investment, as well as shifts in consumer sentiment and business models. We expect this will change the investment landscape: The transition away from fossil fuels toward clean energy, for example, could transform the global economy and create significant investment opportunities. ESG-focused (environmental, social, and governance) investment approaches as well as broader portfolios can be positioned to harness these kinds of potential opportunities. Fixed income markets, in our view, may present a diverse array of sustainable investment options in the years to come. We assess both top-down macro trends and bottom-up ideas amid the evolving environment of climate risk.

Figure 1: Global atmospheric carbon dioxide and mean surface air temperature change, 1958-2018



Source: U.S. NASA (National Aeronautics and Space Administration) land-ocean temperature index, annual mean 1958–2018, with base period 1951–1980 (global mean estimates are based on land and ocean data); U.S. NOAA (National Oceanic and Atmospheric Administration) atmospheric carbon dioxide (CO_2) levels through 2018

PIMCO'S CLIMATE RISK ANALYSIS FRAMEWORK

PIMCO's climate research is led by credit analysts – the experts in their market sectors – who build on the structure of our broader ESG specialist desk for coordination and consistency. Climate risk now features in our proprietary ESG scores for the issuers we evaluate. In this way, PIMCO leverages the expertise of our analyst teams, while harmonizing climate risk analysis across asset classes and sectors. Our ESG scores inform broad PIMCO portfolios, not only ESG-focused portfolios with specific sustainability objectives.

To help analysts evaluate climate risk, PIMCO's ESG specialists designed seven proprietary tools (see Figure 2), drawing on our decades of experience in fixed income analysis. The insights these tools provide are intended to help portfolio managers to better manage and mitigate climate-related credit risks and align ESG dedicated portfolios with the Paris Agreement targets – as always, working within specific portfolio objectives and guidelines. (The Paris Agreement is the global accord to limit the global temperature rise by year 2100 to 1.5°C – 2°C above preindustrial levels.)

These analytical frameworks serve the whole spectrum of PIMCO's ESG-specific and broader investment strategies and enable PIMCO's ESG dedicated strategies to align with the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD).

PIMCO'S SEVEN CLIMATE TOOLS: RISK ANALYSIS IN PRACTICE

Figure 2: Summary of PIMCO's seven tools for climate risk analysis and management

OBJECTIVE	TOOL #	FOCUS	PIMCO TOOL NAME	KEY QUESTION
Lower credit risk	1	Economic Impacts (Top-down)	Climate Macro Tracker	How to assess and decrease portfolio exposure to financial risks brought about by climate change
	2	Credit Risk Impacts (Bottom-up)	Portfolio Climate Risk Heat Map	
	3		Issuer Climate Risk Score	
Reduce carbon emissions	4	Brown Bonds	Energy and Technology mix compared with the Paris Agreement (IEA Scenarios)	How to reduce portfolio exposure to activities contributing to global warming
	5	Carbon Intensity	Portfolio Carbon Intensity Analysis	How to reduce portfolio's carbon footprint
	6	Green Bonds	Green Bonds Score	How to increase portfolio's exposure to activities that help mitigate global warming
Both objectives	7	Engagement	Expectations toward issuers on climate change	How to influence companies' strategy

For illustrative purposes only. Source: PIMCO as of July 2019

TOOL #1: CLIMATE MACRO TRACKER

To ensure we have a robust long-term, top-down perspective on climate risk, PIMCO designed and developed our own **Climate Macro Tracker (Tool #1)**. This tool monitors the broad momentum in climate change across key themes and scenarios, and measures the gap between the real-world metrics and global climate goals.

Currently, our macro tracker (see Figure 3) tells us that despite progress in some areas, broad global trends remain deeply concerning as the concentration of carbon dioxide (CO_2) in the atmosphere continues to rise and is projected to lead to a temperature rise exceeding 3˚C by 2100 at this pace.

From a macro perspective, climate-related risks to the global economy are real and alarming. By some estimates, climate change could result in multitrillions of dollars of economic losses and a large negative impact on global GDP, in addition to the profound impact on communities and ecosystems (sources: OECD, CRO Forum, among others). Along with the challenges and risks, we also keep an eye on climate-related macro trends (regulations, energy, and technology, for example) likely to create business and investment opportunities.

Figure 3: PIMCO's Climate Macro Tracker updates key macro data on climate change and the energy transition

Theme	Metric	Data	Trend	1.5°C–2°C Alignment	Gap
Macro climate					
Carbon emissions	Carbon dioxide (CO_2) in parts per million (ppm)	411 ppm	Negative	No	Large
Temperature	Human-caused global warming vs. pre-industrial time	1.0°C	Negative	No	Large
Temperature	Forecast temperature rise by 2100 vs. pre-industrial time based on current pledges	>3.0°C	Negative	No	Large
Temperature	Four hottest years on record	2018, 2017, 2016, 2015	Negative	No	Large
Physical risks	Losses from natural catastrophes	160 billion USD	Negative	No	Large
Physical risks	Sea level rise	3.4 mm/year	Negative	No	Large
People	People displaced in 2018 due to disasters linked to weather and climate events (as share of total number of displaced persons)	2.3 million (13%)	Negative	No	Large
Nature	Number of species threatened with extinction (share of total)	1 million (25%)	Negative	No	Large
Energy supply and storage					
Renewables	Modern renewables share of global total final energy consumption (excluding traditional biomass)	10.6%	Mixed	Mixed	Medium
Storage	Deployed energy storage	620MWh	Positive	Yes	None
Coal	Coal share of energy generation	27%	Negative	No	Large
Energy demand					
Industry	Industry CO_2 emissions growth	1.1%	Positive	No	Small
Transport	Electric vehicles (EVs) share of global light vehicle sales	1%	Positive	Nearly	Small
Transport	Annual average fuel efficiency improvements in aviation	3.7%	Positive	No	Medium
Transport	Fuel efficiency improvement per vehicle-km in international shipping	1%	Positive	No	Large
Buildings	High-efficiency buildings share of construction (building stocks)	5% (1%)	Positive	No	Large
Carbon pricing and investment					
Carbon price	Carbon price range in major regions based on existing policies and announcements (2018-2050E)	USD 5–40t/CO_2e	Positive	No	Large
Low-carbon energy investment	Annual average investment in low-carbon energy (supply and demand) and grids	Approx. 900 billion USD	Negative	No	Large

Source: PIMCO, BP, International Energy Agency (IEA), Bloomberg, Climate Action Tracker, Munich Re, NASA, United Nations (2017-2018) as of July 2019. Note: Data on energy above predominantly stem from the IEA, which produces reference scenarios based on global warming pathways and potential policy responses, resulting in different levels of energy demand and fuel mixes and illustrating macro trends in the energy sector.

TOOL #2: PORTFOLIO CLIMATE RISK HEAT MAP

The pace of change is swift: Risks and opportunities related to climate change may materialize in unexpected ways. The impact on financial markets and bond prices may be abrupt and sudden, and as investors we must stay vigilant and flexible.

When evaluating climate-related risks and opportunities of specific sectors and issuers, we begin with two broad categories: 1) transition risks (e.g., tighter regulations on carbon emissions) and 2) physical risks (e.g., how the rising intensity and frequency of extreme weather events affects critical assets and natural resources used by the issuer) – see Figure 4.

Figure 4: Examples of transition risks and physical risks to assess for sectors and issuers

Climate change and the energy transition	Natural capital and resource efficiency
Climate risk mitigation	*Climate risk adaptation*
Transition risk	**Physical risk**
• *Carbon regulation (e.g., tax or cap-and-trade systems)* • *Energy-realted technology changes (e.g., rise of low-carbon sources of energy such as renewables)* • *Shifting customer preferences* • *Liability (e.g., litigation against governments and companies due to lack of action)*	• *Acute physical risks (e.g., increased severity of extreme weather events, such as cyclones and floods)* • *Chronic physical risks (e.g., changes in precipitation patterns and extreme variability in weather patterns, rising mean temperatures and sea levels)* • *Water, forest, land , biodiversity, air pollution footprint compared with global planetary and societal limits*

For illustrative purposes only. Source: PIMCO, TCFD

PIMCO's **Tool #2, the Portfolio Climate Risk Heat Map**, gives a high-level overview of exposure to climate risk (both transition and physical) among relevant sectors and assets. Figure 5 illustrates a "heat map" of select corporate sectors' exposure, from low risk (green) to high risk (red), along with examples of relevant climate risks within each sector. Looking across the range of risks in a portfolio helps a portfolio manager assess and fine-tune exposures.

Figure 5: PIMCO's corporate sector climate risk heat map — sector examples

more at risk   moderately at risk   less at risk

Sector	Transition risk level and examples	Physical risk level and examples
Automotive	Tightening CO_2 emissions standards; electric vehicles (EVs) have considerably expanded but not fast enough	Sensitive to supply chain disruptions entailed by extreme weather events such as hurricanes
Chemicals	Petrochemicals affected by carbon risks	Sensitive to supply chain disruptions entailed by extreme weather events such as hurricanes (e.g., U.S. Gulf Coast, chemical "triangle")
Energy: independent exploration and production (E&P)	Increased demand for natural gas and renewables versus oil (especially costly projects may be at risk)	Industrial accidents, spills, and disasters, especially offshore, may be amplified
Food and beverage	Demand for alternative products and potentially increased costs (though typically passed through)	Upward pressure on food prices and input costs; likely less relevant for beverages
Healthcare	Little impact	Pandemics might weigh on claims
Insurance: property and casualty (P&C)	Growing, but still modest, asset risk from the potential increase in prices of certain assets	Heightened underwriting and risk management complexity
Metals and mining: coal	Structural pressure on the demand for coal	Significant risks of water shortages; disruption due to extreme weather events
Real estate investment trusts (REITs): data centers	Energy efficiency and environmental regulations have become more stringent but direct costs are nonmaterial	Some exposure to water stress considering reliance for cooling
Textiles	Small transportation costs rise	Water shortages may pose a risk (cotton a large user)
Transportation services	Stricter exhaust regulations (sulfur oxides, nitrous oxides, CO_2)	Ports face disruption risks brought about by sea level rise and extreme weather events (e.g., need to raise the elevation)
Utilities	Utilities in Europe and North America shifting from coal to natural gas and renewables (less competitive)	Significant risks of water shortages (e.g., for water utilities) and the rise of natural hazards such as forest fires or hurricanes bear both direct and indirect consequences, e.g., threatening transmission and distribution

For illustrative purposes only. Source: PIMCO, International Energy Agency (IEA), Moody's, Natural Capital Coalition, Dun & Bradstreet as of July 2019

TOOL #3: ISSUER CLIMATE RISK SCORE

PIMCO's Issuer Climate Risk Score (Tool #3) assesses climate change risks for a wide range of relevant sectors and issuers. In the auto sector, for example, we explore climate change in the broader context of stricter legislation covering air pollution, while for the food and agriculture sectors, carbon risks should not, in our view, be disentangled from steps taken by issuers to mitigate the underlying commodities' water or land footprint.

As with the heat map (Tool #2), the climate risk scores are divided into transition risks and physical risks. Our transition risk scores are typically favorable for the most carbon-efficient issuers and for those proactively seeking to align with the Paris Agreement in light of their respective business and geographical contexts. The transition risk score draws on metrics such as the issuer's current and future carbon emissions using a lifecycle approach and recognized methods such as the science-based target approach, as well as business mix outlook (e.g., revenues, capital expenditures) considering technology pathways enabling issuers to align with the limits on rising temperatures.

Case study A: Energy (corporate credit)

For instance, PIMCO's fundamental analysis of credits in the energy sector closely examines companies' exposure to different types of energy sources, environmental and regulatory risks to the business activities, the relative cost positions of companies and their commitments, and steps taken to diversify into low-carbon sources of energy.

Ultimately, we look to map the likely winners and losers, notably based on scenario analysis and the extent to which long-term climate risks are reflected in our credit views and bond prices, and, if they are not, what this could mean for issuers' credit quality considering bond characteristics (e.g., duration) over time.

Case study B: Real estate and mortgage-backed securities

In general, we believe the real estate sector needs to step up its efforts to improve buildings' energy efficiency via more extensive upgrades of existing properties. Our environmental assessment for real estate examines practices in terms of green buildings and like-for-like carbon emissions, energy intensity reductions, and reduction of physical risks.

Looking across subsectors, our climate scores for REITs (real estate investment trusts) suggest that malls and offices are generally the most advanced in their practices and trajectories. And within mortgage-backed securities (MBS), we see geographical diversity as a key edge against material losses prompted by extreme weather events.

Case study C: Sovereign credit

Our sovereign credit climate score comprises a host of metrics that capture each country's exposure and readiness to cope with climate change, connecting environmental with economic variables. Energy-intensive and fossil-fuel-dependent economies are much more likely to be affected by the transition to cleaner energy, but the pace will be key to each sovereign's ability to manage the transition risks, as well as their savings buffer and reforms to shore up growth from other sectors. Conversely, rising temperatures and physical climate risks are likely to disproportionally affect the credit risk of developing and smaller countries.

Case study D: Municipal bonds

PIMCO's municipal climate score considers a variety of factors to assess the economic vulnerability associated with climate risks, as well as the ability and willingness of states and local governments to adapt and achieve sustainable initiatives.

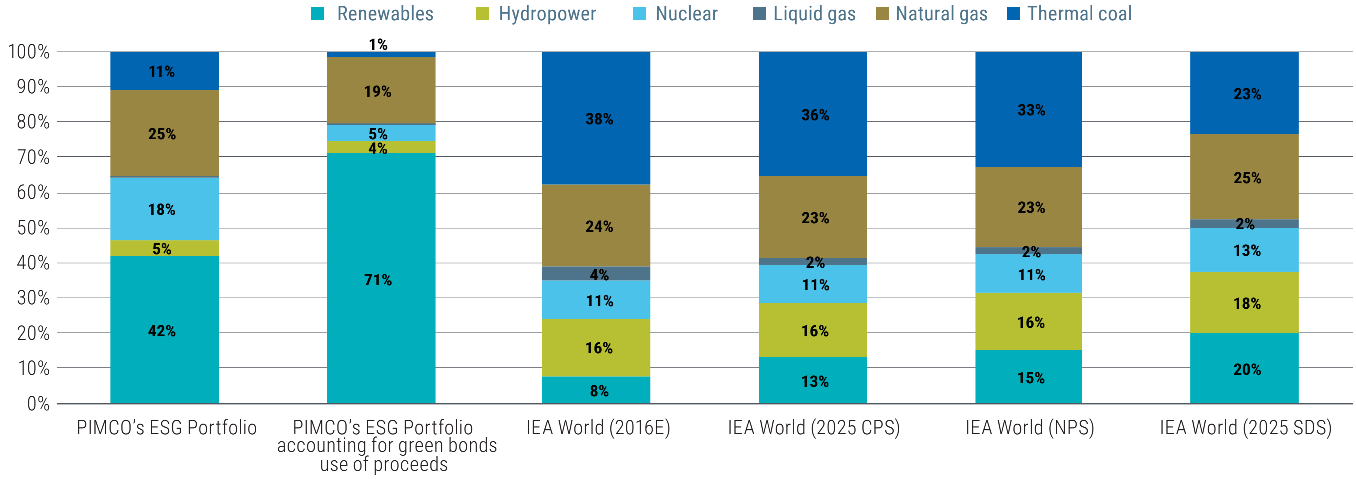
In the municipal market, high physical risks are generally concentrated around coastal communities with elevated incidents of storms and flooding, while high transition risks reflect economies with larger exposures to the energy and mining sectors.

TOOL #4: PORTFOLIO ENERGY AND TECHNOLOGY MIX MEASURED AGAINST THE PARIS AGREEMENT

We complement our sector-based and bottom-up analysis of carbon risks with a portfolio tool that monitors the carbon impact of corporate holdings across a portfolio and seeks ways to mitigate emissions beyond exclusion screens.

PIMCO's Energy and Technology mix compared with the Paris Agreement (Tool #4) assesses the average technology and energy mix of a portfolio compared with global energy scenarios modeled by the International Energy Agency (IEA), including the potential impact of green bonds, considering their specific environmental features and issuer-level data. Figure 6 compares PIMCO's ESG portfolio with current and future IEA estimates of Paris-aligned portfolios.

Figure 6: PIMCO's sample ESG Portfolio energy mix compared with the current global energy mix and with different IEA scenarios for 2025



Note: "PIMCO's ESG Portfolio" refers to the current weighted average energy mix of four sample portfolios following the Total Return Bond ESG Strategy, Low Duration Bond ESG Strategy, Global Bond ESG Strategy, and Global Investment Grade Credit ESG Strategy. "PIMCO ESG Portfolio, accounting for green bonds' use of proceeds" adjusts green bond issuer data to reflect the energy mix of the use of proceeds. Together, these numbers represent a plausible range as the actual energy mix "financed by the bond" (funded by the investor) is likely to be in practice between these two numbers for a green bond issuer. IEA CPS refers to the Current Policy Scenario (no changes in policies from today, i.e., business as usual), IEA NPS to New Policies Scenario (including pledges and commitments made by countries) and IEA SDS to Sustainable Development Scenario (aligned with the UN Sustainable Development Goals and 2°C trajectory). For corporate bonds only. Data coverage for carbon intensity: c. 92% of the Corporate PMV (Percentage Market Value) of the accounts.

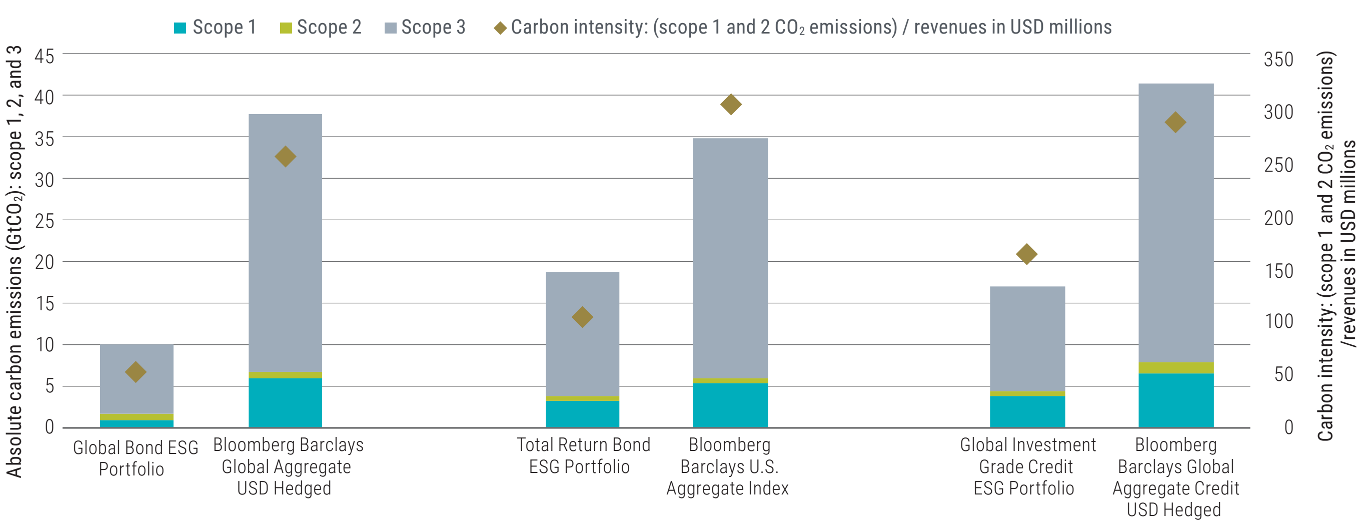
This Figure is provided for information purposes and should not be construed as a solicitation or offer to buy or sell any PIMCO or other securities or related financial instruments in any jurisdiction.

For illustrative purposes only. Source: PIMCO, MSCI and IEA data from the World Energy Outlook 2017. All rights reserved. www.iea.org/statistics. License: www.iea.org/t&c. As of July 2019, unless otherwise indicated.

TOOL #5: PORTFOLIO CARBON INTENSITY ANALYSIS

Moreover, as part of **PIMCO's Portfolio Carbon Intensity Analysis (Tool #5)**, we have developed high-level portfolio screens that allow comparison of carbon intensity of different portfolios and benchmarks based on the weighted average sum of both direct greenhouse gas emissions and greenhouse gas emissions due to purchases of electricity, heating, and cooling (i.e., scope 1 + scope 2 emissions in tonnes of carbon dioxide equivalent, or tCO_2e / revenues in USD (weighted based on percentage of market value)) – see Figure 7.

Figure 7: Carbon intensity in sample PIMCO ESG portfolios and benchmarks



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TOOL #6: GREEN BONDS SCORE

Green bonds and other debt instruments geared toward sustainability are proliferating in the global marketplace. Our ESG process integrates analysis of debt instruments geared toward climate solutions via our proprietary **Green Bonds Score (Tool #6)**.

We assess green bond instruments both prior to and after issuance, mapping them across a spectrum based on strategic fit, potential impact, red flags, and reporting, resulting in PIMCO's impact score for green, social, or SDG bonds. PIMCO's green bond scores aid the investment process and security selection, allowing for stronger differentiation among green bond issuers and frameworks.

TOOL #7: ENGAGEMENT WITH ISSUERS ON CLIMATE CHANGE

We engage with bond issuers both to bolster their Paris Agreement alignment and to help them improve their management of the underlying credit risks, moving from awareness to readiness, and ultimately commitment **(Tool #7: PIMCO's Engagement With Issuers on Climate Change)**. To learn more about how we use issuer engagement as a tool to actively monitor and encourage issuers' disclosure and strategy on climate change, please see our latest ESG Investing Report.

PIMCO is part of Climate Action 100+, an investor-led climate engagement coalition that works with selected issuers among the largest carbon emitters in a broad range of sectors.

KEY TAKEAWAYS

As we discuss in PIMCO's latest Secular Outlook, we believe the disruptive impact of climate change on human lives, economic activity, and financial markets will create many winners and losers, which will require active management of credit and other risks. Climate-related shocks could become more frequent and severe, and have the potential to wreak havoc with economic activity and inflation, and thus could make it more difficult for investors and central banks to separate the noise from the signal.

As an active investment manager, PIMCO seeks to understand and act on that signal – to proactively assess and manage the risks and opportunities created or compounded by climate change. Our proprietary tools and methods are designed to help investors navigate an uncertain future in an evolving global economy.

Learn more about our innovative approach to ESG investing in fixed income markets.

READ HERE

Download our latest ESG Investing Report, featuring detailed insights into trends and tools for sustainable investing.

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