GPIF

ESG REPORT
2020

Government Pension Investment Fund

For All Generations

Contents

For All Generations

GPIF is committed to fulfilling our fiduciary duty to secure adequate retirement funds for both current and future beneficiaries.

We believe that improving the governance of the companies that we invest in while minimizing negative environmental and social externalities – that is, ESG (environmental, social and governance) integration – is vital in ensuring the profitability of the portfolio over the long term.

About GPIF

Government Pension Investment Fund (GPIF) manages and invests Japan's pension reserve fund, which is used to pay Employee Pension Insurance and National Pensions. We contribute to the stability of the pension system by earning returns on our investments and distributing these to the government.

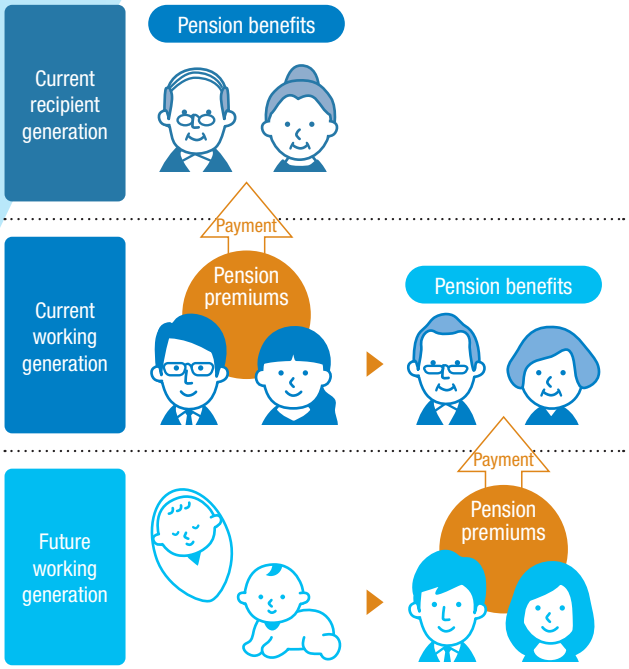
1 Pension System in Japan

Japan adopts a "pay-as-you-go" pension system in which contributions from the current working generation are used to pay the pensions of elder generations. As such, with the birth rate declining and the population aging at a rapid pace, in order to avoid an unduly heavy burden being placed on future generations, pension contributions not immediately applied to the payment of benefits are accumulated as pension reserves and placed under fiscal management so that these payments can continue to be made into the future.

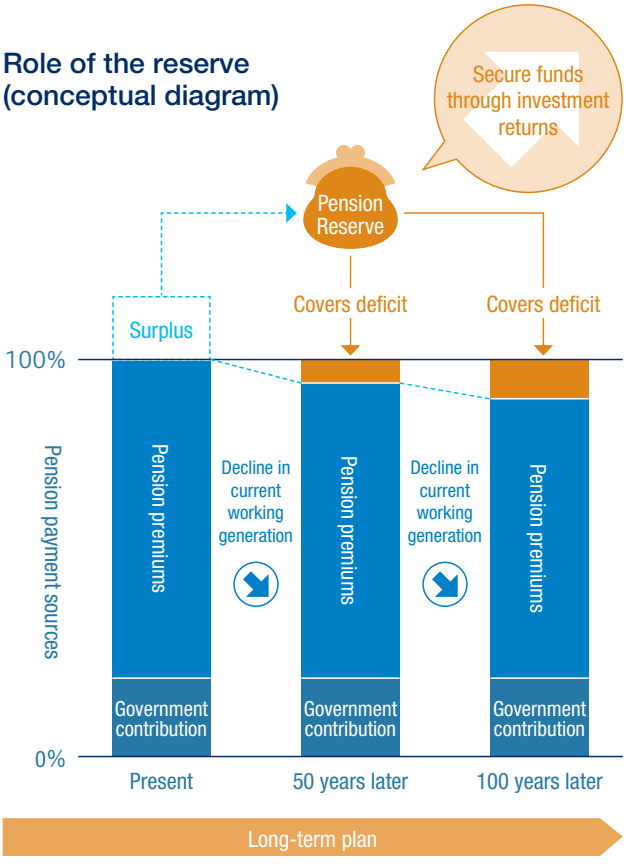
GPIF invests this reserve in Japanese and overseas capital markets. Both returns on the reserve and the reserve itself will be used to supplement pension payments to future generations as part of a 100-year fiscal plan. For this reason, even if a valuation gain or loss occurs in a particular year, pension payments for the following year will not be affected.

Pay-as-you-go system

Japan adopts a system where the current working generation supports the livelihoods of the elderly.



Role of the reserve (conceptual diagram)



(Note) The above diagram is for illustrative purposes; please refer to the Ministry of Health, Labour and Welfare website for details on the public pension system.

2 Diversified, International Investment Over the Long-Term

GPIF manages the pension reserve through a combination of long-term and diversified investments with the aim of stable returns. Investment returns fluctuate on a daily basis due to a variety of factors, but in general, short-term oscillations even out as the investment period grows, resulting in more stable returns on an annualized basis. In addition, the market value of the assets under management fluctuates depending on economic conditions, foreign exchange rates, and other factors. For this reason, with assets under management of approximately ¥186 trillion as of March 31, 2021, we invest not in a single asset class but in a broad, diverse range of assets, including equities, bonds, and alternative investments both in Japan and overseas. We expect such diversified investment to generate profits from economic activities all around the world and reduce the possibility of major losses.

3 Integrating ESG (Environmental, Social and Governance) into the Investment Process

GPIF promotes ESG integration throughout all of our investment processes in line with our Investment Principles, which state that "sustainable growth of investee companies and the capital market as a whole are vital in enhancing long-term investment returns." Of these investments, the assets under management tracking ESG indexes, which can be described as ESG investments in a narrow sense, total approximately ¥10.6 trillion, and investment in green, social and sustainability bonds issued by multilateral development banks is currently at approximately ¥1.1 trillion.

GPIF in numbers

Universal owner

Asset size
¥186 trillion
World's largest pension fund

Number of GPIF-owned issues
5,702 stocks
14,829 bonds

+

Cross-generational investor

Investment time horizon
100 years
Playing a role in pension finance with an investment time horizon of over 100 years

GPIF's ESG activities (investments)

ESG integration (all assets)	Assets under management tracking ESG indexes	Investments in green bonds, etc.	Rating by PRI (strategy and governance)
¥186 trillion	¥10.6 trillion	¥1.1 trillion	A+

Ensuring Pension Stability

Our Mission

Our mission at GPIF is to contribute to the stability of the national pension system by managing and investing the pension reserves entrusted to us by all beneficiaries.

To fulfill its role of contributing to stable pension finance, GPIF has been given an investment return target of 1.7% above wage growth by the Minister of Health, Labour and Welfare. We began managing assets as we are today in fiscal 2001, and since then, we have recorded a cumulative return rate of +3.61% (annualized) and total returns of ¥95.3 trillion as of the end of fiscal 2020.

Pension reserves managed by GPIF are used to prevent the burden on future generations from becoming too excessive.

Our Conviction

We firmly believe that enhancing the sustainability of financial markets as a whole through ESG activities will help stabilize the pension system to the ultimate advantage of all beneficiaries.

We are committed to continue promoting ESG in order to reduce the negative impact of environmental and social problems on financial markets, and thus encourage sustainable economic growth and improve long-term returns from all the assets we manage.

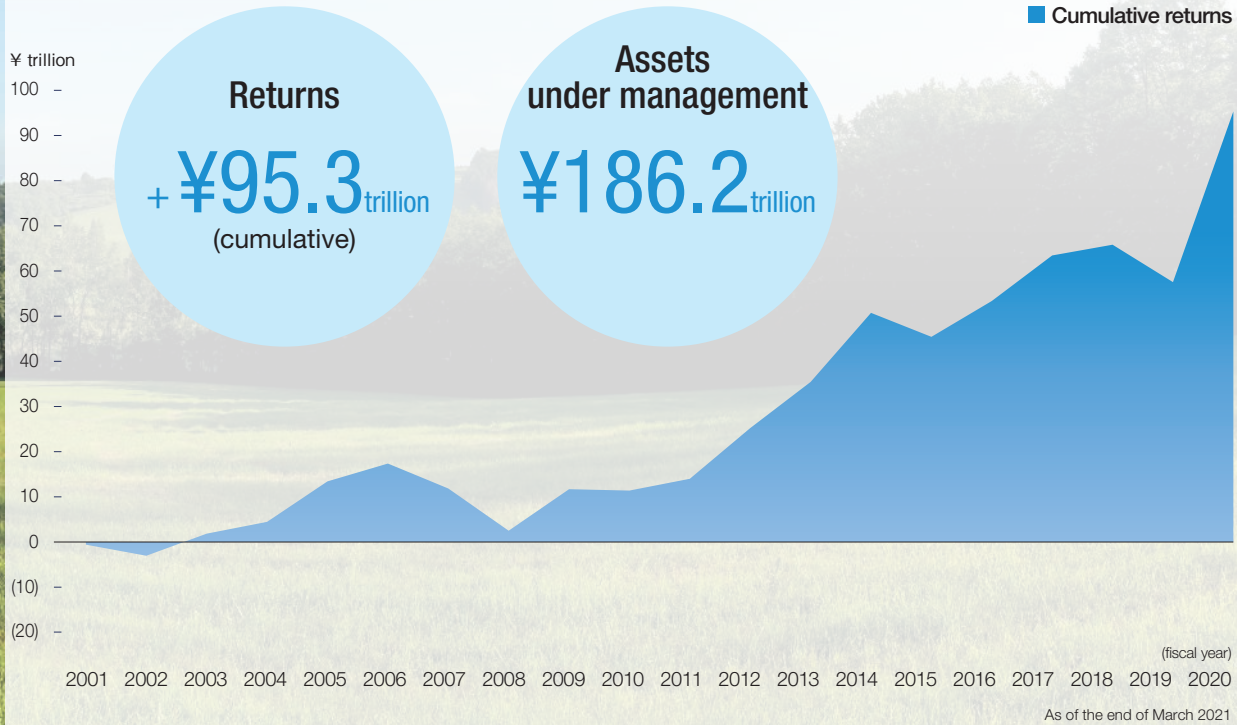
Pension reserves

Pension reserves are managed based on legislation that includes the Employees' Pension Insurance Act, National Pension Act, and the Act on the Government Pension Investment Fund, Independent Administrative Agency. These laws require GPIF to invest these reserves safely and efficiently from a long-term perspective and for the sole benefit of pension recipients.

In addition, GPIF conducts its business operations in accordance with medium-term targets set by the Minister of Health, Labour and Welfare. GPIF's 4th Medium-term Plan (FY2020–FY2024), which it established in response to those medium-term targets, states that GPIF will promote investments that are conscious of non-financial factors, namely ESG, while being mindful of the Pension Reserve Basic Policy.

In 2020, the Basic Policy of Pension Reserves that GPIF follows was revised to require that the fund, from the perspective of securing long-term returns for the benefit of pension recipients, consider different activities to promote investments integrating non-financial factors, namely ESG (environmental, social and governance) in addition to financial factors, and take the necessary actions to implement these. GPIF is committed to promoting ESG investment based on the Basic Policy and the Medium-term Plan.

Cumulative returns since fiscal 2001



As of the end of March 2021

What is ESG?

ESG is the acronym for Environmental, Social, and Governance. While investors have traditionally used cash flows, profit margins and other quantitative financial data to value a company's equity or other securities, "ESG investment" also takes non-financial ESG factors into consideration. GPIF is committed to promoting ESG investment.

1 What is ESG?

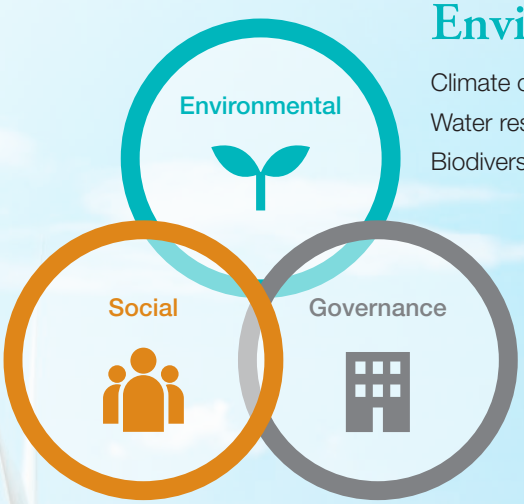
The term "ESG" was first popularized in 2006, when the United Nations proposed the Principles for Responsible Investment (PRI) – a new framework for incorporating ESG into the investment process – to institutional investors around the globe. As the world economy has grown, environmental, social and corporate governance issues that have the potential to negatively impact socio-economic sustainability, such as climate change, supply chain labor problems, and corporate misconduct, have surfaced. Based on this recognition, ESG investment is expected to improve risk-adjusted returns over the long term by incorporating environmental, social, and corporate governance perspectives into investment decisions.

Environmental

Climate change
Water resources
Biodiversity etc.

Social

Diversity
Supply chain etc.



Governance

Composition of the board of directors
Protection of minority shareholders etc.

2 Why Does GPIF Focus on ESG?

GPIF can be accurately described as a "universal owner"; that is, a long-term investor with a substantial level of assets under management that invests in securities spanning the entire world capital market. Furthermore, the pension reserves managed by GPIF are used to mitigate the burden of pension contributions made by future generations. Long-term corporate value creation by each investee company and the sustainable, stable growth of the entire capital market is critical for GPIF – a universal owner and cross-generational investor – to achieve stable income over the long run. Since environmental and social issues will inevitably impact capital markets over the long term, it is essential that we reduce the negative impact of these problems in our pursuit of sustainable returns.

3 About the SDGs

The SDGs (Sustainable Development Goals) are international goals set forth by the United Nations in the "2030 Agenda for Sustainable Development" adopted at the UN Summit in September 2015. The SDGs evolved from the Millennium Development Goals formulated by the UN in 2001 and are targeted for achievement by 2030. The SDGs advocate "leaving no one on the planet behind." And consist of 17 goals and 169 targets, including "Gender Equality," "Industry, Innovation, and Infrastructure", and "Climate Action."

As the goals and targets of ESG investment and the SDGs are largely the same, the former can go a long way in accomplishing the latter. Achieving the SDGs and realizing a sustainable economy and society would lead to a better return on all assets managed by GPIF over the long term.

Column GPIF and Impact Investment

GPIF's Investment Principles clearly state that we will promote investments that consider ESG, and we thus integrate ESG factors into all aspects of our pension reserve management. On the other hand, GPIF does not conduct investment where the explicit purpose is to create some type of social impact, such as achieving the SDGs. While this may seem like a contradiction, it is related to the legislation governing GPIF and the *objective* of our investment behavior.

As mentioned above, GPIF is required by law to manage pension reserves solely for the benefit of pension recipients from a long-term perspective, thereby helping to fund future pension benefits. In this context, *benefit* is construed as *economic benefit*. The goal of GPIF's ESG investment is to ensure the *economic benefit* of pension recipients from a long-term perspective by reducing the negative impact of environmental and social issues on capital markets. For this reason, it was decided that, under existing legislation and the *objective* of investment behavior to be taken by the fund, GPIF would not make investments whose sole purpose was to "contribute to the solution of social problems."

In general, there are many similarities between ESG investment and impact investment, and few investors may be clearly aware of the differences. We believe that GPIF's ESG investment will have an impact by enhancing companies' ESG activities and improving their ESG ratings, which will ultimately lead to the mitigation of risks and improvement of portfolio returns. Having said that, GPIF's ESG investment does not directly target social impact itself, which is the major difference with impact investment.

Message from Our President

The year 2020, which marked the commencement of the 4th Medium-term Plan, was a turbulent year for GPIF. The COVID-19 pandemic, which began in the previous fiscal year and exploded around the entire world, continued to severely impact the global economy and society in fiscal 2020. While progress is being made with the vaccination roll-out in developed countries in Europe and America, many other countries, including Japan, are caught in a repeated cycle of harsh restrictions to reduce transmission of the virus and the easing of those restrictions.

Amid this unprecedented crisis, socioeconomic systems and industrial structures are undergoing major transformations. ESG also continued to attract attention on many fronts, with the pandemic driving an even greater awareness of the importance of social (S) issues, including employee health and safety, supply chain management, and human rights. 2020 also saw the beginning of a greater global alignment on climate change. Several countries announced their intention to reduce greenhouse gas emissions to net zero, beginning with China in September 2020 followed by Japan and South Korea the following month. And on the inaugural day of the new Biden administration in January 2021, the United States announced its return to the Paris Agreement – an international framework to combat climate change. While the pandemic continues to rage on, the world has already begun to look forward toward a post-COVID future.

In this tumultuous year, both domestic and overseas stock markets rose significantly due to economic stimulus packages implemented in major economies, including major fiscal spending and continued accommodative monetary policies. Our tactical allocation of funds to risk assets such as domestic and foreign stocks whose prices had dropped substantially due to the COVID-19 shock contributed greatly to performance in fiscal 2020, with our portfolio generating a record-high return of around 25.2%, or approximately ¥37.8 trillion.

GPIF is committed to fulfilling our fiduciary duty to secure adequate retirement funds for both current and future beneficiaries by managing pension reserves from a long-term perspective, based on our Investment Principles and Code of Conduct, without being swayed by short-term investment results.

GPIF's Investment Principles state that "we promote investments that take into account the non-financial elements of ESG, in addition to financial elements, with a view to ensuring long-term returns for the benefit of pension recipients." We also firmly believe that enhancing the sustainability of financial markets as a whole through ESG activities will help stabilize the pension system, to the ultimate advantage of all beneficiaries.

Based on this conviction, GPIF has been promoting various ESG-related initiatives ever since becoming a PRI signatory in 2015. In fiscal 2020,

we adopted new ESG indexes for foreign equities and collaborated with various international organizations to promote green, social, and sustainability bonds and investment in COVID-19 bonds. We also actively continued our engagement with index providers and ESG ratings agencies

The benefits of ESG-related initiatives take a long time to materialize. We have examined the impact of our activities every year in our ESG Report to confirm that we are headed in the right direction and ensure that we ultimately achieve the results we are aiming for. This is the fourth such report since it was first published in fiscal 2017. For the disclosure of climate change risks and opportunities, the importance of which is increasing year by year, we attempted to conduct a more forward-looking analysis, as well as delve more deeply into the analyses we have conducted to date.

Although many challenges remain, such as constraints on information availability, we are committed to continuously improving our yearly analysis and disclosures. We hope that our efforts provide an impetus for other asset owners and asset managers to disclose similar information.

Government Pension Investment Fund

President

MIYAZONO Masataka

Fiscal 2020

Activity Highlights

In fiscal 2020, GPIF continued to promote ESG in new areas. Here we present the highlights of our ESG activities during the year.

Adoption of ESG-Themed Foreign Equity Indexes

MSCI ACWI ESG Universal Index

MORNINGSTAR GenDi

After examining the indexes submitted to the Index Posting System based on the Practical Guidelines for ESG Index Selection, GPIF adopted the MSCI ACWI ESG Universal Index – a general ESG index – and the Morningstar Gender Diversity Index, and began passive investment based on these two indexes.

Please refer to pages 19 and 20 for details.

Collaboration with International Organizations on ESG Bonds and Investment in COVID-19 Bonds

GPIF is working to expand investment opportunities in green, social and sustainability bonds as part of its efforts to integrate ESG into fixed income investment. In fiscal 2020, we formed new partnerships with three banks while continuing our existing partnerships with other major multilateral development institutions. Also, GPIF has invested in COVID-19 bonds issued by our partner institutions in response to the increased demand for funding to address the pandemic,.

Please refer to pages 21 and 22 for details.

Stewardship Activities and ESG Promotion

With a view to increasing long-term investment returns, GPIF fulfills its stewardship responsibility by pursuing activities that promote long-termism and the sustainable growth of investee companies and the market as a whole. Our FY2020 survey of listed companies found that an increasing number of firms gave a favorable assessment of institutional investors' usage of integrated reports. In addition, we saw examples of stewardship focused passive managers successfully encouraging investee companies to take concrete action to create corporate value.

Please refer to pages 23 to 26 for details.

Engagement with Index Providers and ESG Ratings Agencies

GPIF has been actively engaging in dialogue with index providers and ESG ratings agencies since first selecting ESG indexes for Japanese equities in 2017. As GPIF's investments are predominantly passive, index providers and ESG ratings agencies play a pivotal role in the success or failure of our fund management. GPIF engages in dialogue with these providers in an effort to improve ESG rating coverage and rating methodologies.

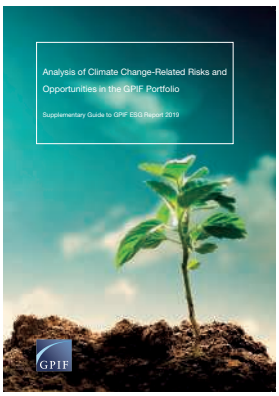
Please refer to pages 29 to 34 for details.

ESG in Alternative Asset Management

GPIF also takes ESG factors into consideration when investing in alternative assets. We examine ESG initiatives in the process of selecting asset management companies, and monitor these managers after a mandate is awarded. In this report, we conduct a quantitative analysis of climate change risk for domestic real estate which GPIF invests in through private funds.

Please refer to pages 35 and 36 for details.

Publication of the Analysis of Climate Change-Related Risks and Opportunities in the GPIF Portfolio



https://www.gpif.go.jp/en/investment/GPIF_CLIMATE_REPORT_FY2019_2.pdf

In the "Analysis of Climate Change-Related Risks and Opportunities in the GPIF Portfolio" report published in October 2020, GPIF further enhanced its disclosures in line with the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) by broadening the scope of analysis and conducting a comprehensive assessment of climate change-related risks and opportunities across asset classes. As GPIF is a "universal owner," we are confident that this report not only serves as an evaluation of our portfolio companies, but also provides a wealth of implications about the different climate-related challenges and risks countries around the world are facing, as well as the inherent value of problem-solving technologies and business opportunities that could emerge in the future.

ESG-Related Governance and Organizational Frameworks

The Board of Governors discusses and oversees the promotion of ESG and approaches to ESG investment at GPIF. The Executive Office promotes ESG initiatives through coordination between the Public Market Investment Department, Investment Strategy Department, Private Market Investment Department, and other departments related to asset management, and reports to the Board of Governors on important matters.

Deliberations by the Board of Governors

The Board of Governors discusses and oversees the promotion of ESG and approaches to ESG investment at GPIF. The Board, established in October 2017, makes decisions concerning important matters such as the formulation of the policy asset mix and medium-term plans by mutual consent, and oversees the execution of operations by the Executive Office.

In fiscal 2020, the Board of Governors met 13 times, and ESG-related issues were discussed at six of those meetings.

The Board of Governors discusses and oversees the promotion of ESG and approaches to ESG investment at GPIF. Details of the discussions of the Board of Governors are posted on the GPIF website in the form of a summary of the proceedings after a certain period of time has passed.

Status of the Board of Governors
https://www.gpif.go.jp/operation/board/

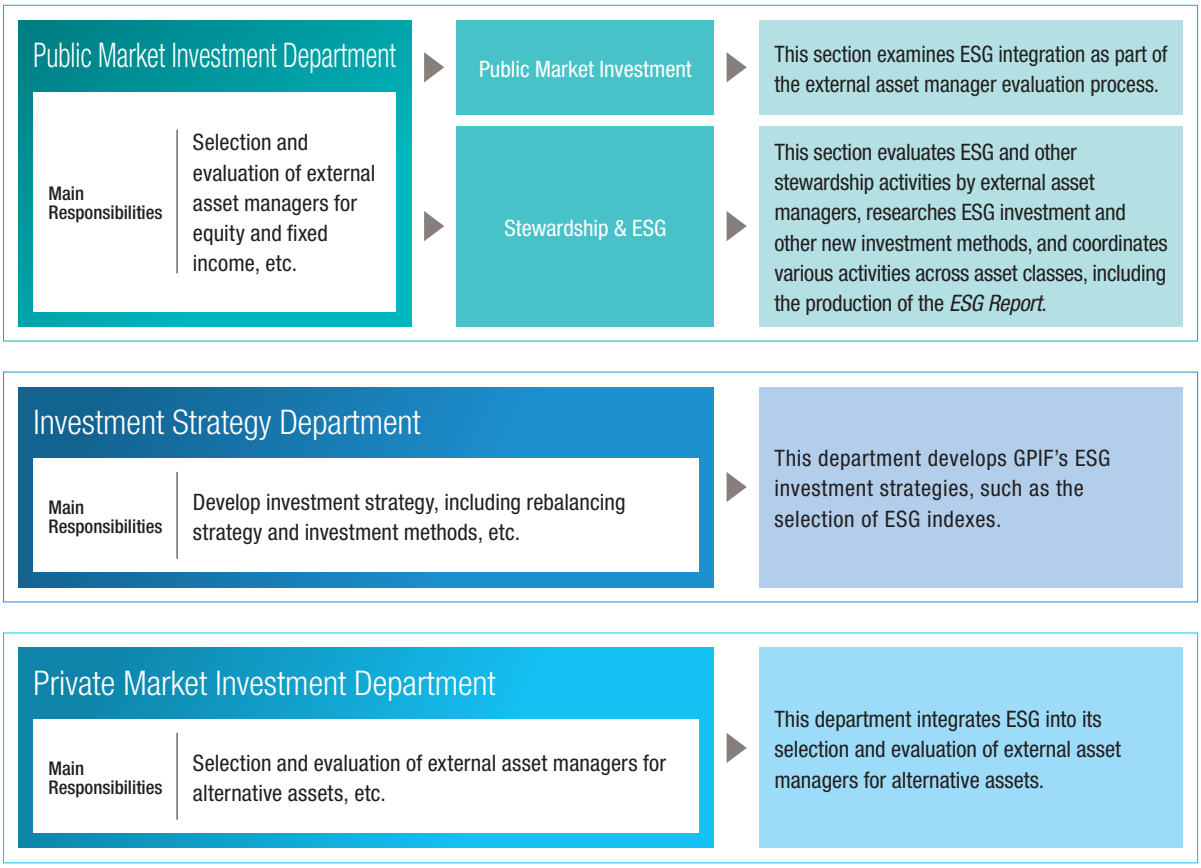
ESG-related items discussed and reported on at Board of Governor meetings

Meeting number	Meeting date		Agenda item
42nd	May 2020	Reported matter	*ESG Report* (Outline)
44th	June 2020	Matter for resolution	Change of policy for fulfillment of stewardship responsibilities
		Reported matter	Selection of ESG-themed foreign equity indexes
45th	July 2020	Matter for resolution	ESG index selection
		Reported matter	*ESG Report 2019* (final version)
46th	September 2020	Matter for resolution	ESG index selection (2)
47th	October 2020	Reported matter	*Analysis of Climate Change-Related Risks and Opportunities in the GPIF Portfolio* (a supplementary guide to *the ESG Report*)
53rd	March 2021	Reported matter	Report on stewardship activities in 2020/2021

ESG-related executive structure

The Executive Office implements ESG initiatives through coordination between the Public Market Investment Department, Investment Strategy Department, Private Market Investment Department, and other departments related to asset management. The Investment Committee, chaired by the Chief Investment Officer (CIO), deliberates and makes decisions on ESG-related initiatives and other asset management-related issues, and particularly important matters are reported to the Board of Governors. Preparation of the ESG Report is also deliberated on by the Investment Committee before being reported to the Board of Governors.

Key departments responsible for ESG



Practical guidelines for the selection of ESG indexes

At the 46th meeting of GPIF's Board of Governors held in September 2020, the Board deliberated and voted on the Practical Guidelines for the Selection of ESG Indexes, which set forth basic policies for the selection of ESG indexes. These guidelines clarified several matters relating to the selection of ESG indexes, including 1) to avoid directly influencing financial markets and corporate management, GPIF must not select individual stocks, nor give directions for such selection, and 2) selection of indexes should be conducted exclusively for the benefit of pension recipients (i.e., securing of long-term returns) from a long-term perspective. Based on these fundamental rules, the guidelines stipulate that, "when selecting an index that includes negative screening methods, ... such selection must be based exclusively on an economic rationale, avoid generating unnecessary speculation, include a rational and transparent selection process, and be dealt with in a cautious and conservative manner."

Practical Guidelines for the Selection of ESG Indexes

ESG Initiatives Within GPIF

In 2020, GPIF established the SDGs Promotion Group—a committee reporting directly to the President created to develop initiatives designed to bolster the fund's ESG and SDG-conscious internal values. GPIF went on to establish the Diversity and Inclusion Promotion Group under the SDGs Promotion Group. Through these organizations, GPIF promotes ESG and the SDGs within the fund itself.

SDGs and Diversity-Related Initiatives

GPIF's Code of Conduct states, "We are committed to GPIF's mission by promoting communication and teamwork and nurturing a diversity of talents and capabilities," and further, "We shall respect each person's personality, talents and capabilities, perspectives, well-being, and privacy to maintain a good working environment." Building on this, in January 2020 GPIF launched the SDGs Promotion Group, which reports directly to the President of GPIF and conducts regular training sessions for fund employees on the SDGs. Further, GPIF launched the Diversity and Inclusion Promotion Group ("D&I Group") as a sub-group to the SDGs Promotion Group, which consists mainly of fund employees who have applied to the group and been selected by the President. Both the SDGs Promotion Group and the D&I Group are tasked with developing initiatives designed to bolster the fund's ESG-conscious internal values, and members discuss specific measures for creating a work environment in which everyone can work with a sense of purpose.

In 2020, the D&I Group proposed a plan of action based on the concept that understanding and accepting people with different values and cultures and encouraging the development of team members who generate new ideas is crucial in enhancing fund management and investment. The proposal sets out two approaches for its implementation. In terms of conduct, it aims to create a workplace environment where everyone can work with a sense of purpose. In terms of raising awareness, it aims to foster a mindset and awareness of diversity and inclusion in employees.

The advancement of women in the workplace is a crucial part of diversity promotion. The table on the opposite page includes GPIF's numbers for the five metrics that companies are required to disclose under the Act on Promotion of Women's Participation and Advancement in the Workplace, which are also quantitative evaluation metrics used in the MSCI Japan Empowering Women Index (WIN). GPIF will continue to implement initiatives for enhancing diversity and inclusion in the future.

FY2020 SDGs training

Session 1	October 2020	Part 1: SDGs Basics and Global Trends Lecturer: KANIE Norichika, Professor, Keio University Graduate School of Media and Governance Part 2: Report on Joint Research on Society 5.0 for SDGs
Session 2	November 2020	Part 1: The Fight against COVID-19 Lecturer: HANAKI Hideaki, Director of the Research Center for Infection Control, Kitasato University Omura Satoshi Memorial Institute Part 2: Ministry of Health, Labour and Welfare's COVID-19 Countermeasures
Session 3	March 2021	Part 1: The Significance of Womenomics Lecturer: Kathy Matsui, General Partner, MPower Partners Part 2: Introduction of Diversity & Inclusion Promotion Group

(Note) A fund employee in charge of D&I served as lecturer for Part 2.

Women in the workplace at GPIF

(i) % female new hires	0.0%	(iv) % women in senior management	11.9%
(ii) % women in the workforce	30.3%	(v) % women on board	16.7%
(iii) Difference in years men and women are employed by the company*	(47.8)%		

(Note) Data for (i) is for fiscal 2020; the other data is as of March 31 2021 or April 1, 2021.

* Difference in years men and women are employed by the company = (average years women employed – average years men employed) / average years men employed. This ratio is highly sensitive to changes in hiring and retirement due to GPIF's small workforce (174 employees) and thus fluctuates significantly from year to year.

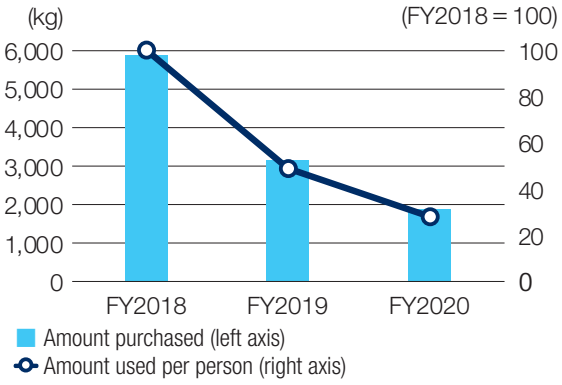
** Percentage of women on the Board of Governors. Governors (including the President) are appointed by the Minister of Health, Labour and Welfare.

Environmental Initiatives

As part of our environmentally-conscious initiatives within the fund, GPIF established a "Basic Policy on Promoting Green Procurement" for fiscal 2020 based on the Act on Promotion of Procurement of Eco-Friendly Goods and Services by the State and Other Entities. Based on this policy, GPIF works to ensure that the paper and stationery, office furniture, office equipment, appliances, and other office products we use have a minimal impact on the environment.

To reduce paper consumption, in principle, all meetings, including Board of Governors and Investment Committee meetings, are paperless. We ask asset managers and ESG ratings agencies to provide meeting materials in advance in electronic form, and use tablets, laptops, and other devices to view these presentations. In fiscal 2020, these initiatives, in addition to enhancements to our remote work frameworks made in response to the COVID-19 pandemic, resulted in about 40% less copier paper being purchased and approximately 43% less paper used per employee compared with the previous year.

Amount of Copier Paper Purchased at GPIF



GPIF's Response to COVID-19

From 2020 and into 2021, the global COVID-19 pandemic has had a massive impact on society. GPIF was no exception.

In response to the pandemic, GPIF implemented remote work beginning in March 2020, and set up a COVID-19 response headquarters when a state of emergency was declared in the Tokyo metropolitan area in April. The response headquarters, chaired by the President and including the Executive Managing Directors and departmental general managers, was established to address issues such as how to secure the safety of fund employees and ensure business continuity. The response headquarters shared information on various issues within the fund, coordinated different departmental efforts, and monitored the status of those efforts. From April onward, we proactively recommended all officers and employees to work from home. We also began holding important meetings, such as meetings of the Board of Governors and Investment Committee, remotely over the Internet, while strictly managing information security. As a result, every day an average of around 70% of officers and employees worked from home during the states of emergency declared in April 2020 and again in January and April 2021. In addition to the promotion of remote work, we are also implementing other initiatives in the workplace such as the introduction of staggered working hours to avoid the "three Cs" (closed spaces, crowded places, and close-contact settings) during the commuting rush. GPIF will continue developing its business continuity framework for continuing pension reserve management operations even in times of emergency.

Support for TCFD and Climate-Related Financial Disclosures

Although the potential impact may vary in size, climate change risks occur simultaneously across all companies and asset classes, and it is difficult to completely eliminate these risks simply through diversification. In addition, as climate-change risks are highly likely to manifest over the long term, we believe that, as an asset owner, GPIF should take the lead in addressing them.

Climate-Related Financial Disclosure Consistent with TCFD Recommendations

The Financial Stability Board (FSB) established the Task Force on Climate-related Financial Disclosures (TCFD) in December 2015, and in June 2017, the TCFD released their recommendations on how companies and others can better disclose information related to climate change risks and opportunities. The recommendations published by the TCFD outline a series of information disclosure practices for companies and other organizations in (1) governance, (2) strategy, (3) risk management, and (4) metrics and targets, in relation to climate change.

Although the potential impact may vary in size, for investors, climate change risks occur simultaneously across all companies and asset classes and cannot be completely eliminated simply through diversification. Moreover, these risks are highly likely to manifest over the long term, and we therefore believe that GPIF, as an asset owner, should take the lead in addressing them. We therefore declared support for the TCFD in December 2018 and began disclosing information in accordance with the TCFD recommendations in that fiscal year's ESG Report. The analytical methods used to measure climate change risks are evolving year by year, and we've worked to further enhance our disclosures in this year's report. For example, in addition to analyzing transition and physical risks and opportunities for individual asset classes, the analyses in this year's report include Scope 3 greenhouse gas emissions data, in addition to Scope 1 and Scope 2 data.

It is difficult to separate climate change-focused investment and activities from ESG activities as a whole, and GPIF regards climate change as one of the most important themes in ESG activities in general. Accordingly, as shown in "Disclosures recommended by the TCFD and GPIF's response" (on the opposite page), our disclosures are not confined to initiatives only relating to climate change but include all ESG activities. To make it easy to understand what kind of information GPIF discloses for the four TCFD disclosures, from this fiscal year, the ESG Report will provide an illustration of the four core disclosure elements as shown on the opposite page.

GPIF will work to enhance the sustainability of the entire market by further improving its disclosure of information on ESG in general, including climate change-related financial information.

Disclosures recommended by the TCFD and GPIF's response

Disclose the organization's governance around climate-related risks and opportunities

- GPIF's Investment Principles and Stewardship Principles clearly state that climate change and other ESG factors shall be taken into account in fund management, and GPIF actively works to achieve this (page 74).
- The Board of Governors, which oversees the Executive Office, receives reports on ESG from the Executive Office as necessary (page 13).
- The Executive Office, which consists of officers and employees under the President, convenes Investment Committee meetings to make decisions on climate change and other ESG-related initiatives. The Office also develops organizational frameworks for implementing these initiatives (page 14).

Disclose the actual and potential impacts of climate related risks and opportunities on the organization's businesses, strategy, and financial planning where such information is material.

- As a universal owner, GPIF stresses sustainable enhancement of the corporate value of each investee company, which is realized through minimizing the impact of environmental and social issues and fostering the long-term sustainability of society as a whole (page 74).
- GPIF proactively integrates ESG across all asset classes. In equity investment, we incorporate external asset managers' ESG activities into their evaluations as well as conduct passive investment based on ESG indexes (page 21). In fixed income investment, we propose investment opportunities in ESG bonds to our external asset managers (pages 21–22). We also promote ESG integration in our alternative investments (pages 35–36).
- In relation to the environment (E) in particular, we use indexes for equity investment that focus on each company's carbon efficiency (pages 19–20) and invest in green bonds through fixed-income investment (pages 21–22).
- In addition to measuring the carbon footprint of GPIF's portfolio, we also assess the physical and transition risks and opportunities that materialize in temperature rise scenarios of 1.5°C, 2°C, and 3°C and above, and estimate their impact on investment returns (pages 51–64).

Disclose how the organization identifies, assesses, and manages climate-related risks.

- GPIF is developing an organizational framework for monitoring the greenhouse gas (GHG) emissions (carbon footprint and carbon intensity) of its entire portfolio as well as for each fund for which management has been outsourced.
- As well as requiring asset managers to actively engage with companies on key ESG themes (pages 23–26), GPIF engages with index providers to encourage improvement in the evaluation techniques used within the methodologies of the carbon efficient indexes and ESG indexes for domestic and foreign equities that GPIF adopts (page 29–33).

Disclose the metrics and targets used to assess and manage relevant climate- related risks and opportunities where such information is material.

- GPIF aims to control portfolio risk and gain opportunities for investment return by contributing to the effort to curb greenhouse gas (GHG) emissions across the entire economy, through engagement with external asset managers and measures such as the adoption of ESG indexes (pages 19–20 and 23–26).
- GPIF calculates the Scope 1 to Scope 3 carbon footprint for each asset class and compares these with each portfolio benchmark. We also calculate each portfolio's carbon intensity using weighted average carbon intensity (pages 51–54).
- GPIF estimates climate change-related transition and physical risks and opportunities using Climate Value-at-Risk (CVaR) (Pages 55–64).

Source of image: TCFD Knowledge Hub

ESG Index Selection and ESG Index-Based Asset Management

In order to improve the long-term risk/return profile of the portfolio by reducing ESG risks, GPIF adopts several ESG-integrated indexes as benchmarks for passive investment. In fiscal 2020, GPIF newly adopted a comprehensive ESG index and a diversity-focused index for foreign stocks.

Selection of Two ESG Indexes for Foreign Equities

GPIF has used ESG indexes as passive investment benchmarks since fiscal 2017. We believe passive investment based on indexes that focus on corporate sustainability will not only improve the risk/return profile of the portfolio over the long run, but also enhance the Japanese equity market through secondary effects such as the improvement of ESG ratings.

GPIF selected three ESG benchmark indexes for Japanese equities in fiscal 2017, followed by two domestic and foreign equity indexes that focus on corporate greenhouse gas emissions in fiscal 2018. In fiscal 2019, GPIF announced the introduction of and began gathering information through the "Index Posting System" (IPS), a new framework for collecting index information on a continuous basis.

In fiscal 2020, the Board of Governors established the Practical Guidelines for the Selection of ESG Indexes. Based on these Guidelines, GPIF examined the posted indexes and selected two ESG indexes for foreign equities.

Emphasis was placed on the following points in the selection of these indexes:

Primary evaluation criteria

1) ESG ratings play a central role in the constituent selection/weighting process.
2) The index encourages ESG disclosure (i.e., ratings are based on public information).
3) The ratings methodology is clearly disclosed and the index provider/ESG ratings agency actively engages in dialogue with issuers.
4) The scope of issuers rated is sufficiently broad.
5) The governance and conflict of interest management structures of the ESG ratings agency and index provider are adequate.

Of the ESG indexes newly adopted in fiscal 2020, the MSCI ACWI ESG Universal Index, a comprehensive ESG index, increases the investment weight of companies with high ESG scores and companies whose score has improved as evaluated by MSCI. The index aims to curb the ESG risk of the portfolio while limiting tracking error versus the parent index.

The Morningstar Gender Diversity Index, on the other hand, uses data from Amsterdam-based data provider Equileap to assess companies' gender equality initiatives. The index increases the investment weight of companies that have a track record for establishing policies and frameworks for the active promotion of women. There is a large body of evidence that shows that companies with greater gender diversity are able to access a wider pool of talent, which gives them the potential to elevate management performance. From a macro-economic perspective, the improvement of gender diversity may boost the economic growth of individual countries. By investing in companies with greater gender diversity, the fund aims to enhance long-term investment returns through the sustainable growth of our investments and the market as a whole.

GPIF's Expanding ESG Investment

GPIF has expanded its ESG index-based investment since beginning passive investment in three domestic equity ESG indexes in fiscal 2017. In fiscal 2020, we started managing investments on the scale of ¥1 trillion based on the MSCI ACWI ESG Universal Index and ¥300 billion based on the Morningstar Gender Diversity Index. As of March 2021, total ESG index-based passive investments have grown to approximately ¥10.6 trillion. Please refer to "ESG Index Performance" on pages 41 and 42 for information on the performance of each index. By investing in these indexes, GPIF aims to enhance long-term investment returns through the sustainable growth of our investments and the market as a whole.

Main characteristics of ESG indexes adopted by GPIF

ESG Indexes for Domestic Equities

	FTSE Blossom Japan Index	MSCI Japan ESG Select Leaders Index	MSCI Japan Empowering Women Index ("WIN")	S&P/JPX Carbon Efficient Index
Concept and characteristics of index	• The index uses the ESG assessment scheme used in the FTSE4Good Japan Index Series, which has one of the longest track records globally for ESG indexes. • It is a broad ESG index that selects stocks with high absolute ESG scores and adjusts industry weights to neutral.	• The MSCI Japan ESG Select Leaders Index is a broad ESG index that integrates various ESG risks into today's portfolio. The index is based on MSCI ESG Research used globally by more than 1,000 clients. • The index is comprised of stocks with relatively high ESG scores in each industry.	• MSCI calculates the gender-diversity scores based on information disclosed under "the Act on Promotion of Women's Participation and Advancement in the Workplace" and selects companies with higher gender diversity scores from each sector. • The first index designed to cover a broad range of factors related to gender diversity.	• Constructed by S&P Dow Jones Indices based on carbon data provided by Trucost, a pioneer in environmental assessment. • This index is designed to overweight companies that have lower carbon footprints (annual greenhouse gas emissions divided by annual revenues) and that actively disclose their carbon emission information.
Index construction	Best-in-Class	Best-in-Class	Best-in-Class	Tilted
Constituent universe (Parent index)	FTSE Japan All Cap Index (1,391 stocks)	MSCI Japan IMI Top 700 (694 stocks)	MSCI Japan IMI Top 700 (694 stocks)	TOPIX (2,187 stocks)
Number of index constituents	200	231	298	1,844
Assets under management (¥billion)	1,490.6	2,026.8	1,236.2	1,536.5

ESG Indexes for Foreign Equities

	MSCI ACWI ESG Universal Index	Morningstar® Developed Markets Ex-Japan Gender Diversity Index℠ (GenDi)	S&P Global LargeMidCap Carbon Efficient Index
Concept and characteristics of index	• One of MSCI's flagship ESG indexes, this index adjusts the weight of constituents based on each issuer's current ESG rating and rating trend to elevate the ESG metrics of the index overall. • The index was developed for large investors seeking to enhance ESG integration while achieving the same level of investment opportunity and risk exposure as the parent index.	• Determines investment weighting based on assessment of companies' commitment to gender equality, using the Equileap Gender Equality Scorecard. • Ratings are conducted in four categories: (1) Gender balance in leadership and workforce; (2) equal compensation and work-life balance; (3) policies promoting gender equality; and (4) commitment, transparency, and accountability.	• Constructed by S&P Dow Jones Indices based on carbon data provided by Trucost, a pioneer in environmental assessment. • This index is designed to overweight companies that have lower carbon footprints (annual greenhouse gas emissions divided by annual revenues) and that actively disclose their carbon emission information.
Index construction	Tilted	Tilted	Tilted
Constituent universe (Parent index)	MSCI ACWI ex Japan ex China A ESG Universal with Special Taxes Index (2,207 stocks)	Morningstar® Developed Markets Ex-Japan Large-Mid (1,937 stocks)	S&P Global Ex-Japan LargeMidCap (3,003 stocks)
Number of index constituents	2,106	1,909	2,303
Assets under management (¥billion)	1,178.4	343.8	2,823.9

(Note) Data is current as of March 31, 2021
(Source) Prepared by GPIF based on data from FactSet and individual index providers.

ESG in External Equity and Fixed Income Management

GPIF examines ESG initiatives when evaluating the external asset managers through which we manage our equity and fixed income assets. We have also formed partnerships with several multilateral development banks and governmental financial institutions to expand investment opportunities in green, social, and other ESG-related bonds.

ESG Integration in Asset Manager Evaluations

Most of GPIF's portfolio assets are managed externally by asset management companies in Japan and overseas. The Public Market Investment Department and Investment Strategy Department work together to select and evaluate these companies. Managers are evaluated on their investment policies, asset management processes, organizational structure and human resources. ESG integration is a key part of the asset management process review.

As a PRI signatory, in 2018 we defined ESG integration as "the explicit and systematic inclusion of ESG factors into investment analysis and investment decisions," based on the definition provided by PRI.

In fiscal 2019, we established evaluation criteria for ESG integration based on this definition and began comprehensive asset manager evaluations according to these new criteria. In addition to evaluating existing external asset managers, the new ESG integration criteria are also used when selecting new external asset managers.

Although an increasing number of asset managers emphasize ESG and are explicitly and systematically including it in their investment analysis, there are no established methods for assessing how and to what degree ESG factors have an impact on corporate value, and individual asset managers have adopted their own various initiatives in this regard. We hope to see further progress in this and other areas of ESG integration among asset managers in the future.

ESG Integration in Fixed Income Investments

GPIF and the World Bank Group have been working together to promote ESG integration in fixed income investment through efforts such as publishing a joint research paper entitled "Incorporating Environment, Social and Governance (ESG) Factors into Fixed Income Investment" in 2018.

Following up on this research, the International Bank for Reconstruction and Development (IBRD) and the International Finance Corporation (IFC)—both members of the World Bank Group—drew up a new proposal in 2019 to provide GPIF's external asset managers with an opportunity to invest in green, social and sustainability bonds.

GPIF provides its external asset managers with opportunities to both integrate ESG into their fixed income investments and gain excess return over government bonds by building platforms in which they can invest in green, social and sustainability bonds issued by multilateral development banks and governmental financial institutions.

The initiative, launched in collaboration with IBRD and IFC, has since expanded to more of the world's major multilateral development banks. In fiscal 2020, while maintaining these existing partnerships, we have entered into new partnerships with three governmental financial institutions : Nederlandse Waterschapsbank (NWB Bank) in the Netherlands, Kommunalbanken Norway (KBN) in Norway, and Export Development Canada (EDC) in Canada. As of March 31, 2021, we have built investment platforms with ten multilateral development banks and six governmental financial institutions as issuers.

GPIF is committed to promoting ESG-based investment, not only in equities but also in fixed income and other assets, in order to limit negative environmental and social externalities and enhance the long-term return of the portfolio across all asset classes.

International organizations with investment platforms in green bonds, etc.

Column

Investment in COVID-19 bonds

The global response to COVID-19 triggered a dramatic transformation of the ESG bonds market. There was a sharp increase in issues of social and sustainability bonds to provide funds for activities aimed at mitigating the effects of COVID-19, such as assistance to medical institutions. In 2020, the size of that market increased by 32% year on year to approximately ¥85 trillion.[1]

The issue of COVID-19 bonds is also progressing among multilateral development banks that have built investment platforms in conjunction with GPIF. Through these platforms and other channels, GPIF invests in green, social, and sustainability bonds via the investment decisions of its external asset managers. The size of those investments, which also include COVID-19 bonds, grew to around ¥1.1 trillion[2] as of March 31, 2021. The largest of those investments is in the "Fight COVID-19" Social Bond issued by the African Development Bank (AfDB). The objectives of this COVID-19 bond are to support responses to the COVID-19 pandemic in African nations and to mitigate the pandemic's impact on their economies and societies. The funds raised by the bond issue are allocated to projects with aims such as disseminating COVID-19 antigen tests and supporting small businesses.

GPIF has also invested in COVID-19 bonds issued by the International Finance Corporation (IFC), the European Investment Bank (EIB), and the Islamic Development Bank (IsDB).

1 As calculated by GPIF based on Bloomberg data.
2 Track record in investment in bonds, calculated by GPIF, based on Bloomberg data, in compliance with International Capital Market Association (ICMA) principles, etc.

© African Development Bank (AfDB)

Stewardship Activities and ESG Promotion

When GPIF first engaged in activities related to stewardship responsibilities ("stewardship activities"), equity asset managers were the initial focus. We enhanced our ESG and other stewardship activities after revising our Investment Principles in October 2017 and our Stewardship Principles in February 2020, including expanding the scope of activities to all assets.

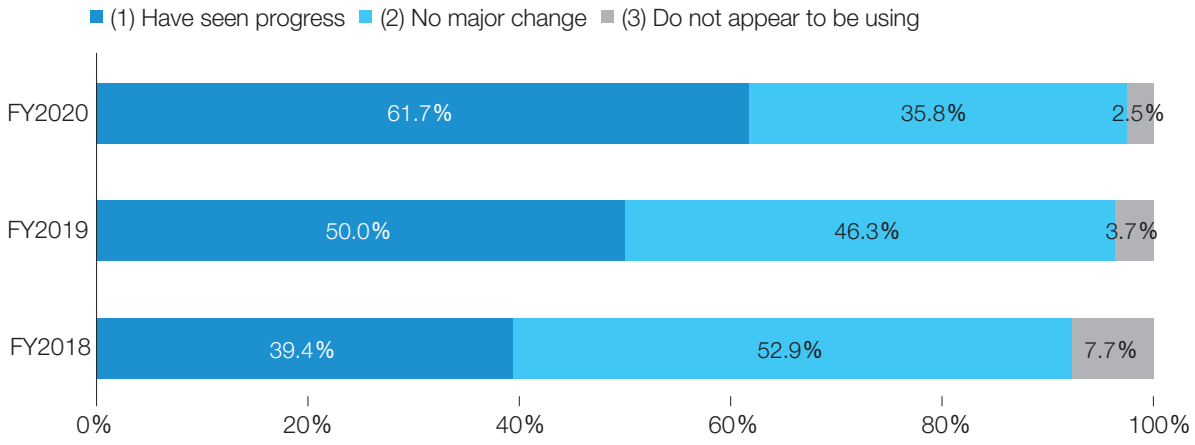
Survey of Listed Companies

GPIF conducts an annual survey of companies listed on the First Section of the Tokyo Stock Exchange in order to get their feedback on the stewardship activities of our external asset managers and to monitor the nature and progress of their engagement. We also use the survey to understand these companies' ESG disclosure initiatives and to gather their opinions on the ESG indexes we invest in. In our sixth survey conducted in fiscal 2020, we received responses from 681 companies, representing 69.8% of total market capitalization.

The survey results for fiscal 2020 indicate that the percentage of companies voluntarily disclosing ESG and other non-financial information (e.g., CSR reports, sustainability reports, and integrated reports) rose from 74.8% in the previous year to 78.5%. The survey also indicated that the number of companies endorsing TCFD rose to 208 (31%), 139 of which were already disclosing information consistent with TCFD. More than 90% of those companies responded that they had partly or fully implemented disclosures recommended by TCFD in all four categories, namely (i) governance, (ii) strategy, (iii) risk management, and (iv) metrics and targets.

Companies appear to believe that investors are making good use of these kinds of disclosures; compared with the previous survey, more companies gave a favorable assessment of institutional investors' utilization of both integrated reports and corporate governance reports. For integrated reports in particular, around half of the companies in the previous survey noted progress in institutional investors' usage of these reports, while in the latest survey that number exceeded 60%.

Figure 1. Responses to the Question, "Has There Been Progress in the Use of Integrated Reports by Institutional Investors?"



(Note) Total number of responses was 397 in FY2020, 404 in FY2019, and 363 in FY2018

The most recent survey showed that the COVID-19 pandemic elicited a change in the nature of the dialogues companies have with institutional investors as well as in their ESG initiatives. Of the companies surveyed, 78.1% responded that the pandemic affected the content and topics of their dialogue with institutional investors. Specifically, in addition to pandemic-induced changes in the market and the impact on business results, many companies responded that there was more discussion about topics related to society (S), such as employee health and safety initiatives and work styles. More than half of the responding companies also indicated that the pandemic had prompted changes in their ESG efforts. In addition to a large number of responses indicating a change in initiatives related to employee safety and work styles, some companies also launched initiatives to develop new products to accommodate social needs post-COVID-19.

Key ESG Issues Cited by External Managers

GPIF's Stewardship Principles require external asset managers to engage proactively on key ESG issues. When we surveyed our external equity managers on what ESG issues they consider to be key, all passive managers, who are required to hold investee companies' shares for extended periods of time, cited climate change, diversity, and supply chain as key issues. They viewed long-term challenges, including environmental (E) and social (S) issues, as being of particular importance.

There was a notable change in the response regarding supply chain from the previous year; all passive managers mentioned this as a key issue, with a greater percentage of both Japanese and foreign equity passive managers citing this as important. This suggests that supply chains are now being recognized as a serious issue due to the lockdowns and other restrictions resulting from the COVID-19 pandemic.

Meanwhile, active asset managers, who primarily invest for shorter periods ranging from several months to several years, differed in what they consider to be key ESG issues depending on if they managed Japanese or foreign equities. For foreign equities, all asset managers considered climate change to be a key issue, followed by multiple social (S) issues, whereas for Japanese equities, all asset managers cited "composition and evaluation of the board of directors" and "protection of minority shareholders (cross-shareholdings, etc.)" as key issues, indicating that they saw G (governance) themes as more important. This year, fixed income investment managers were also asked what they considered to be key ESG issues as corporate bond investors. The results are shown below.

Figure 2: Key ESG Issues Recognized by External Asset Managers

Japanese Equities – Passive		Japanese Equities – Active		Foreign Equities – Passive		Foreign Equities – Active		Japanese Bonds		Foreign Bonds	
Climate change	100%	Composition and evaluation of the board of directors	100%	Climate change	100%	Climate change	100%	Information disclosure	100%	Climate change	95%
Misconduct and scandals	100%	Protection of minority shareholders (cross-shareholdings, etc.)	100%	Information disclosure	100%	Other (society)	86%	Climate change	89%	Health and safety	67%
Information disclosure	100%	Capital efficiency	89%	Supply chain	100%	Health and safety	86%	Corporate governance	67%	Composition and evaluation of the board of directors	57%
Supply chain	100%	Misconduct and scandals	89%	Diversity	100%	Human rights and local communities	86%	Composition and evaluation of the board of directors	56%	Human rights and local communities	57%
Diversity	100%	Information disclosure	89%	Corporate governance	75%	Corporate governance	86%	Health and safety	56%	Corporate governance	52%
Composition and evaluation of the board of directors	83%	Supply chain	89%	Other (society)	75%	Information disclosure	86%			Supply chain	52%
Protection of minority shareholders (cross-shareholdings, etc.)	83%	Diversity	78%	Health and safety	75%	Diversity	71%			Diversity	52%
Capital efficiency	83%	Environmental market opportunities	78%	Composition and evaluation of the board of directors	75%	Social market opportunities	71%			Pollution and resources	52%
Corporate governance	83%	Climate change	67%	Other (governance)	75%	Labor standards	71%			Information disclosure	52%
Environmental market opportunities	67%	Corporate governance	67%	Water resources and water use	75%	Composition and evaluation of the board of directors	71%			Product and service safety	52%
Health and safety	67%	Health and safety	67%	Risk management	75%	Protection of minority shareholders (cross-shareholdings, etc.)	71%			Waste management	52%
Human rights and local communities	67%	Human rights and local communities	67%	Deforestation	75%	Supply chain	71%			Labor standards	52%
Other (society)	67%	Pollution and resources	67%			Environmental market opportunities	71%				
Water resources and water use	67%	Product and service safety	67%			Product and service safety	57%				
Biodiversity	67%	Waste management	67%			Other (governance)	57%				
Anti-corruption	67%	Labor standards	67%			Capital efficiency	57%				
Deforestation	67%	Other (society)	56%			Anti-corruption	57%				
		Other (governance)	56%			Other (ESG)	57%				
		Other (environment)	56%			Water resources and water use	57%				
		Social market opportunities	56%			Pollution and resources	57%				

E (environment)
S (society)
G (governance)
Multiple ESG themes

(Source) Survey of GPIF's external equity and fixed investment asset managers as of December 2020

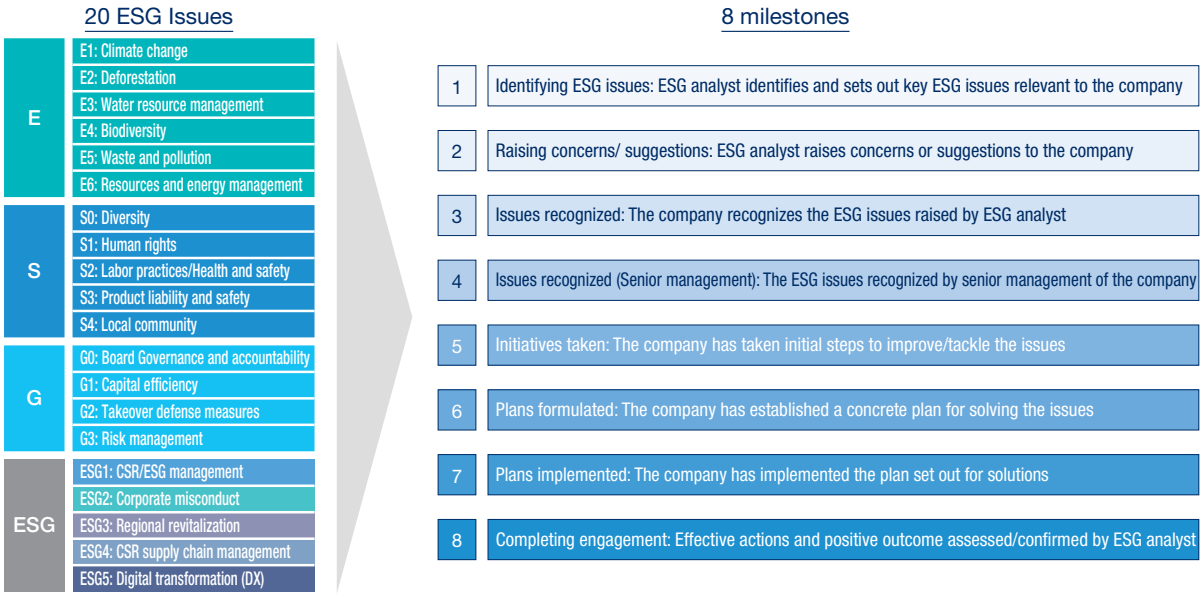
(Note) The above list is of issues cited as "key ESG issues" by more than 50% of external asset managers in each investment method. The figures in the above list indicate the percentage of asset managers that chose the corresponding issues, with the number of external asset managers in each asset management method as the denominator. For Japanese equities, if an external asset manager adopts both active and passive investment methods, it is counted in the method for which the investment amount mandated by GPIF is largest.

Stewardship-Focused Passive Investment

In order to diversify and enhance our approach to stewardship and improve the quality of the entire market through these activities, in 2018 we selected two external managers – Asset Management One Co., Ltd. and FIL Investments (Japan) Limited – as "stewardship-focused passive investment managers." In selecting these managers, we focused on (i) the establishment of appropriate KPIs and (ii) systems and methods of engagement. Since the compensation level differs from that of normal passive investment, we conduct an annual review of each manager and renew these mandates based on each company's progress on the KPIs specified in their engagement plans and the next fiscal year's milestones.

At Asset Management One, experienced analysts and fund managers from the responsible investment group engage with companies on ESG themes with the purpose of improving the TOPIX as a whole. For each company they engage in dialogue with, the firm selects specific ESG themes to engage on from among 20 predetermined ESG issues – including digital transformation from FY2020. Progress on each theme is closely monitored according to eight milestones, from the identification of issues to their resolution. When Asset Management One first began engaging with companies, many themes were not yet at the "issues recognized" stage, but by 2020, around two-thirds of these themes had progressed to one of the final four milestones where companies were taking concrete action towards resolving the issue. Half of the themes that reached the "completing engagement" stage in 2020 spanned the entire spectrum of ESG, such as CSR/ESG management and CSR procurement.

Figure 3. ESG Issues and Milestones Established by Asset Management One



(Source) Prepared by Asset Management One Co., Ltd.

Meanwhile, FIL Investments, which adopts a "bottom-up" approach to asset management, leverages the insights of active investment analysts to specify priority issues for engagement, with the aim of efficiently enhancing beta by promoting change in large corporations with a significant impact on the equity index. Specifically, FIL Investments screens for engagement target companies by selecting those with (i) market capitalization of ¥1 trillion or greater, and/or (ii) corporate value with expected improvement of 50% or more. This enables FIL Investments to focus their engagement efforts on those companies that can potentially exert a meaningful impact on total market capitalization. The firm chooses engagement themes based on issues that lead to corporate value creation, with several new themes added in 2020. Progress is gauged using three indicators—input, output, and outcomes, and in 2020 around 90% of target companies showed improvements. Many of the issues resolved in the past year were related to governance, but progress was also observed in some problems related to business strategy.

Interviews with Engagement Officers at Stewardship-Focused Passive Managers

GPIF asked engagement officers at the two stewardship-focused passive managers about GPIF's mandate and what they expect from Japanese companies. GPIF fulfills its duty of accountability by actively disclosing information related to this new mandate launched in 2018.

●Asset Management One Co., Ltd.

(1) What are the strengths of passive management engagement?

Passive managers do not sell the shares we own in investee companies but hold them on a semi-permanent basis—much longer than active managers. Nor do we engage in divestment. ESG is the most effective engagement theme for improving the market as a whole from an ultra-long-term perspective. Passive managers tend to have a relatively high percentage of ownership of their investee companies' stock, which gives them more influence over the investee companies. Moreover, that relationship continues unbroken over the long term, making it easier to persist with engagement to bring issues to a resolution.

(2) What are your expectations of the Japanese companies that you invest in and with which do you engage?

In what has been described as the VUCA[1] era, and with the added trials of the COVID-19 pandemic, many companies are being called on to address climate change and other social issues. To meet those expectations, we would like to see companies developing long-term visions that are highly compatible with ESG through broad-ranging internal debate, and to establish medium-term plans to work toward that vision. Those visions and plans will serve as the foundation from which companies transform their current business strategies into seamless, sustainable management. The most important point will be how they will implement their initiatives and how effectively they will be able to promote them to the world. We will also lend them our support through our engagement process.

1 Acronym standing for "volatility, uncertainty, complexity, and ambiguity."

TERASAWA Toru, Head of the Responsible Investment Group, Asset Management One Co., Ltd. (Interviewed in May 2021)

●FIL Investments (Japan) Limited

(1) What is your view on the effectiveness of engagement under this mandate?

Many of the companies covered by this mandate are being forced to rethink their existing business strategies due to changes in the structure of their industries. The patient understanding of shareholders who are able to support companies throughout the investment phase is crucial for them to stay on course in enhancing corporate value over the medium to long term. That is where I see the advantage of passive management, which allows for sustained engagement. Further, a recent empirical analysis conducted by Professor Kotaro Inoue of the Tokyo Institute of Technology provided empirical confirmation of the usefulness of engagement skills and expertise that leverage our active management insights. I see this as an extremely encouraging result that will lead to the success of this mandate. (Please refer to "Empirical Analysis of Effects of Engagement" on pages 27 and 28.)

(2) Have your expectations of companies and your engagement themes changed in light of the pandemic?

Amid growing risk of unexpected environmental change, such as the COVID-19 pandemic and climate change, it has become even more important for management to make decisions that are not merely an extension of existing strategies if companies are to improve medium- to long-term corporate value. We aim to have constructive dialogue with companies by encouraging bold decisions from an investor standpoint, such as business portfolio revision and business model transformation, as well as the establishment of mechanisms the lead to highly effective governance and innovation that support such decisions.

IKAWA Tomohiro, Director of Engagement and Portfolio Manager, FIL Investments (Japan) Limited (Interviewed in May 2021)

* The descriptions and interviews regarding engagement by Asset Management One Co., Ltd. and FIL Investments (Japan) Limited are intended as disclosure information regarding GPIF's stewardship-focused passive managers and are not a recommendation of the products, etc. managed by these two companies.

Column

Empirical Analysis of Engagement Effectiveness

GPIF believes that active dialogue between asset managers and companies is essential in improving market sustainability and enhancing investment returns. In addition to initiatives such as our survey of listed companies, we follow up on various empirical studies conducted by academics in order to understand the state of engagement and verify its effectiveness. In this column, we present one such study.

Because the specific details of institutional investor engagements are not usually made public, it is impossible to tell externally whether changes in corporate behavior are due to the effectiveness of that engagement or if they are autonomous changes made by the companies themselves. Therefore, until now, limited data availability and other issues have severely limited the amount of empirical research on engagement effectiveness. Recently, however, a number of major asset managers provided a group led by Professor Kotaro Inoue of Tokyo Institute of Technology ("K. Inoue Lab") with information on their engagement activities targeting Japanese companies, which the group used to review each manager's reasons for selecting the companies to engage with, what kind of dialogue it held with whom, and the effect that those engagements had.[1]

This column introduces K. Inoue Lab's review of engagements conducted by FIL Investments (Japan) Limited (FIL), one of GPIF's stewardship-focused passive managers. The analysis covers a total of 248 dialogues that FIL conducted with 117 companies with shared KPIs and deadlines by FIL for achieving the objective of improving corporate value from 2017 to 2019. The analysis includes engagements other than those related to the stewardship-focused passive manager mandate, but does not include the several thousands of interviews it conducts with companies every year (Figure 1).

The results of the analysis showed that companies targeted for engagement by FIL are characterized by (i) a high percentage of share ownership by FIL and high portfolio weight and (ii) a low Tobin's Q[2] (low ratio of market value to book value) (Figure 3, left column).

Figure 1. Analysis of Effects of Engagement by FIL Investments (Japan) Limited

Year	Dialogue		Dialogue Theme						Dialogue with CEO	
			Environment/Society		Governance		Capital Policy			
	No. of Companies	Total Dialogues	No. of Dialogues	Percentage (%)	No. of Dialogues	Percentage (%)	No. of Dialogues	Percentage (%)	No. of Dialogues	Percentage (%)
2017	41	61	18	29.5	58	95.1	31	50.8	14	23.0
2018	59	75	42	56.0	72	96.0	30	40.0	7	9.3
2019	70	112	45	40.2	106	94.6	73	65.2	8	7.1
Total	117	248	105	42.3	236	95.2	134	54.0	29	11.7

(Note) If a single dialogue covered discussion of multiple themes, it was counted multiple times in each of those themes.
(Source) Produced by K. Inoue Lab, Tokyo Institute of Technology, based on data provided by FIL

1. Hidaka, Ikeda, and Inoue, *Motivations and Effects of Engagement by Institutional Investors* (2021 RIETI Discussion Paper).
2. In this article, calculated using Tobin's Q ([market value + total liabilities] divided by total assets)
3. This is entirely the opinion of FIL and is not the opinion of GPIF.

In this analysis of engagement effectiveness, profit indicators such as ROA (return on assets) and ROE (return on equity), corporate value assessment indicators such as PBR (price-to-book ratio) and Tobin's Q, and corporate governance indicators such as the ratio of cross-shareholdings to total assets and whether the company had takeover defense measures were selected as dependent variables. This column presents particularly noteworthy areas in which the analysis confirmed the effectiveness of FIL's engagement activities.

First, with respect to corporate governance, engagement effectiveness was confirmed by (i) decreases in the ratio of cross-shareholdings to total assets and (ii) the scrapping of takeover defense measures (Figure 2, left column). FIL considers both of these governance issues to be particularly problematic from the perspective of long-term investors.[3] They believe that cross-shareholdings can lead to management complacency as it is an arrangement in which the company ensures stable business from clients in exchange for unconditional approval of the client's management proposals during proxy voting. FIL has a similar view of takeover defense measures, namely that they reduce the incentive for management to improve corporate value during normal times and work to earn the trust of existing shareholders.

An analysis of the impact of engagement on share price also provides evidence that FIL's engagement approach is effective. As mentioned above, companies targeted for engagement by FIL are characterized by a low Tobin's Q, but particularly in cases in which FIL was able to engage in dialogue with the CEO after sharing their issues of concern, the company's Tobin's Q was shown to increase (Figure 3, right column).

Figure 2. Effect of Engagement on Corporate Governance

Variable	Engagement Effect (2018–2020)	Ref: Average of all listed companies (2017–2020)
Cross-shareholdings (%, percentage of total assets)	-0.784**	4.431
Existence of takeover defense measures (0, 1)	-0.111***	0.099

(Note1) The figures for "engagement effect" are coefficients of multiple regression analysis, controlling for various factors such as seasonality and individual company attributes. They indicate the difference between before and after engagement. *** and ** indicate statistical significance at the 1% and 5% level, respectively.
(Note2) Engagement effectiveness was analyzed based on the values one year after engagement.
(Source) Produced by K. Inoue Lab, Tokyo Institute of Technology, based on data provided by FIL

Figure 3. Effect of Engagement on Corporate Value (Tobin's Q)

Variable	Difference between engagement target companies and the average for all listed companies (2017–2019)	Engagement effect of achieving dialogue with CEO (2018–2020)
Tobin's Q	-0.480***	0.147***

(Note1) The figures for "engagement effect" are coefficients of multiple regression analysis, controlling for various factors such as seasonality and individual company attributes. They indicate the difference between before and after engagement. *** indicates statistical significance at the 1% level.
(Note2) Engagement effectiveness was analyzed based on the values one year after engagement.
(Source) Produced by K. Inoue Lab, Tokyo Institute of Technology, based on data provided by FIL

Engagement with Index Providers and ESG ratings agencies

GPIF has been actively engaging in dialogue with index providers and ESG ratings agencies since selecting ESG indexes for Japanese equities in 2017. We have held an ongoing dialogue with these agencies regarding (1) the expansion of companies subject to ESG rating; (2) the promotion of dialogue between ESG ratings agencies and companies; (3) improvement of ESG rating methods; and (4) the governance frameworks of ESG ratings agencies and index providers.

Topics Discussed with Index Providers and ESG Ratings Agencies

In the press release "ESG Indices Selected" announcing the adoption of ESG indices for Japanese equities in July 2017, GPIF explained that it emphasized three major points in its selection of ESG indexes, namely (i) that the index uses a "positive screening" methodology, in other words that equities with high ESG scores are selected; (ii) that ESG is evaluated based on publicly available information and the assessment methods and results would be disclosed; and (iii) that the governance frameworks and conflict-of-interest management of ESG ratings agencies and index providers are robust. Almost four years have passed since then, and GPIF believes that the importance of those three points has in no way diminished. This section provides details on GPIF's engagement with index providers and ESG ratings agencies since the adoption of ESG indexes with regards to these three points.

Figure 1. Key Evaluation Points of ESG Index Selection and Topics Discussed with Index Providers and ESG Ratings Agencies

Evaluation point (i) Emphasis on ESG, positive screening is key

- Emphasize ESG rating as the central element of the index
- Positive screening based on ESG evaluation is key
- Favor indexes that offer opportunities for a wide range of companies to be selected for the index in order to improve the overall market

Dialogue theme: (1) Expansion of ESG rating coverage

Evaluation point (ii) Promotion of disclosure (based on publicly released information), improvement of rating methodologies

- Encouraging companies to disclose more ESG information and improving ESG rating methodologies are essential to enhancing the precision of ESG ratings.
- Both FTSE and MSCI have a policy of actively disclosing their ESG rating methodologies and results in detail, providing feedback on rating outcomes to companies, holding dialogue with investors that use their ESG indexes, and linking the outcomes to the improvement of ESG ratings.

Dialogue themes: (2) Promotion of dialogue with companies; (3) improvement of ESG rating methodologies

Evaluation point (iii) Management of governance frameworks and conflicts of interests by ESG ratings agencies

- Unlike market capitalization-weighted indexes, there is plenty of room in ESG indexes for human intervention, such as by analysts, in ESG rating and index construction.

  To ensure the continuity, transparency, and neutrality of ESG evaluation, the governance frameworks and conflict-of-interest management of ESG ratings agencies and index providers are extremely important.

Dialogue theme: (4) Governance frameworks of ESG ratings agencies and index providers

(Source) Prepared by GPIF based on the press release, "ESG Indices Selected" (released July 2017)

Expansion of ESG Rating Coverage

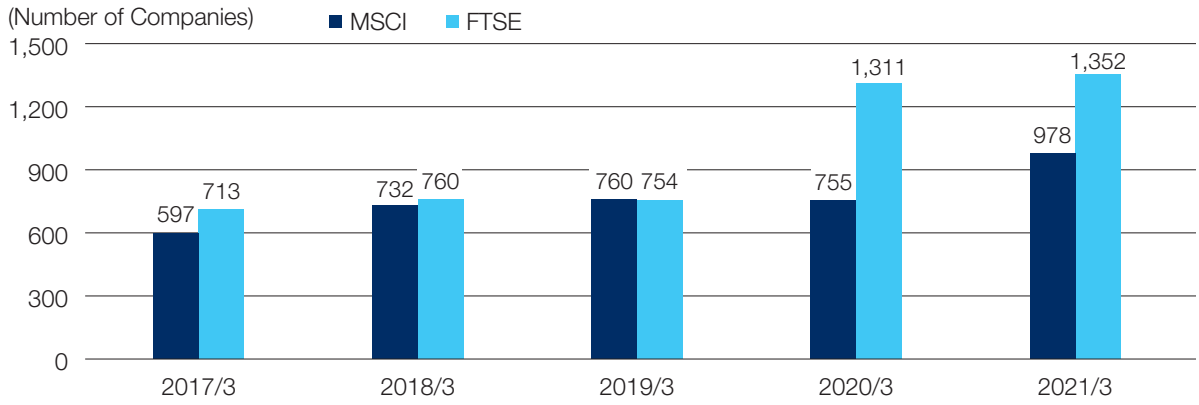
When selecting ESG indexes, GPIF has emphasized the importance of providing a broad range of companies with the opportunity to be selected as constituents, rather than categorically excluding specific industries or companies from eligibility. This is based on our belief that the possibility of index inclusion acting as a driver to encourage companies to improve their ESG profiles is key to enhancing the sustainability of the market as a whole

Despite this, ESG index eligibility is naturally constrained by the ESG rating universe. In many cases, companies are excluded from eligibility merely because they are not covered by the relevant ESG ratings agency, and in our survey of listed companies, many have called for an expansion of ESG rating coverage.

On the other hand, for ESG ratings agencies, expanding the coverage universe means hiring more analysts and a greater investment of management resources. Over the course of multiple discussions with them, however, the ratings agencies have indicated that they understand the importance of expanding the ratings universe, and both FTSE and MSCI have made major strides in increasing the number of companies they cover (Figure 2). As a result, the number of stocks eligible for the MSCI Japan ESG Select Leaders Index and the MSCI Japan Empowering Women Index increased to the 700 largest stocks by market capitalization in November 2018 and November 2019, respectively. For the FTSE Blossom Japan Index, the scope of companies eligible for inclusion expanded significantly to include small-cap stocks in December 2020.

Currently, limited management resources and other issues have impeded information disclosure for smaller companies as opposed to larger ones. Even compared with foreign companies of a similar size, these smaller companies have lower ESG scores. We hope that expanding ESG index inclusion eligibility to small-cap stocks leads to greater interest in ESG ratings by smaller companies, and ultimately an enhancement of their ESG initiatives (Figure 3).

Figure 2. Trends in Japanese Equities Included in ESG Rating Universe (FTSE, MSCI)



(Note) In a media release dated June 11, 2021, MSCI announced that the number of Japanese stocks subject to ESG rating had expanded to 1,274, covering all stocks in the MSCI Japan IMI Index.
(Source) FTSE Russell. Reproduced by permission of MSCI ESG Research LLC ©2021.

Figure 3. Rate of Reporting and ESG Ratings of Japanese Companies by Size

	Rate of integrated report/ ESG report publishing(%)	CDP response rate (%)	FTSE ESG rating (simple average)
Large-cap	39	53	2.98
Medium-cap	33	32	2.32
Small-cap	10	4	1.58

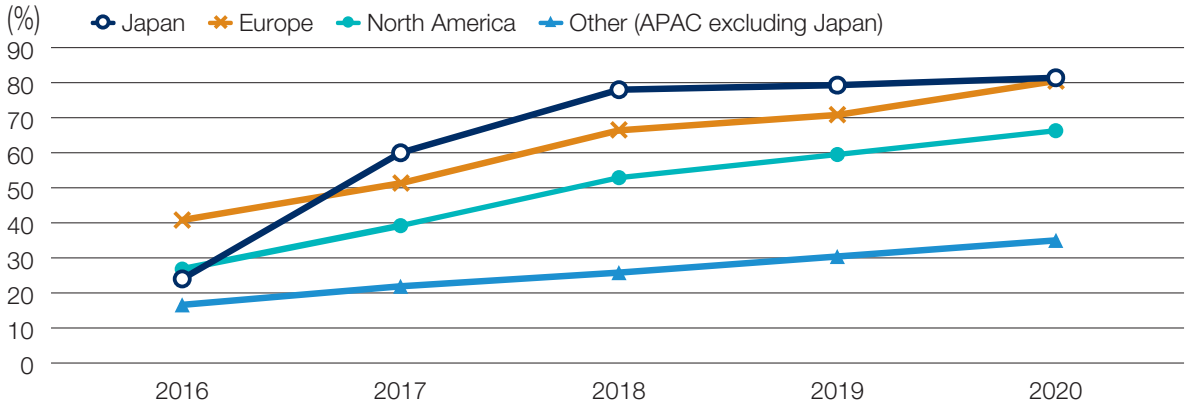
(Note1) Data is as of March 2021.
(Note2) FTSE Japan All Cap Index constituent stocks used for calculation.
(Source) FTSE Russell

Promotion of Dialogue with ESG Ratings Agencies and Companies

As in previous years, GPIF conducted feedback meetings with ESG ratings agencies during fiscal 2020 to discuss the inquiries and opinions they received from the companies that they rate. More and more firms are consulting with ESG ratings agencies over the course of the rating process, and according to MSCI, Japanese firms are among the companies that contact them the most out of the world's major economies. (Figure 4).

The percentage of companies that consult with FTSE during the ESG rating process is also rising, and data from FTSE clearly shows that the more actively a company consults with them, the greater the improvement in their ESG rating. This trend was also seen in an analysis by MSCI.

Figure 4. Percentage of Companies Consulting with MSCI During the ESG Rating Process



(Source) Reproduced by permisson of MSCI ESG Research LLC ©2020.

Improvement of ESG rating methodologies

As GPIF's investments are predominantly passive, index providers and ESG ratings agencies play a pivotal role in the success or failure of our fund management. GPIF engages in dialogue with index providers and ESG ratings agencies to improve the sustainability of the market and enhance our long-term investment performance. In our press release in July 2017 announcing the selection of ESG indexes for Japanese equities, we pointed out that ESG ratings vary widely among ratings agencies, and that more accurate ESG ratings would require better ESG information disclosure by companies and improved ESG rating methodologies.

We have seen some positive changes with respect to the former, with a greater number of large-cap companies in particular producing integrated reports and ESG reports, and an increase in the number of companies disclosing information on climate change risks and opportunities in line with the TCFD framework.

Figure 5. Major Changes in FTSE and MSCI ESG Rating and Index Methodologies since 2017

FTSE Changes

Timing	Major Changes
December 2017	ESG Rating: Update of climate change theme Background: Response to climate change initiatives, e.g., TCFD Details: Added research points on identification of risks and opportunities, scenario analysis, internal carbon pricing, etc.
December 2018	ESG Rating: Update of water security theme Background: Efforts to further align with initiatives such as CDP, WBCSD (World Business Council for Sustainable Development), and GRI Details: Added research points on governance, risk management, strategies, etc. concerning water security
December 2019	ESG Rating: Update of human rights theme Background: Response to update of SASB, CHRB (Corporate Human Rights Benchmark), and UN Guiding Principles on Business and Human Rights Details: Added research points on internal supervision of human rights, human rights training, implementation of mitigation measures, etc.
	ESG Rating: Update of tax transparency theme Background: Encourage improved disclosure by large-cap companies with high domestic sales ratios Details: Previously, only large-cap companies with a ratio of sales in high-risk countries of more than 30% had been targeted, but now all companies classified as large-cap companies are targeted regardless of country and sales.
September 2020	Change in index methodology: Change in threshold for inclusion in the FTSE Blossom Japan Index Details: Changed from 3.1 to 3.3 (exclusion threshold also raised from 2.7 to 2.9 in line with this change)
December 2020	Change in index methodology: Change in FTSE Blossom Japan parent index Details: The Blossom index's parent index was changed from the FTSE Japan Index (large-cap and medium-cap equities) to the FTSE Japan All Cap Index (large-, medium- and small-cap equities). 12 small-cap equities were included in the Blossom Index as a result of this change.

MSCI Changes

Timing	Major Updates
November 2018	Change in index methodology: Expansion of eligible universe for MSCI Japan ESG Select Leaders Index Details: The parent index was changed from the MSCI Japan IMI Top 500 Index to the Top 700 Index to reflect expanded coverage of ESG ratings. Rebalancing frequency was also changed from annual to semi-annual for more timely reflection of ESG rating information.
November 2019	Change in index methodology: Expansion of eligible universe for MSCI Japan Empowering Women Index (WIN) Details: The parent index was changed from the MSCI Japan IMI Top 500 Index to the Top 700 Index to reflect expansion of gender diversity score coverage.
November 2020	ESG Rating: Change in governance pillar Details: A new theme, Corporate Behavior, was established in the Governance Pillar. This theme consists of the key issues of Business Ethics and Tax Transparency, and is applied to the ESG ratings of all companies alongside the Corporate Governance theme.
	ESG Rating: Change in rating methodology for the financial sector Background: Increased importance of climate change risk exposure analysis for banks, such as reporting in line with TCFD recommendations. Details: Added climate risk analysis and environmental opportunity factors for loans and expanded scope of financing projects covered by the Financing Environmental Impact assessment. Standardized risk levels among companies in the Consumer Financial Protection assessment.
	ESG Rating: Addition of Community Relations as key issue Background: Issues related to community relations had previously been divided into two key issues (Biodiversity & Land Use, Corruption & Instability) depending on what was being affected (the environment or communities). Details: Established new key issue of Community Relations in the Stakeholder Opposition theme, merging issues related to community relations into a single key issue.

(Source) Prepared by GPIF based on data from FTSE and MSCI. FTSE Russell. Reproduced by permission of MSCI ESG Research LLC ©2021.

Meanwhile, ESG ratings agencies are also working to improve their methodologies. When they consider changing these methodologies, ESG ratings agencies provide end users such as asset managers and pension funds with an opportunity to express their opinions (consultations), similar to when they consider changes to index methodologies. In addition to regular dialogue, GPIF actively exchanges opinions with ESG ratings agencies through consultations and other opportunities. FTSE and MSCI are working to improve their rating methods through continuous engagement with GPIF and other ESG rating users (Figure 5).

There are currently significant discrepancies in ESG ratings between different agencies. Since analysts' opinions differ even in their assessment of companies based on financial information, we will likely never see a complete convergence in their assessment of companies based on non-financial ESG information. Nevertheless, GPIF believes that ESG information needs to be reflected in the evaluation of companies in more appropriate ways, by improving rating methods, enhancing information

disclosure, and standardizing disclosure criteria. As a reference point to ascertain the current situation, we monitor the ESG rating correlation between FTSE and MSCI every year (Figures 6 and 7).

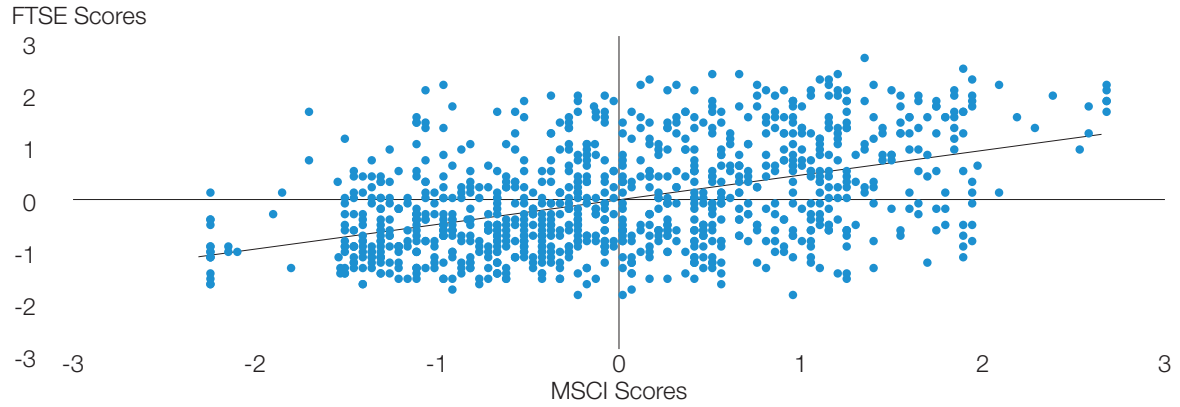
Governance Framework of ESG Ratings Agencies and Index Providers

Similar to asset managers, index providers and ESG ratings agencies play a vital role in GPIF's fund management. Index-tracking passive investments account for approximately 90% of our equity portfolio, and since the stocks we invest in and the weights of these investments are determined by the indexes calculated by index providers, these providers arguably play a critical role in determining the success or failure of our investments.

For ESG indexes in particular, constituent stocks and their weights vary greatly depending on each firm's ESG rating, so the companies that conduct these evaluations bear a particularly great responsibility. As such, similar to external asset managers, GPIF conducts due diligence of index providers and ESG ratings agencies when selecting ESG indexes. We assess the governance structures of these companies to ensure the transparency and neutrality of their ESG ratings and index constituent selection processes.

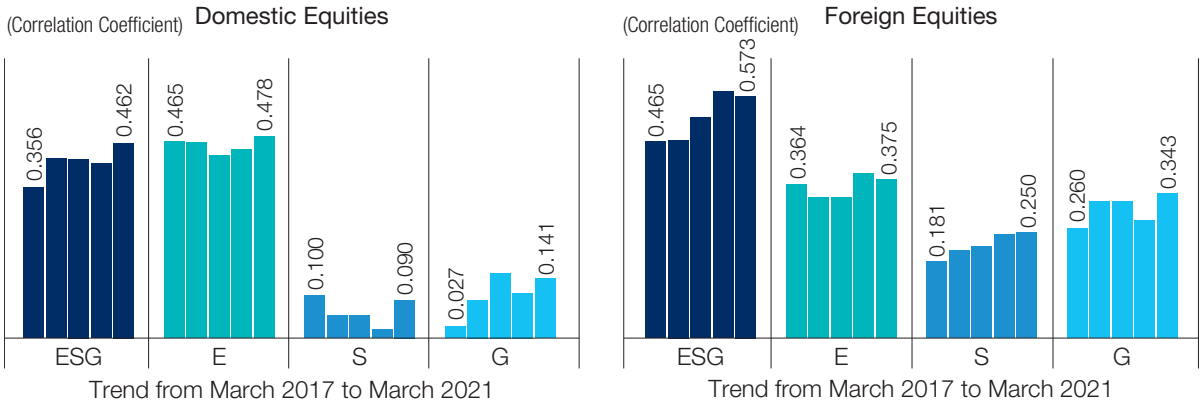
In fiscal 2020, in addition to conducting due diligence on the index providers that GPIF has been using since before we first adopted ESG indexes for domestic stocks in 2017, we also performed follow-up assessments of the ESG ratings agencies and index providers that we had conducted due diligence on previously.

Figure 6. FTSE and MSCI ESG Score Correlation Charts (Domestic Equities, as of March 31, 2021)



(Note) Normalized (mean 0, variance 1) and plotted ESG rating data from FTSE and MSCI.
(Source) Prepared by GPIF based on data from FTSE and MSCI. FTSE Russell. Reproduced by permission of MSCI ESG Research LLC ©2021.

Figure 7. Trends in Correlation Coefficient of ESG Score Data from FTSE and MSCI



(Source) Prepared by GPIF based on data from FTSE and MSCI. FTSE Russell. Reproduced by permission of MSCI ESG Research LLC ©2021.

Interviews with ESG Rating Officers

●FTSE Russell

How would you describe the characteristics, strengths, and weaknesses of Japanese companies' ESG initiatives in comparison with other countries?

Japanese companies' ESG initiatives have improved dramatically in recent years and are fast closing in on those of European companies. This is because Japanese companies communicate with us more than the global average and are making efforts to better understand how to improve their disclosures. Although the environmental scores of Japanese large-cap companies are lower than their European counterparts, they are higher than U.S. companies and are on par with the average score for developed countries. Combined with the fact that many companies are posting green revenue, Japanese companies are at an advantage at a time when investors are starting to shift their portfolios to Paris Agreement targets. One area in which Japanese companies do need to improve is corporate governance. When it comes to highly transparent information disclosure and building strong governance and monitoring frameworks, Japanese companies are lagging behind companies in other developed countries.

What are your expectations of companies regarding their approaches to ESG?

Given the growing expectations from investors, there is an emerging need for companies to place more emphasis on sustainability in their business decision-making processes. Securing transparency is also important, and consistent, accurate disclosure in line with international standards such as TCFD has become essential not just for the IR and CSR divisions, but for the entire company and its executive management. The expectation is that sustainability reports will become just as important as financial reports and that they will provide supplementary viewpoints on material impacts on business. What investors want to see is not appealing stories about how companies are putting sustainability into practice, but data with which they can measure companies' clear commitment and state of progress.

Jaakko Kooroshy, Head of Sustainable Investment Data & Methodologies, FTSE Russell (Interviewed in May 2021)

●MSCI

What kind of changes are taking place in the world in terms of companies' ESG initiatives?

There have been some noteworthy developments in companies' efforts to respond to climate change and social inequality. (These issues are also featured in MSCI's *2021 ESG Trends to Watch*.) A growing number of companies are announcing their commitments to reducing greenhouse gas emissions to net zero by 2050 to address the climate change crisis.[1] Some companies have also announced their commitment to promoting further diversity in employment and promotion to address the problem of social inequality that has been highlighted and exacerbated by the COVID-19 pandemic.[2]

What kinds of changes are you considering in your company's ESG rating methodology going forward?

To accelerate the transition to a net zero economy, we are focusing on the development of leading-edge analytical tools that will help institutional investors and companies to measure climate change-related risks appropriately and to align their investment and business activities with the path toward net zero.

We will also continue to explore how to make use of exciting new alternative data sources that will enable companies to analyze the risks and opportunities they face regarding a variety of ESG issues, from social inequality to biodiversity, as well as initiatives to manage those risks and opportunities in more detail.

Linda-Eling Lee, Global Head of ESG Research, MSCI Inc. (Interviewed in May 2021)

1. *The Role of Capital in the Net-Zero Revolution*, MSCI, April 2021; 2021 ESG Trends to Watch, MSCI ESG Research, December 2020.
2. *2021 ESG Trends to Watch*, MSCI ESG Research, December 2020.

ESG in Alternative Asset Management

GPIF engages in initiatives to properly integrate ESG in the alternative asset manager selection and monitoring process. In this report, we conduct a quantitative analysis of climate change risks for domestic real estate in which GPIF invests through private funds.

ESG in Alternative Assets

The holding period for alternative assets (infrastructure, real estate, and private equity) is generally quite long, and in some cases, the asset manager itself is involved in the corporate management and business operations of the investee. As a result, more asset managers are focusing on integrating ESG into their investment processes in order to identify the risks encountered during the holding period and, conversely, to find opportunities for sustainable asset value growth and improvement of corporate value. This trend is particularly prominent among overseas asset managers.

Although we use the collective phrase "alternative asset management," material ESG factors actually differ depending on the individual characteristics of the asset and/or business in question. The asset manager's individual investment strategies also make a difference in the ESG initiatives they engage in. With an understanding of these differences, GPIF as an asset owner assesses asset managers' approach to ESG and monitors the status of their investment.

(1) ESG Ratings When Selecting Asset Managers

Since it began selecting alternative asset managers that adopt a multi-manager strategy in April 2017, GPIF has added an examination of prospective asset managers' ESG initiatives to its screening criteria. Screenings are conducted from many different aspects, including through due diligence questionnaires, interviews with ESG staff, and evaluations by third-party consultants. Among other things, we look at the manager's company-wide ESG policies, ESG integration in the investment process, their oversight systems and how they report to investors after an investment is made. All asset managers selected by GPIF have signed the Principles for Responsible Investment (PRI).

(2) Post-Investment Monitoring

As of yet, there is still no standardized rating criteria for ESG factors that can be applied across all alternative assets. As such, each asset manager creates their own unique ESG rating criteria and scoring methodology based on the characteristics of the asset and the fund manager's investment strategy. GPIF monitors asset managers for any changes in their ESG-related organizational structure, whether or not the diversified funds in which they invest are PRI signatories, and the status of their ESG initiatives. In addition to requiring individual asset managers to provide a report detailing the status of their ESG-related investment capabilities and initiatives, we engage in regular dialogue with them to understand the state of the ESG-related aspects of their portfolios.

Integrating ESG into Real Estate Investments

Increasingly stringent regulations on buildings' environmental performance and greenhouse gas emissions have made the collection and analysis of data on energy use and CO2 emissions generated from buildings owned essential for the real estate sector. Many companies have installed integrated systems for managing such data in order to monitor the effectiveness and progress of energy conservation measures.

Investment Example
Medical offices building owned by a U.S. real estate fund in which GPIF has invested. This facility has installed systems that automatically collect and analyze environmental efficiency.

Integrating ESG into Infrastructure Investments

The infrastructure market is witnessing a surge of investment in renewable energy projects such as wind and solar power as individual countries pursue initiatives to reduce greenhouse gas emissions by lowering their rate of fossil fuel power generation. This is becoming a major investment sector as investors can expect to earn stable revenue through long-term power purchase agreements and various government support measures.

Investment Example
The portfolio of wind farms in which GPIF has jointly invested with a Canadian public pension fund. The portfolio has facilities already in operation with a capacity of approximately 4.7 GW, along with other facilities under construction or in development totaling more than 10 GW. Stable revenue is ensured through long-term power purchase agreements.

Analysis of Real Estate Portfolio Using Climate Value-at-Risk

In its climate-related financial disclosures for fiscal 2020, GPIF conducted a quantitative analysis of the climate change risks for domestic real estate in which GPIF invests through private funds.

Physical Risks

The physical risk analysis assessed risks related to (1) coastal flooding, (2) fluvial flooding, (3) tropical cyclones, (4) extreme heat, and (5) extreme cold by sector.

The results of the analysis indicated high risk from (3) tropical cyclones and (4) extreme heat across all sectors. On the other hand, physical risks to the portfolio arising from (1) coastal flooding and (2) fluvial flooding, which are of particular concern in Japan, are low despite the inclusion of a very small number of properties exposed to a high risk of coastal and other flooding.

As a result, a comprehensive assessment of all physical risks from (1) to (5) indicate "low" or "very low" risk across all sectors.

Transition Risks

In the transition risk analysis, we measured the carbon intensity (greenhouse gas emissions per area) of each property, and estimated the reduction in carbon intensity required by 2033 in order to achieve temperature targets of 1.5°C, 2°C, and 3°C targets.

Results indicated that emissions needed to be reduced by a total of 32.8 CO_2 equivalent tons per square meter over the next ten years or so in order for the portfolio analyzed to achieve the 1.5°C target.

The analysis also confirmed that the current warming potential is currently 2.78°C, which is higher than the 2°C and 1.5 °C targets set by the Paris Agreement.

There are several limitations inherent this analysis, including the fact that the average value for each sector was used for properties for which information could not be obtained, and as such, there is room to improve the accuracy of results. We will continue to engage in dialogue with external asset managers to encourage further disclosure of portfolio climate-related risk and risk management.

* Please refer to pages 63 and 64 for details of this analysis.

Collaboration with Overseas Public Pension Funds and Other Institutions

GPIF collaborates with a wide range of domestic and foreign institutions. In fiscal 2020, GPIF joined the JPX ESG Knowledge Hub, which was set up by the Japan Exchange Group (JPX), as a supporter.

2015

September 2015 Signed the Principles for Responsible Investment

Signatory of: PRI Principles for Responsible Investment

GPIF has been stepping up its ESG initiatives since it signed the PRI in September 2015. Every year, we report our ESG initiatives to the PRI and receive a full assessment on how we are progressing. We also participate in various committees, including the Asset Owner Advisory Committee, SDGs Advisory Committee, and Japan Network Advisory Committee. We received an A+, the highest rating, for strategy and governance in our 2020 assessment.

2016

November 2016 Joined the Thirty Percent Coalition and the 30% Club

30% Club GROWTH THROUGH DIVERSITY

THIRTY PERCENT COALITION

Both the Thirty Percent Coalition in the U.S. and the 30% Club in the U.K. are initiatives that seek greater diversity in listed company boards by increasing the proportion of female board members to 30%. GPIF has participated in the Thirty Percent Coalition in the U.S. and the Investor Group of the 30% Club in the U.K. as an observer since November 2016. Since December 2019, we have also participated in the 30% Club Japan Investor Group.

2018

April 2018 Published a Joint Research Paper with the World Bank Group

WORLD BANK GROUP
THE WORLD BANK IBRD • IDA IFC International Finance Corporation

In 2018, GPIF and the World Bank Group published a joint research paper entitled "Incorporating Environment, Social and Governance (ESG) Factors into Fixed Income Investment." Following up on this research, in April 2019, the International Bank for Reconstruction and Development (IBRD) and the International Finance Corporation (IFC) – both members of the World Bank Group– drew up a new proposal to provide GPIF's external asset managers with an opportunity to invest in green bonds. This initiative has led to partnerships with other international financial institutions and governmental financial institutions in various countries.

October 2018 Joined Climate Action 100+

Climate Action 100+

Climate Action 100+ is an investor-led climate change initiative launched in September 2017. Members of this initiative hold constructive dialogues with companies that have a significant impact on the resolution of climate change issues. Participants discuss improving climate change-related governance, making efforts to reduce greenhouse gas emissions, and enhancing information disclosure. Currently, 545 investors[1] participate in the initiative, including pension funds and other asset owners as well as asset managers. GPIF has participated in Climate Action 100+ as a supporter since October 2018, and also participates as an asset owner in the Asia Advisory Group (AAG), which advises the Steering Committee on circumstances and conditions in the Asia region.

1 As of June 30, 2021.

December 2018

Declared Support for the TCFD

GPIF declared our support for the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) in December 2018. We commenced information disclosure in accordance with the TCFD recommendations in August 2019 with our *ESG Report 2018* and have done so every year since.

November 2020

Joined JPX ESG Knowledge Hub

The ESG Knowledge Hub, established by the Japan Exchange Group (JPX), is a platform that aims to encourage listed companies to disclose ESG information by providing one-stop access to content and information that will assist in understanding ESG investment. Another goal of the Hub is to eventually form a community linking listed companies with investors and related organizations. GPIF joined the ESG Knowledge Hub as a supporter when it was first established in November 2020.

https://www.jpx.co.jp/corporate/sustainability/esgknowledgehub/index.html

2019

2020

August 2019

Joined ICGN

The International Corporate Governance Network (ICGN) is an international network of institutional investors and other organizations. It promotes better corporate governance and stewardship activities with the aim of advancing efficient markets and sustainable economies. GPIF joined ICGN in August 2019.

August 2019

Joined CII

The Council of Institutional Investors (CII) is a network of institutional investors established by U.S. public pension funds, with the aim of advocating and collaborating in the areas of shareholder rights and corporate governance in the U.S. GPIF joined CII in August 2019.

Column

Joint research with ANU on the diversification and portfolio efficiency effect of ESG investment

In a joint research project with the Australian National University (ANU), GPIF is engaged in studying the efficiency of ESG investment through time series, cross-country and other quantitative analyses. In particular, this project aims to achieve unique, leading-edge results by using regime switching models and other sophisticated methods to detect and analyze the conditions of regime changes.

Joint research with Kyoto University on exploration of corporate value in the post-pandemic society

Kyoto University is currently conducting research aimed at the development of methods to measure the social values of diverse stakeholders and the prediction of future trends in a society in which more emphasis is placed on social value post-pandemic. GPIF is participating in this research as part of a study of the effectiveness of ESG investment, assisting with questionnaire surveys of stakeholders and data analysis.

Review of ESG Activities and Future Outlook

In fiscal 2020, positive changes continued to be observed in companies' ESG initiatives and in ESG ratings agencies in the improvement of their rating methods. We will continue working to secure long-term investment returns by stepping up our ESG initiatives in cooperation with a number of different partners.

Although ESG indexes remained robust when stock prices plummeted due to the COVID-19 pandemic at the end of fiscal 2019, they have lagged slightly in the rebound phase since the beginning of fiscal 2020. We have seen that companies with high ESG ratings generally have lower risk of declining sharply, but tend to perform relatively weaker when value stocks are favored. This trend is fairly consistent with our intuitive understanding of companies with high ESG ratings.

ESG factors are sources of potential long-term risk and opportunity, and as a cross-generational investor, GPIF strives to secure long-term investment returns by taking these into account when investing. Having said that, allowing our portfolio to deviate from our current policy benchmarks unconditionally in order to curb or avoid future ESG risks can potentially cause greater than expected short-term performance swings. Balancing both short-term risks and future ESG risks is enormously difficult, but we will constantly strive to find the optimal balance between the two.

Fiscal 2020 also witnessed many positive changes for ESG investment. As reported in this ESG Report, the scope of ESG rating coverage of Japanese equities is expanding rapidly, which is an extremely positive development. Previously, small-cap equities were not included in ESG indexes because they had not been given ESG ratings, which lead to small-cap companies being automatically excluded from ESG indexes and therefore causing unintended investment risk (size bias). Another more fundamental problem was that, even though ESG-conscious management is necessary to enhance sustainability regardless of the size of the company, inclusion in ESG indexes was not serving as an incentive for small-cap companies. A larger scope of companies being given ESG ratings allows us work towards making improvements in these areas.

On the other hand, high-quality disclosure by companies is a prerequisite for investors to be able accurately reflect ESG factors into investment decisions. In recent years, a growing number of Japanese companies have been producing integrated reports and disclosing information in line with TCFD recommendations, and we hope to see the emergence of a virtuous cycle in which GPIF's ESG initiatives provide an incentive for companies to disclose ESG information, leading in turn to the improvement of the quality of ESG investments.

Regarding ESG-conscious stewardship activities, this report describes stewardship focused passive investments in detail, but we also feel that the quality of engagement of other external asset managers is also steadily improving. We will continue to support constructive dialogue between external asset managers and companies and measure the outcomes of these engagements.

UEDA Eiji,
Executive Managing Director and Chief Investment Officer (CIO)

Column

Global Approaches to Climate Change and Actions Taken by Japanese Companies

As the world's major nations commit to reducing greenhouse gas emissions to net zero, central banks, financial institutions, and companies are also undertaking various initiatives related to climate change. In June 2020, based on the Action Plan on Sustainable Finance, the EU released the final version of a "taxonomy" that provides a clear and common definition of what is "green." In March 2021, the EU Sustainable Finance Disclosure Regulation (SFDR) came into effect, and institutional investors subject to the regulation will be required to disclose sustainability information beginning from the end of June 2021.

More than 90 institutions[1] have joined the Network of Central Banks and Supervisors for Greening the Financial System (NGFS) and are actively engaged in various initiatives such as developing scenarios for climate change-related analysis.

The TCFD Recommendations published in 2017 are becoming the standard for the disclosure of climate change risks and opportunities, and the number of institutions endorsing the TCFD has climbed to more than 2,300.[1] In December 2020, the U.K.'s Financial Conduct Authority introduced a new rule for commercial companies with a U.K. premium listing, where subject firms must disclose in line with the recommendations of the TCFD from 2021.

In Japan, the Stewardship Code was revised a second time in March 2020, and states that institutional investors should hold dialogues with companies based on "consideration of sustainability according to investment strategy." The second revision of the Corporate Governance Code was also published in June 2021. Based on this, companies wishing to be listed on the Prime Market of the Tokyo Stock Exchange (TSE) will now be required to enhance the quality and quantity of their climate change-related disclosures based on the TCFD or an equivalent international framework.

While Japan is believed to have more institutions endorsing the TCFD than any other country in the world, only 308 of the companies listed on the First Section of the TSE have TCFD-aligned disclosures.[2] The Code sets forth a principle of "comply or explain," but as most of the companies listed on the First Section of the TSE are expected to seek a listing on the Prime Market, how much progress these companies will make in endorsing and actually disclosing according to the TCFD Recommendations is a point of high interest.

Figure1: Companies Listed on the First Section of the Tokyo Stock Exchange (TSE) That Endorse TCFD, by Industry and Capitalization

	Based on the number of equities (%)			
	Large-cap equities	Medium-cap equities	Small-cap equities	Total
Utilities	100.0	100.0	9.1	58.3
Financials	100.0	62.5	12.2	31.9
Materials	100.0	55.1	5.5	20.5
Real Estate	100.0	85.7	0.0	18.2
Energy	100.0	50.0	0.0	15.8
Consumer Staples	100.0	37.8	2.3	15.6
Industrials	80.0	41.0	4.9	13.7
Information Technology	85.7	51.1	1.1	9.9
Consumer Discretionary	62.5	41.9	0.9	9.1
Healthcare	61.5	4.0	0.0	8.8
Telecommunications Services	66.7	0.0	1.1	4.2
Grand Total	81.8	43.6	3.2	14.1

(Note1) Data as of June 30, 2021; number of companies endorsing TCFD is 308.
(Note2) Small- to large-cap classifications by TOPIX. Industry classifications by GPIF.
(Source) Prepared by GPIF based on data from TCFD.

1 As of June 22, 2021
2 As calculated by GPIF based on TFCD As of June 30, 2021

ESG Index Performance

The ESG indexes selected by GPIF outperformed market averages over the past four years, but we believe that these types of investments can only be accurately assessed over the long term. We have also confirmed that these ESG indexes have both improved their Sharpe Ratios and reduced ESG risks over the past four years.

ESG Index Performance Attribution Analysis

Figure 1 shows the performance of GPIF's selected ESG indexes from April 2017 to March 2021 and during the previous year from April 2020 to March 2021. Over the past four years, these indexes generally outperformed both their parent indexes and market averages (TOPIX for Japanese equities and MSCI ACWI (excluding Japan) for foreign equities).

Figure 2 shows the performance from April 2017 to March 2021. As GPIF has only invested in the ESG indexes for foreign equities for a short period, this figure only includes the performance of five domestic equity ESG indexes: (1) the MSCI Japan ESG Select Leaders Index (MSCI ESG Select Leaders), (2) the MSCI Japan Empowering Women Index (MSCI WIN), (3) the FTSE Blossom Japan Index (FTSE Blossom), (4) the S&P/JPX Carbon Efficient Index (S&P/JPX Carbon), and a composite ESG index (an equally-weighted combination of ESG indexes (1) to (4)). This graph displays the relative performance of these indexes compared with the market average (TOPIX) by dividing the value of each index by the price of the TOPIX.

Using the composite ESG index as a proxy for the performance of ESG indexes overall, the share price for these indexes relative to the TOPIX fell below 1 during the period from fiscal 2017 to the first half of fiscal 2018, but from the second half of fiscal 2018, it exceeded 1 and started to trend upward. In fiscal 2019, all ESG Indexes continued to rise relative to TOPIX due to outperformance in quality and growth stocks (stocks with relatively high-margins and high-growth rates), which have a relatively strong correlation with ESG Index constituents. In fiscal 2020, some ESG indexes underperformed relative to the TOPIX as quality and growth stocks pulled back after the sharp rise the previous fiscal year, while value stocks (relatively cheap stocks) rose. However, the overall performance of all ESG indexes remained stable.

In fiscal 2020, some ESG indexes expanded their investment universe to include small-cap stocks. We look forward to seeing further efforts to reduce the impact of specific style factors and size biases on performance.

GPIF believes that in the case of ESG investments, the longer the investment period, the better the improvement in risk-adjusted returns. In order to verify this, we calculated the relationship between the Sharpe Ratio and the ESG rating for the four domestic equity ESG indexes and the TOPIX index as shown in Figure 3. The Sharpe Ratio, which is widely used as an indicator of risk-adjusted returns, is the ratio of portfolio return rates divided by the portfolio risk (standard deviation of return). The higher the value, the more efficient the portfolio. Figure 3 confirms that ESG indexes (1) to (4) have higher ESG ratings than the TOPIX, and that their Sharpe Ratios using risk and return for the past four years also tend to be higher (i.e. more efficient).

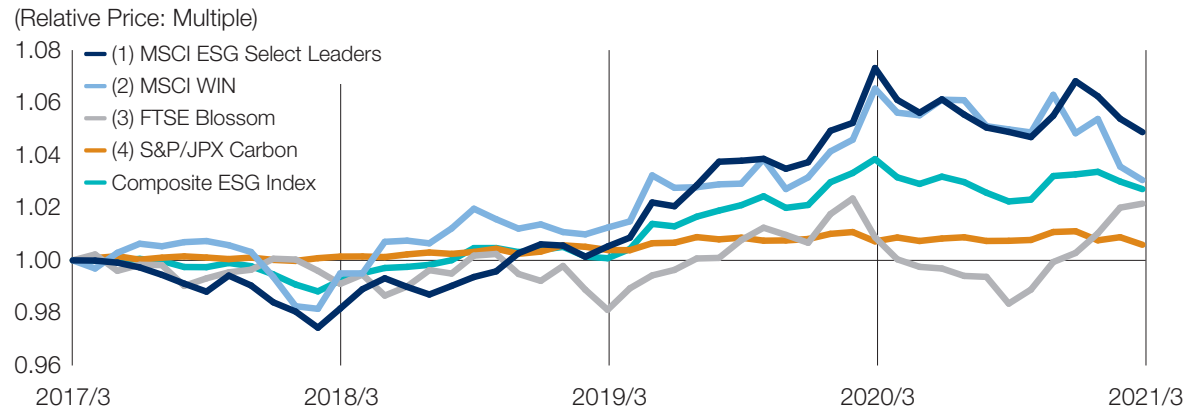
Note that these results only cover a short four-year period and only examine certain indexes. While the impact of ESG ratings on risk-adjusted returns needs to be examined over the long term, we can say that, for at least the past four years, both improvement in the Sharpe Ratio and the reduction of ESG risks have been achieved.

Figure 1. Returns of Seven ESG Indexes Selected by GPIF

	April 2017 to March 2021 (past 4 years, annualized)					(Reference) April 2020 to March 2021				
	Return Rates			Excess Return		Return Rates			Excess Return	
	(a)	(b)	(c)	(a-b)	(a-c)	(a)	(b)	(c)	(a-b)	(a-c)
	ESG Index	Parent Index	TOPIX	Parent Index	TOPIX	ESG Index	Parent Index	TOPIX	Parent Index	TOPIX
(1) MSCI ESG Select Leaders	10.38%	9.51%	9.07%	0.87%	1.31%	38.90%	43.43%	42.13%	(4.53)%	(3.23)%
(2) MSCI WIN	9.89%	9.51%		0.38%	0.82%	37.49%	43.43%		(5.94)%	(4.65)%
(3) FTSE Blossom	9.65%	9.57%		0.08%	0.58%	43.93%	43.81%		0.12%	1.80%
(4) S&P/JPX Carbon	9.23%	9.07%		0.16%	0.16%	41.95%	42.13%		(0.18)%	(0.18)%
	ESG Index	Parent Index	MSCI ACWI ex Japan	Parent Index	MSCI ACWI ex Japan	ESG Index	Parent Index	MSCI ACWI ex Japan	Parent Index	MSCI ACWI ex Japan
(5) S&P Global Carbon	13.23%	13.41%	13.38%	(0.18)%	(0.14)%	58.22%	59.95%	60.21%	(1.73)%	(1.99)%
(6) MSCI ESG Universal	13.89%	13.24%		0.65%	0.52%	59.34%	60.10%		(0.76)%	(0.87)%
(7) Morningstar GenDi	13.91%	13.77%		0.14%	0.53%	58.38%	60.25%		(1.87)%	(1.83)%

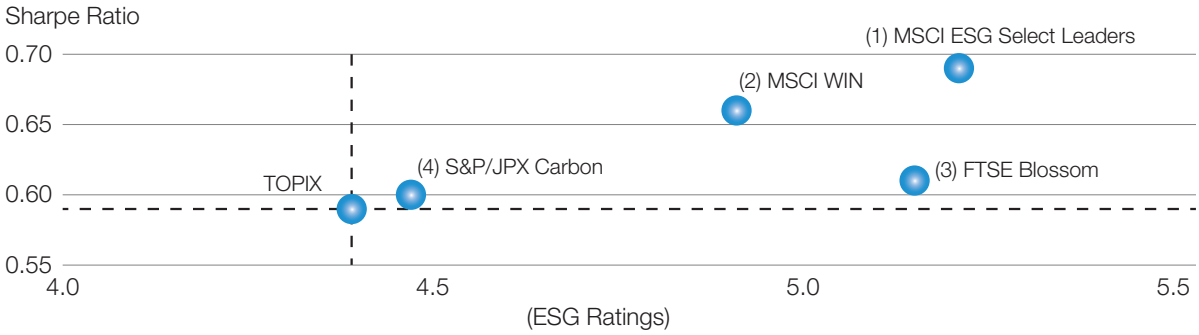
(Note1) Index returns include dividends. The periods used to calculate index return rates differ from the terms of GPIF's actual investments.
(Note2) The parent indexes (constituent universe) for (1) to (7) are as follows: (1) MSCI JAPAN IMI TOP700, (2) MSCI JAPAN IMI TOP700, (3) FTSE JAPAN ALL CAP, (4) TOPIX, (5) S&P Global Large Mid (ex JP), (6) MSCI ACWI ex Japan ex China A, (7) Morningstar Developed Markets (ex JP) Large-Mid
(Source) Prepared by GPIF based on data from FactSet.

Figure 2. Relative Prices of ESG Indexes for Domestic Equities (1) to (4), Composite ESG Index and TOPIX



(Note1) Relative prices are normalized to 1 as of March 31, 2017.
(Note2) The composite ESG index is an equally-weighted combination of ESG indexes (1) to (4).
(Source) Prepared by GPIF based on data from FactSet.

Figure 3. Relationship Between Domestic Equity ESG indexes and TOPIX Index ESG Ratings and Sharpe Ratios



(Note1) ESG ratings are based on data as of the end of March 2021. Sharpe Ratios are from April 2017 to March 2021 (annualized).
(Note2) ESG ratings are the average of FTSE and MSCI (Refer to page 43 and 44 for the calculation of portfolio ESG rating).
(Source) Prepared by GPIF based on data from FTSE and MSCI.

Portfolio ESG Rating

GPIF invests in a broad range of equity and fixed-income assets in Japan and overseas through external asset management companies. In this year's report, we once again measured the ESG rating of our equity portfolios. Results confirmed that the portfolio ESG rating continued to improve for both domestic and foreign equities, despite some impact from methodology changes at FTSE and MSCI.

Analysis of Portfolio ESG Rating

GPIF invests in a broad range of equity and fixed-income assets in Japan and overseas through external asset management companies. We have about 2,417 companies in our domestic equity portfolio and 3,285 companies in our foreign equity portfolio. Similar to last year, in this year's report we once again measured the ESG rating of our equity portfolios as below.

We calculated the weighted average ESG score, E score, S score and G score for our portfolio based on ESG ratings from both FTSE and MSCI (excluding stocks for which an ESG rating was not available). The overall ESG rating, weighted by market capitalization, represents the sum of the E, S and G ratings. (MSCI ratings include an industry adjustment factor.)

Figures 1 to 4 show the trend in each ESG rating for GPIF's equity portfolios every year from March 31, 2017 to March 31, 2021, as well as the ESG rating for market representative indexes as of March 31, 2021. In the FTSE evaluation, the ESG rating for domestic equities increased, but there was a slight fall in the rating for foreign equities. On the other hand, the MSCI ESG rating continued to improve for both domestic and foreign equities. The G score for domestic equities, in particular, shows significant improvement from 1.34 to 1.58.

The change in scores may be due to changes in FTSE's and MSCI's methodologies. For MSCI, the E and S scores for both domestic and foreign equities declined, while the G score rose. This is likely due to a change in MSCI's ESG rating methodology in November2020, in which the weight of the G score was increased to at least 33% of the ESG score.

Figures 5 and 6 show trends over time in each of the E, S, and G ratings for GPIF's equity portfolios from March 2017. In the FTSE evaluation, the E, S and G ratings were all on an upward trend until March 2020 before leveling off or falling in March 2021. In the MSCI evaluation, on the other hand, the E rating for both domestic and foreign equities continued to decline, the S rating fell after trending upward until March 2020, and the G score varied from region to region.

We compared the ESG ratings for GPIF's equity portfolios to ratings for the whole market by using the same methodology to calculate the ESG ratings for market representative indexes, using TOPIX in the case of domestic equities and the MSCI ACWI (excluding Japan) in the case of foreign equities. As a result, in the analysis of the TOPIX and MSCI ACWI (excluding Japan), similar changes in E, S, and G scores to GPIF's equity portfolios were observed. These results support the view that the change in scores was due to changes in methodology by FTSE and MSCI. It also shows that GPIF's equity portfolios are outperforming the market in ESG scores, albeit marginally (Figures 1 to 4). This result is likely due to the adoption of ESG Indexes and Carbon Efficient Indexes.

Figure 1. FTSE ESG Ratings (Domestic Equities)

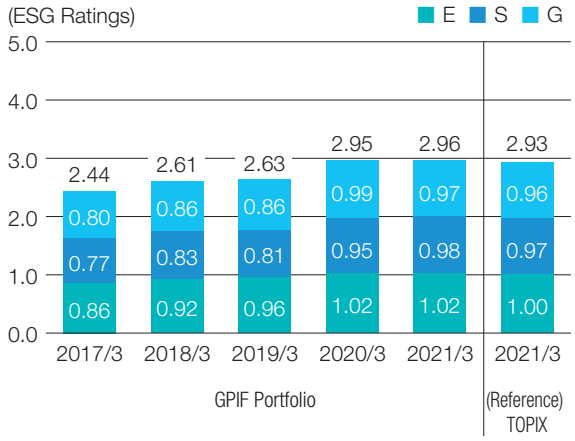


Figure 2. FTSE ESG Ratings (Foreign Equities)

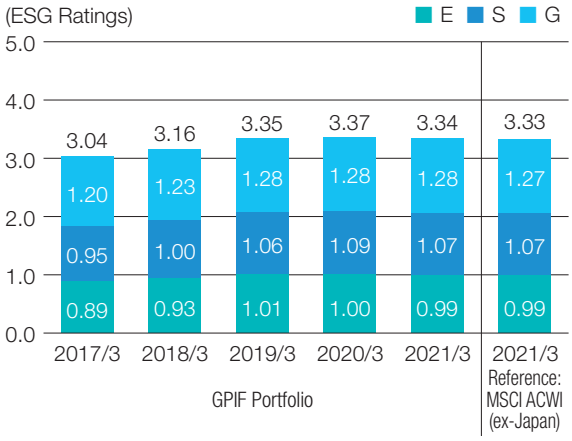


Figure 3. MSCI ESG Ratings (Domestic Equities)

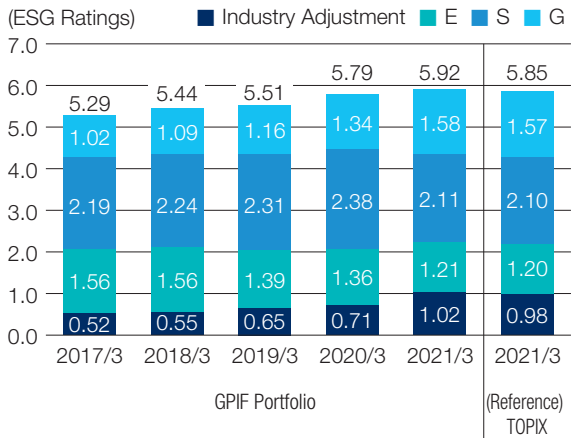


Figure 4. MSCI ESG Ratings (Foreign Equities)

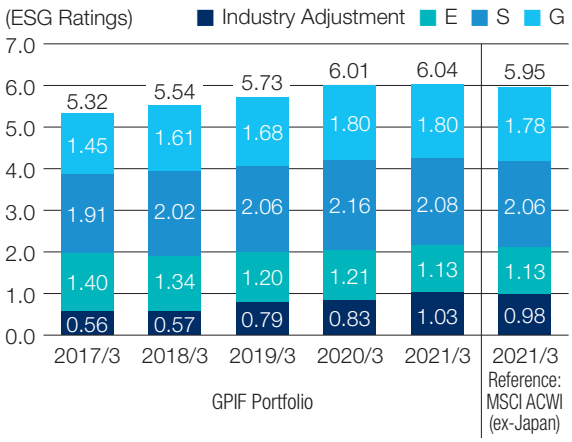


Figure 5. FTSE ESG Ratings for Each Category

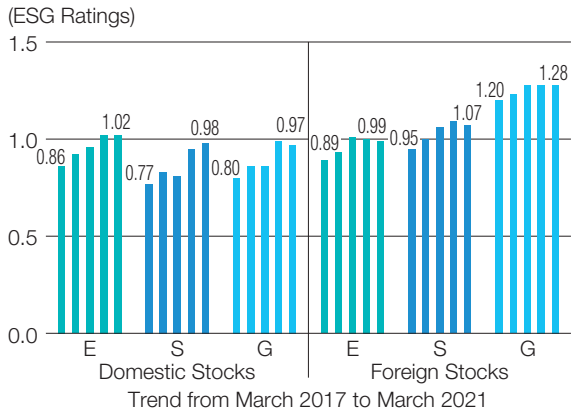
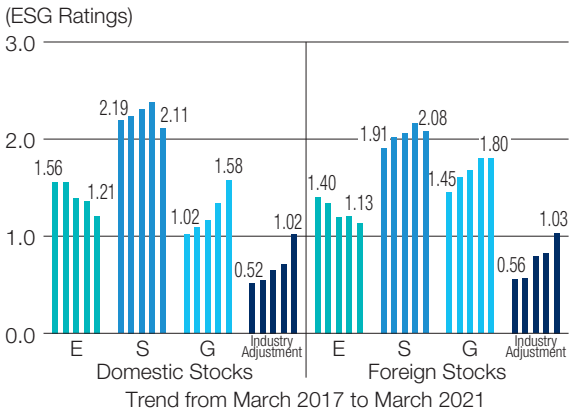


Figure 6. MSCI ESG Ratings for Each Category



Figures 1, 2, and 5 (Note) GPIF holdings: Among the stocks held by GPIF, we analyzed those with ESG ratings by FTSE.

(Source) Prepared by GPIF based on data from FTSE. FTSE Russell.

Figures 3, 4, and 6 (Note1) GPIF holdings: Among the stocks held by GPIF, we analyzed those with ESG ratings from MSCI.

(Note2) Industry adjustment: Difference between the final rating and the weighted average of each company's rating for environmental (E), social (S) and governance (G), arising due to the normalization of ratings by industry.

(Source) Prepared by GPIF based on data from MSCI. Reproduced by permission of MSCI ESG Research LLC ©2021.

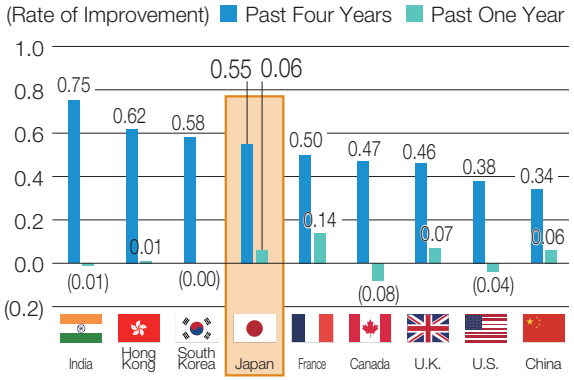
ESG Rating Ranking by Country

ESG Rating Ranking by Country

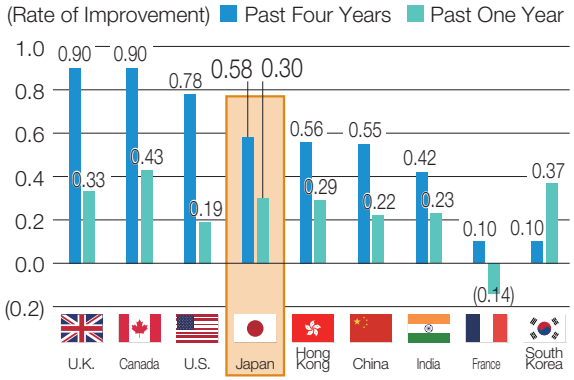
FTSE					
March 2017	March 2018	March 2019	March 2020	March 2021	Latest Value
					3.89
					3.75
					3.19
					3.06
					2.91
					2.55
					2.54
					2.33
					1.51

MSCI					
March 2017	March 2018	March 2019	March 2020	March 2021	Latest Value
					7.46
					7.18
					6.07
					5.70
					5.34
					4.24
					4.19
					4.07
					2.92

Rate of Improvement in FTSE ESG Ratings by Country

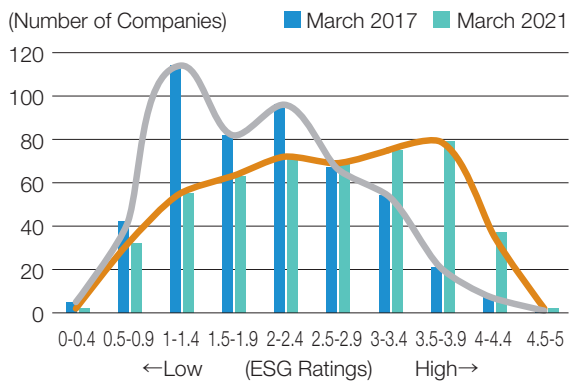


Rate of Improvement in MSCI ESG Ratings by Country

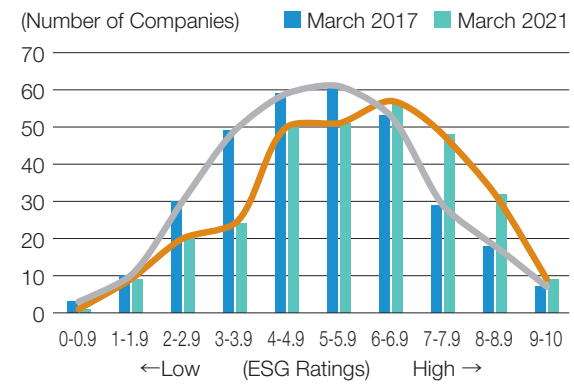


(Note) This figure shows the change over the four years from the end of March 2017 to the end of March 2021 and over the most recent year.

FTSE ESG Rating Distribution for Japanese Companies



MSCI ESG Rating Distribution for Japanese Companies



(Note) Among the companies included in FTSE's "FTSE Developed Index" and "FTSE Emerging Index" and MSCI's "MSCI All Country World Index," the analysis focused on those that had an ESG rating.

(Source) Prepared by GPIF based on data from FTSE and MSCI. FTSE Russell. Reproduced by permission of MSCI ESG Research LLC ©2021.

Column

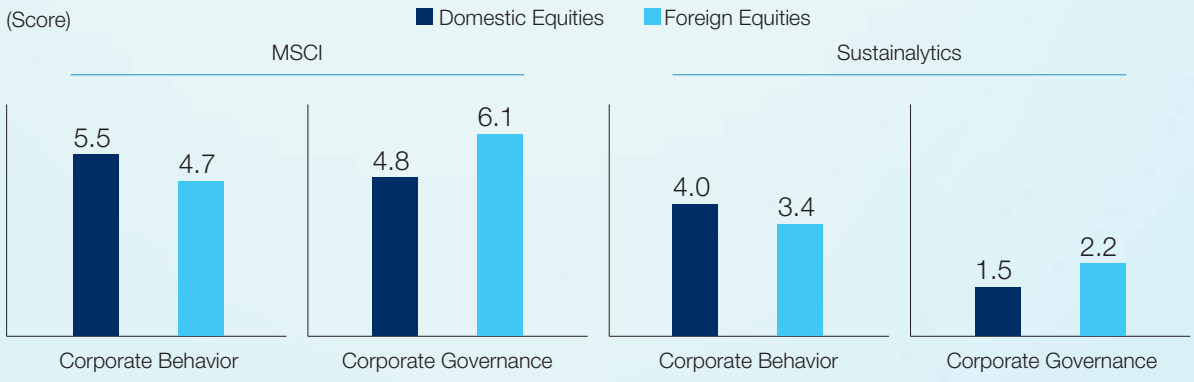
Corporate Governance and Corporate Behavior of Japanese Companies

As shown in "Portfolio ESG Rating" (page 43), in the ESG ratings for GPIF's equity portfolio, the G (corporate governance) score of both Japanese and foreign companies has been improving in recent years. Over the past year in particular, the G score of foreign companies, while still higher than that of Japanese companies, has flattened, while Japanese companies' scores have improved significantly from a lower level than their non-Japanese counterparts. Why are the corporate governance scores of Japanese companies improving?

In 2020, MSCI changed its ESG rating methodology for the assessment of G (Governance), adding a "Corporate Behavior" category as a risk indicator in addition to the existing category of "Corporate Governance." In this "Corporate Behavior" category, the company in question is assessed on matters such as "Business Ethics", "Corruption & Instability", and "Tax Transparency." Calculation of GPIF's equity portfolio scores in terms of corporate behavior found that Japanese companies scored higher than foreign companies (Figure 1). On the other hand, Japanese companies scored lower than their foreign counterparts in the Corporate Governance category, which assesses the company in question on matters including "Board", "Pay," "Ownership and Control," and "Accounting." (Figure 1).

To find out if other ESG rating agencies rate Japanese companies' corporate behavior highly as well, we checked Sustainalytics' evaluation metrics for "Corporate Governance" and "Corporate Behavior", which are similar to those of MSCI. As with the MSCI results, we found that foreign companies had a higher rating in "Corporate Governance" than Japanese companies, while Japanese companies rated higher in "Corporate Behavior" than foreign companies. Many Japanese companies have problems with "Corporate Governance," but if they can improve them, it will lead to improvement in their G score from rating agencies, and, as a result, significant improvement in their overall ESG score can be expected.

Figure 1. G score Comparison Between MSCI and Sustainalytics (as of May 31, 2021)



(Note1) GPIF evaluated portfolio companies for which data exists from both companies with respect to common criteria in the "Corporate Governance" and "Corporate Behavior" categories as well as the overall G Pillar score.
(Note2) Weighted average scores according to the market capitalization weight of each issue in GPIF's portfolio
(Note3) Ratings by Sustainalytics were converted to a scale of 1 (low) to 10 (high).

(Source) Prepared by GPIF based on data from MSCI and Sustainalytics.

Gender Diversity in Japanese Companies

Gender diversity is a central element of the "S" in ESG. This is a major issue for Japanese companies, but at the same time, it is an area with tremendous potential for improvement. In this chapter, we provide an overview of the current status of Japanese companies through a comparison with foreign companies and consider their challenges.

Gender Diversity in Japanese Companies

GPIF adopted the MSCI Japan Empowering Women Index (WIN) in 2017 and the Morningstar Gender Diversity Index (GenDi) in 2020 as passive equity benchmarks. In December 2019, GPIF joined the "30% Club Japan Investor Group," a group that aims to increase the ratio of female executives in Japanese companies. A large body of evidence shows that companies with greater gender diversity are able to access a wider pool of talent, which can potentially lead to more exceptional management performance. From a macro-economic perspective as well, higher gender diversity has the potential to boost the economic performance of individual countries. Based on this understanding, GPIF invests in companies with greater gender diversity in order to enhance the sustainable growth of our investments and the market as a whole for the purpose of increasing long-term investment returns.

Similar to last year, we reviewed data for the metrics used in the WIN index scoring methodology to gauge progress in gender diversity at Japanese companies as shown below.

The WIN index covers, among other things, five criteria ((i) to (v) in Figure 1) which companies are required to disclose under the Act on Promotion of Women's Participation and Advancement in the Workplace. We examined data for the 700 companies (500 until 2019) eligible for inclusion in this index. Looking at the median percentage for each criterion, (i) % Female New Hires and (ii) % Women in the Workforce were both 20-29% , (iv) % Women in Senior Management was less than 10%, and (v) % Women on Board was 10-19% (calculated excluding 0% values). From the perspective of gender diversity, the ratio of men is high and women remain in the minority for each criterion. On the other hand, looking at the trend over the past five years, while (i) % Female New Hires and (iii) Difference in years men and women are employed by the company have remained steady, (ii) % Women in Workforce, (iv) % Women in Senior Management, and (v) % Women on Board are trending upward. Although not a direct criterion of the WIN index, the percentage of companies with at least one female director on their board of directors rose significantly from 40% in 2017 to 72% in 2021 (Figure 1).

Figure 1. Actual Values for WIN Index Quantitative Score Items (Median)

	2017	2018	2019	2020	2021
(i) % Female New Hires	25.0%	27.9%	28.0%	28.9%	28.1%
(ii) % Women in the Workforce	17.0%	18.6%	18.8%	20.2%	21.2%
(iii) Difference in years men and women are employed by the company	(16.6%)	(16.5%)	(16.5%)	(17.5%)	(18.2%)
(iv) % Women in Senior Management	3.5%	4.5%	4.6%	5.1%	5.5%
(v) % Women on Board*	10.0%	10.0%	10.0%	11.1%	12.5%
Rate of Disclosure for (i) to (v)	73.6%	72.7%	77.3%	75.4%	74.0%
Reference: % Companies with Female Directors	40%	42%	52%	61%	72%

(Note) Includes companies evaluated in the WIN index (500 major companies up to 2019, and 700 major companies from 2020). * % Women on Board is calculated excluding the value of 0%.
(Source) Prepared by GPIF based on data from MSCI. Reproduced by permission of MSCI ESG Research LLC@2021.

Comparison of Japanese and Foreign Companies

Next, we analyzed how gender diversity in Japanese companies is evaluated internationally. Every year, the World Economic Forum (WEF) calculates the Global Gender Gap Index, which measures the gender gap in individual countries. Among the 156 countries assessed with this index, Japan ranked 120th in 2021 (121st of 153 countries in the previous year). The Global Gender Gap Index rates countries based on indicators across the four areas of Economic Participation and Opportunity, Educational Attainment, Health and Survival, and Political Empowerment. Japan scored particularly low in the economic and political rankings, ranking 117th among 156 countries in the economic area. The Global Gender Gap Report 2021 cited as reasons for Japan's low ranking in the "Economy" area its low percentage of female "Legislators, senior officials and managers" (14.7%), high rate of female "Workers employed part-time, % of employed people" (50.8%), and the low average of women's income (43.7% lower than men).

To compare the situation at Japanese companies with foreign companies in more detail, we conducted an international comparison using the Equileap Gender Equality Scorecard used in the GenDi Index, as shown below.

The Scorecard assigns companies a score ranging from 0 to 100 points in four categories: (1) Gender Balance in Leadership and Workforce; (2) Equal Compensation & Work-Life Balance; (3) Policies Promoting Gender Equality; and (4) Commitment, Transparency, and Accountability. As of March 31, 2021, 3,814 companies based in 25 developed countries have been researched. Looking at the average scores of these companies by country, Japan ranked 23rd among the 25 countries surveyed.

Advancement of Women into Executive Positions Remains a Challenge

We examined the standardized scores for Japanese companies for each of the 19 criteria included in Equileap's scoring methodology to verify which areas had particular room for improvement (Figure 2). While Japanese companies rank highly globally in terms of "parental leave" and "flexible work options," similar to last year, they continue to lag significantly behind the global standard in terms of the gender balance of boards of directors, executive positions and senior management – criteria that are particularly emphasized in the scoring methodology. For this reason, the gender balance of directors and executives is also a major theme in institutional investors' engagement. Some asset managers have a policy of opposing proposals for the appointment of top management if there are no women on the board. As mentioned above, the ratio of companies with at least one female director on the board rose significantly in companies assessed by the WIN Index, and we believe that this kind of shareholder lobbying is behind this trend. Nevertheless, even today, approximately 30% of companies have no female directors. We believe that improving the gender balance in companies' employees and managers will be a major long-term challenge for the improvement of the gender balance of directors.

Figure 2. Individual Criteria of Average Gender Scorecard and Standardized Scores of Japanese Companies for Each Criterion

Area	Criterion	Standardized Score	Change from previous year
A. GENDER BALANCE IN LEADERSHIP & WORKFORCE	1 Board of Directors	30.5	(0.7)
	2 Executives	29.8	(1.2)
	3 Senior Management	32.9	(1.7)
	4 Workforce	43.7	1.7
	5 Promotion & Career Development Opportunities	37.6	(1.6)
B. EQUAL COMPENSATION & WORK LIFE BALANCE	6 Living Wage	47.0	0.7
	7 Gender Pay Gap	44.2	0.3
	8 Parental Leave	65.0	0.6
	9 Flexible Work Style Options	60.1	4.6
C. POLICIES PROMOTING GENDER EQUALITY	10 Training and Career Development	53.1	0.7
	11 Recruitment Strategy	28.2	9.0
	12 Freedom from Violence, Abuse and Sexual Harassment	50.7	1.6
	13 Safety at Work	45.3	3.0
	14 Human Rights	56.9	1.7
	15 Social Supply Chain	45.6	(0.4)
	16 Supplier Diversity	29.3	0.7
	17 Employee Protection	38.9	4.0
D. COMMITMENT, TRANSPARENCY & ACCOUNTABILITY	18 Commitment to Women's Empowerment	51.5	(1.4)
	19 Audit	45.8	(0.8)

(Note) Standardized scores have been calculated based on the average score for each criterion among companies evaluated in each of the 25 countries. Standardized scores of 40 or lower are shown in red.
(Source) Prepared by GPIF based on data from Equileap.

Disclosure and Analysis of Climate-Related Financial Information: Composition and Key Points

In this our third year of disclosing in line with TCFD recommendations, we expanded our greenhouse gas emissions analysis to include the entire supply chain, and newly added a portion of our alternative asset portfolio (domestic real estate) to the scope of assets analyzed. Additionally, for the first time, we included an analysis of the implications of the shift to a low-carbon society on inter-industry transfers of opportunities and risks.

Analysis Expanded to Include Scope 3 Emissions and Inter-Industry Analysis

In this year's report, in addition to Trucost and MSCI, whom we partnered with last year, we newly engaged Astamuse Co., Ltd. to provide analysis support for our climate-related financial disclosures in line with TCFD recommendations. Astamuse is a Japan-based research company that excels in the analysis of intellectual property and patent information and of research and development investment. As in the previous fiscal year, we conducted a multifaceted analysis that leveraged these companies' respective strengths by dividing up the various areas to be analyzed by each company (Figure 1).

In particular, we aimed to improve three issues that were outstanding from the previous fiscal year's analysis: (1) include the entire supply chain in our greenhouse gas emissions analysis; (2) expand the analysis to include not only traditional asset classes but also alternative asset classes; and (3) provide an analysis of inter-industry transfer of opportunities and risks accompanying the transition to a low-carbon society. Our first aim was to "(1) include the entire supply chain in our greenhouse gas emissions analysis" by adding Scope 3 emissions. Greenhouse gas emissions across the entire supply chain can be roughly divided into the following categories: the company's direct emissions (Scope 1), indirect emissions related to purchased electricity (Scope 2), indirect emissions from procured products and services other than purchased electricity (upstream Scope 3), and indirect emissions from the consumption and use of sold products and services (downstream Scope 3) (Figure 2). Expanding the carbon footprint measurement of our portfolio to include Scope 3 emissions requires a degree of caution, as problems such as counting the same greenhouse gas emissions twice may arise (e.g., the Scope 1 emissions of one company may be included in the Scope 3 emissions of another company). However, our priority was to fully understand the situation across the entire supply chain, and thus we conducted the analysis based on the total value of Scope 1, 2, and 3 emissions.

The initial Climate Value-at-Risk (CVaR) model used to measure the impact of climate change risks and opportunities on the value of equities and corporate bonds was limited to Scope 1 emissions, but has been recently updated to include Scope 2 and Scope 3 emissions. In this model, the introduction of carbon pricing causes costs for the company to increase in direct proportion to Scope 1 emissions, but Scope 2 electricity and upstream Scope 3 raw materials emissions-related costs are affected by the share of costs passed down to the company. Similarly, for greenhouse gas emissions occurring when products are used in downstream Scope 3, the analysis must reflect the extent that demand will change if the company passes on carbon costs to the customer. In general, policy risks tend to increase as the scope of the analysis expands, resulting in a significant negative impact to CVaR. This is seen particularly for companies that produce goods that generate significant greenhouse gas emissions when used. In the analysis for this report, expanding the analysis to include Scope 2 and Scope 3 caused CVaR to fall significantly, predominantly in domestic stocks. (Please refer to pages 57–58 for details.) While the expanded CVaR analysis reflects a portion of Scope 1 and 2 pass-through costs, there is a limit to how far these extremely complex factors, such as price pass-through and price elasticity of demand, can be accounted for. As such, the results should be considered to occur within a certain range.

The second issue was to "(2) expand the analysis to include not only traditional asset classes but also alternative asset classes." In this year's climate-related financial disclosures, we conducted a CVaR analysis of domestic real estate in which GPIF invests through private funds. The results of that analysis showed that, even though real estate in Japan is naturally exposed to risks such as typhoons and flooding, the risk to the value of GPIF's overall portfolio is limited. (Please refer to pages 63–64 for details.)

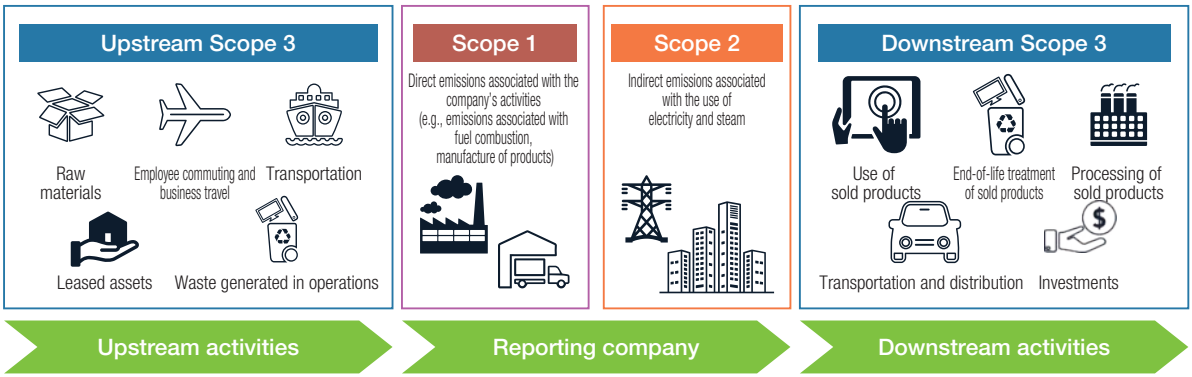
The third issue was to "(3) provide an analysis of inter-industry transfer of opportunities and risks accompanying the transition to a low-carbon society." In the patent-based CVaR assessment of opportunities from low-carbon technologies, the amount of possible revenue from environmental technologies in a certain sector that can be earned going forward is assumed to be equal to the cost of climate change policy (cost of reducing carbon emissions) in that same sector. In other words, in the transition to a low-carbon society, opportunities and risks will be redistributed within the same sector or industry. If we consider, for example, an intra-sector shift in demand from gasoline-powered vehicles to electric and hydrogen-powered vehicles, this is not such an unreasonable assumption. However, when viewed from a more long-term perspective, there are some additional points that need to be considered in the analysis. They include (1) the contribution of low-carbon technologies throughout the supply chain to reductions in carbon emissions beyond sector boundaries will result in the transfer of benefits and demand between sectors, and (2) changes in the prices of goods and services due to carbon pricing, etc. will bring changes to the overall demand structure. An analysis by Astamuse focusing on point (1) above found that the opportunities associated with the transition to a net-zero society greatly exceeded the risks, especially in the energy and chemical industries, and that Japan has promising technologies in these industries. (Please refer to pages 65–68 for details.)

Figure 1. Analysis of Major Climate Change-Related Risks and Opportunities Conducted for This Report

Contents of Analysis	Asset Class	Analysis Performed by
Carbon footprint analysis	Equities / corporate bonds	Trucost
Carbon intensity analysis	Equities / corporate bonds / government bonds	Trucost
Climate Value-at-Risk (CVaR)-based analysis*	Equities / corporate bonds / government bonds / real estate	MSCI
Warming potential analysis	Equities / corporate bonds / real estate	MSCI
Analysis of inter-industry transfer of transition risks and opportunities	Industries	Astamuse
Total patent asset analysis of decarbonization technologies by country/region	Industries / countries	Astamuse
SDGs positive impact / additionality analysis**	Equities	Trucost

(Note1) * In the CVaR analysis of government bonds, impact on GDP, not the price of government bonds, was analyzed.
(Note2) ** In the SDGs-related analysis, all opportunities arising from the resolution of the social issues identified in the SDGs were analyzed, not only climate change-related opportunities.
(Source) Prepared by GPIF based on various materials

Figure 2. Greenhouse Gas Emissions by Scope



(Note) The above figure indicates the major sectors included in each scope.
(Source) Prepared by GPIF based on the GHG Protocol, etc.

Analysis of Portfolio Greenhouse Gas Emissions

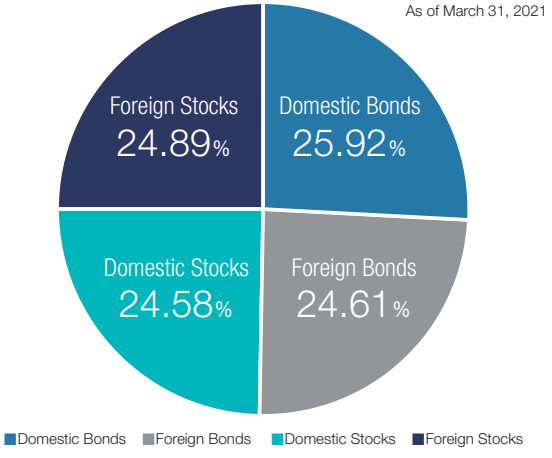
This analysis measures the greenhouse gas emissions (carbon footprint) of the companies held in GPIF's portfolio, based on an understanding of the characteristics of the portfolio's asset classes and sector weightings. Downstream Scope 3 emissions were newly added to the fiscal 2020 analysis.

Features of GPIF's Portfolio

The analysis looked mainly at four asset classes in GPIF's portfolio: domestic bonds, foreign bonds, domestic equities, and foreign equities. Some alternative assets[1] (domestic real estate in which GPIF invests through private funds) were also analyzed. In the sections that follow, we analyze greenhouse gas emission volumes (carbon footprint), transition risks,[2] physical risks,[3] and opportunities relating to these asset classes using data as of March 31, 2021. Because analysis results are heavily influenced by the investment amount and sector weighting of each asset class, it is important to understand the characteristics of our portfolio prior to interpreting these results.

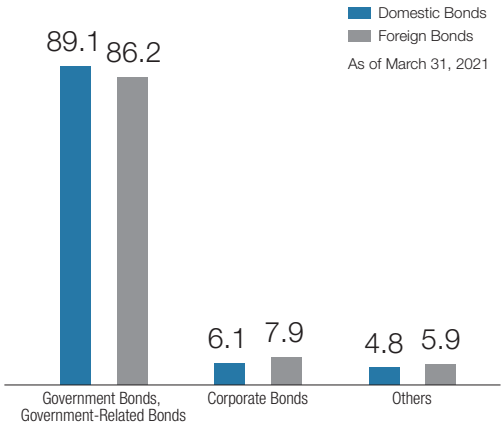
The GPIF portfolio is composed of roughly half bonds and half equities by overall market value (Figure 1). On the fixed income side, domestic bonds accounted for 25.92% of all holdings while foreign bonds accounted for 24.61%. For equities, domestic issues comprise 24.58% of the total portfolio and overseas issues 24.89%. The majority of bond holdings, both domestic and foreign, consist of government bonds (Figure 2).

Figure 1. Breakdown of Portfolio Asset Types (Total for GPIF's Pension Reserves)



(Source) GPIF

Figure 2. Breakdown by Category in GPIF Bond Portfolio (%)



(Note) "Other" includes securitized products.
(Source) GPIF

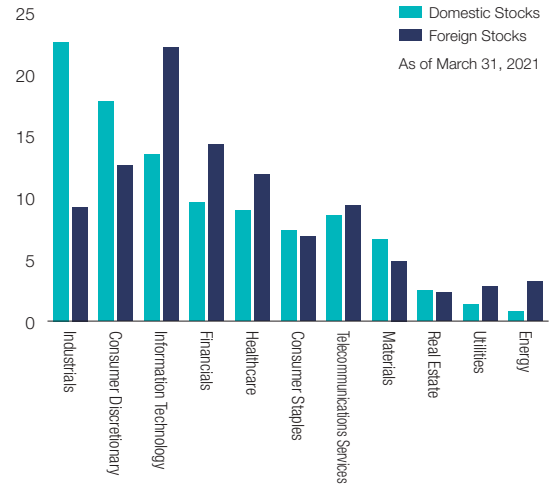
1 Alternative assets account for around 0.7% of the pension reserve fund. Alternative assets are generally allocated to the four main portfolio asset types according to their characteristics.
2 Transition risks are risks that arise from policy, technological innovation, demand change, etc. that accompany the transition to a low-carbon economy.
3 Physical risks are risks from direct damage to an asset, supply chain disruption, etc., resulting from climate change.

When examining GPIF's equity portfolio by sector, there is a difference in the composition of the domestic and foreign equity portfolios (Figure 3). The domestic equity portfolio has a higher proportion invested in the high-emitting industrials and consumer discretionary sectors, while the foreign equity portfolio has a high proportion in the low-emitting information technology, financials, and healthcare sectors.

Looking at the corporate bond portfolio, the largest sector for both domestic and foreign bonds is financials (Figure 4). Among domestic corporate bonds, the proportion of utilities and industrials is higher than that for foreign corporate bonds. Since utilities include electric power companies, this sector is characterized by higher greenhouse gas emissions than other sectors. In the foreign corporate bond portfolio, the proportion of energy companies, which have relatively high greenhouse gas emission volumes, is greater than that for domestic corporate bonds. On the other hand, the proportion of corporate bonds issued by telecommunication services and healthcare companies, which have lower emissions, is also high.

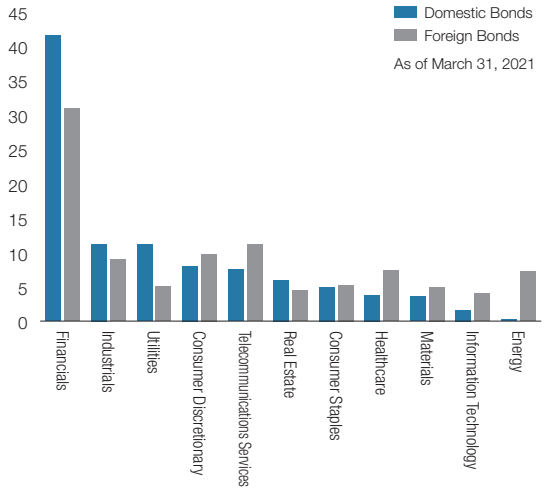
It is necessary to bear this sector bias in GHG emissions in mind when examining the results of the analysis presented in the following sections. Around 90% of stock investments and 70% of bond investments by GPIF are passive investments, which means our investment is virtually identical to the sector ratios of each benchmark.

Figure 3. Breakdown of GPIF Equity Portfolio by Sector Based on Total Market Value (%)



(Source) GPIF

Figure 4. Breakdown of GPIF Bond Portfolio by Sector Based on Total Market Value (%)



(Note) Only corporate issues are analyzed.
(Source) GPIF

Figure 5. Greenhouse Gas Emissions per Million Yen of Sales (CO_2 Equivalent Tons)

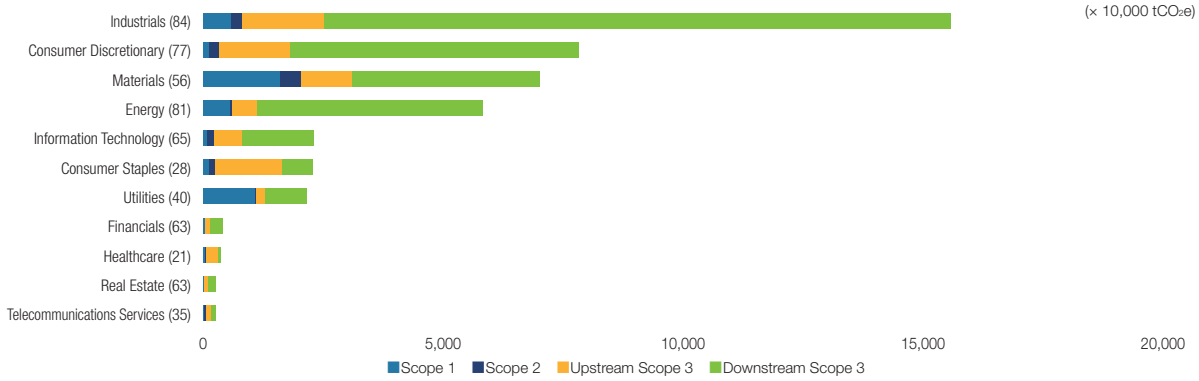
	Telecommunications Services	Consumer Discretionary	Consumer Staples	Energy	Financials	Healthcare	Industrials	Information Technology	Materials	Real Estate	Utilities
Domestic Stocks	1.22	10.25	4.77	**25.02**	0.85	1.13	15.91	5.59	**20.20**	3.25	**23.50**
Foreign Stocks	1.09	7.57	6.27	**35.54**	1.28	1.17	18.98	3.08	**27.93**	5.34	**29.46**
Domestic Bonds	1.30	9.27	9.57	**23.31**	1.00	1.13	9.91	4.32	**25.09**	2.77	**25.01**
Foreign Bonds	1.02	9.97	10.07	**34.62**	1.22	0.88	9.96	3.08	**32.15**	3.98	**31.75**

(Note) The aggregate scope of greenhouse gas emissions includes Scopes 1, 2, and 3. In each asset class, the top three sectors by volume of greenhouse gases emitted are shaded. For bonds, only corporate issues were analyzed. Data are as of March 31, 2021.
(Source) S&P Trucost Limited © Trucost 2021

Major Variations in the Magnitude of Greenhouse Gas Emissions by Sector According to the Scope of Calculation

In this year's report, we expanded the calculation scope of our carbon footprint and other analyses to include indirect emissions from the consumption and use of sold products and services (downstream Scope 3) in addition to direct emissions by the company (Scope 1), indirect emissions related to purchased electricity (Scope 2), and indirect emissions from procured products and services other than purchased electricity (upstream Scope 3). Looking at GPIF's equity portfolio emissions by sector and scope, downstream Scope 3 accounts for 50% or more of total emissions for 7 of the 11 sectors. This means that analysis result interpretations vary greatly depending on whether downstream Scope 3 emissions are considered. For portfolios with a higher weight of industrials, energy, and consumer discretionary companies in particular, analysis results change dramatically depending on whether or not Scope 3 is included in the calculation.

Figure 6. GHG Emissions by Scope in GPIF Equity Portfolio



(Source) S&P Trucost Limited © Trucost 2021
(Note) Numbers in brackets are the percentage of downstream Scope 3 emissions in total emissions.

Carbon Footprint (GHG Emissions) Analysis

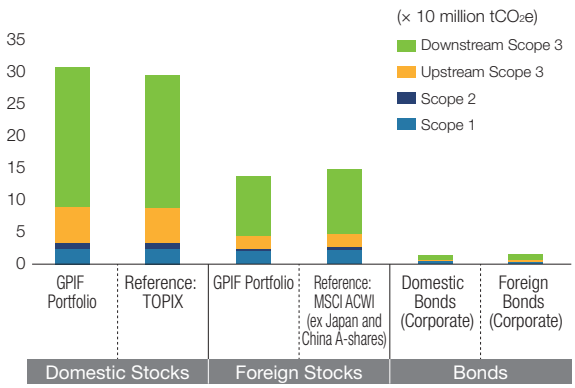
This analysis measures the carbon footprint of GPIF's equity and corporate bond portfolios for Scopes 1 through 3, based on the characteristics of downstream Scope 3 emissions.

Looking at total emissions by asset class, domestic equities were found to have the highest level of emissions, followed by foreign equities, foreign corporate bonds, and domestic corporate bonds (Figure 7). This result is roughly the same as last year's, but does not necessarily mean that domestic companies have more or less carbon emissions than foreign companies. Rather, it reflects the relative size and sector holding of each asset class within GPIF's portfolio.

The breakdown of the portfolio's carbon footprint shows that the combined emissions of Scopes 2 and 3 account for 65% or more of the total emissions for all assets. As such, calculating emissions across the entire supply chain and enhancing the transparency of these emissions and the potential for reducing them is crucial for companies to take efficient emission reduction measures.

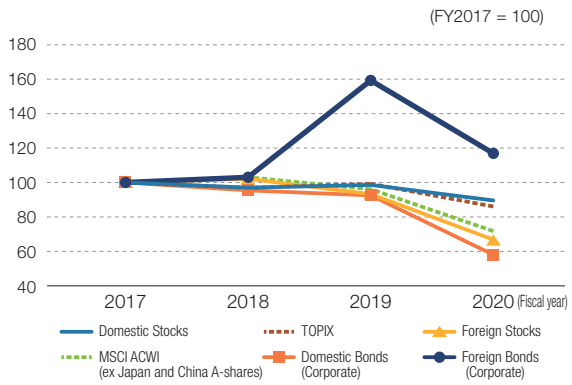
Figure 8 shows long-term greenhouse gas emission trends for Scopes 1, 2, and 3, using 100 for fiscal 2017 emissions as a base . The results indicated that fiscal 2020 saw the largest reduction of emissions in the four years since fiscal 2017. This may be attributable to the impact of COVID-19, as well as to changes in the companies held in GPIF's portfolio and invested amounts. Emissions related to foreign bonds increased significantly between fiscal 2018 and 2019. This is likely due to the decrease in the weight of domestic corporate bonds in the portfolio and corresponding increase in the weight of foreign corporate bonds in fiscal 2019. In fiscal 2020, emissions related to foreign corporate bonds also fell greatly.

Figure 7. Greenhouse Gas Emissions by Scope



(Source) S&P Trucost Limited © Trucost 2021

Figure 8. Greenhouse Gas Emission Trends



(Source) S&P Trucost Limited © Trucost 2021
(Note) The aggregate scope of greenhouse gas emissions includes Scopes 1, 2, and 3.

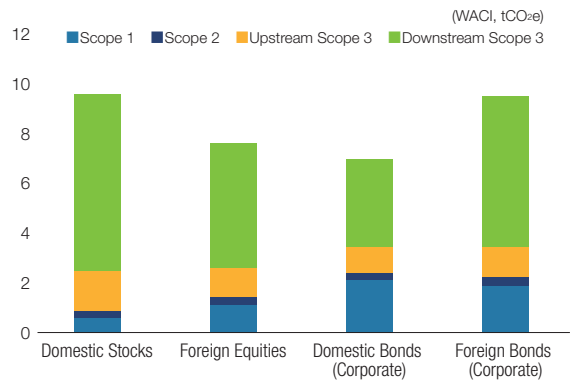
Carbon Intensity Analysis

Carbon intensity is calculated by dividing GHG emissions by value added per unit or some other metric. While carbon intensity can be calculated in a variety of ways, this analysis adopted the weighted average carbon intensity (WACI) approach for equities and bonds, in line with TCFD recommendations. WACI is calculated by multiplying each company's carbon emissions to revenue (C/R) by the weight of that company in the portfolio, then taking the sum of those products to get the weighted average of carbon intensity.

Out of GPIF's equity and corporate bond portfolios, WACI was particularly high for domestic equities and foreign bonds (Figure 9). For the former, Scope 3 downstream emissions accounted for around 74% of WACI, largely due to relatively high allocations to industrials, consumer discretionary and materials – all sectors with high indirect emissions. Foreign corporate bonds, on the other hand, in addition to having higher allocations to several carbon intensive sectors than domestic corporate bonds, also had a higher level of investment in the financials sector, which has a low carbon intensity.

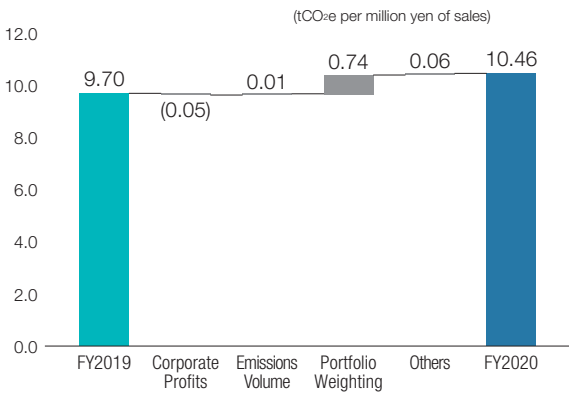
Finally, we analyzed the factors contributing to carbon intensity across the equity and corporate bond portfolio as a whole (Figure 10). In this analysis, we broke down the factors of changes in carbon intensity from fiscal 2019 to fiscal 2020 into (1) corporate profits, (2) companies' emissions volumes, (3) weight of each company in the portfolio, and (4) other factors. The carbon intensity (CO2-equivalent tons per million yen of sales) of GPIF's equity and corporate bond portfolio increased by 7.8%, from 9.70 tons to 10.46 tons, in the space of a year. The largest contribution was from the change in (3) weight of each company in the portfolio. This may be due to the shift to the new policy asset mix beginning in fiscal 2020, which saw a decrease in the weight of domestic bonds, which have a low carbon intensity, and an increase in the weight of foreign bonds, which have a high carbon intensity.

Figure 9. Weighted Average Carbon Intensity (WACI) for Equities and Corporate Bonds



(Source) S&P Trucost Limited © Trucost 2021

Figure 10. Analysis of Factors Contributing to Carbon Intensity



(Note) "Other" represents the cross term of "Corporate Profits," "Emissions Volume" and "Portfolio Weighting."
(Source) S&P Trucost Limited © Trucost 2021

Analysis of Equity and Corporate Bond Portfolio Using Climate Value-at-Risk, etc.

Climate Value-at-Risk (CVaR) is a method of measuring how climate policy changes and disasters caused by climate change impact corporate value. CVaR is an integrated approach that assesses both the risks and opportunities vis-à-vis corporate value stemming from climate change.

Revision of CVaR Analysis Model

GPIF first conducted a CVaR analysis of the climate change risks inherent in its portfolio in the *ESG Report 2019*. Since then, the CVaR methodology has been further refined through an expansion of the analysis to include Scope 3 emissions and revisions made to the CVaR calculation model itself. This fiscal year we have continued to conduct climate-change risk analysis on our portfolio in line with the TCFD recommendations. The following sections examine the impact of these model changes on analysis results.

The risks and opportunities considered in the CVaR analysis are comprised of "transition risks and opportunities" and "physical risks." "Transition risks and opportunities" combines "policy risks," which indicate the impact from greenhouse gas (GHG) emission regulations, and "technological opportunities," which indicate income opportunities made possible from technologies that have a competitive advantage under tightened regulations. "Physical risks," on the other hand, considers the impact of changes in the natural environment and disasters caused by climate change. For each of these components, we compared the results of three analyses: (1) portfolio analysis as of March 31, 2020 using the old calculation model, (2) portfolio analysis as of March 31, 2020 using the new model, and (3) portfolio analysis as of March 31, 2021 using the new model (Figure 1).

Under the 2°C scenario, the comparison revealed that the introduction of the new model (comparison between (1) and (2)) resulted in a reversal of transition risks and opportunities from a potential upside to corporate value of 8.1% to a potential downside of 0.4% due to increased policy risks and a decline in technological opportunities. On the other hand, physical risks improved slightly from -6.4% to -6.2%. A comparison of last year's and this year's portfolios based on the new model (comparison between (2) and (3)) showed a decrease in risks and increase in opportunities for all factors and an improvement in aggregate CVaR from -6.6% to -5.7%.

This revision of the analysis methodology had a particularly significant impact on technological opportunities. A breakdown of the elements of those changes shows that the greatest impact (-4.3%) was the result of weighting stocks by revenue instead of market capitalization in the weighted average sector (industry) profit ratio calculations used in CVaR (Figure 2). As weighted average market capitalization can change significantly due to stock price fluctuations, using weighted average revenue instead provides more consistent analysis results. This method can also curtail the excessive impact on sector profit margins caused by some large companies with large market capitalization in certain industries that have few companies. Results also confirm that updating the data on environment-related income (-2.3%), which is the source of technological opportunities for individual companies, and changes in market capitalization (-2.2%) also had an impact. Looking at the factors of policy risk changes reveals that, in addition to the impact of the different methodology used to calculate sector profit margins (-1.7%) seen in the case of technological opportunities, the expansion of the scope of the analysis to Scope 3 (-3.2%) and the refinement of Scope 2 (-1.6%) also had an impact. In terms of physical risks, fluvial flooding risks were added to the analysis, but the impact of that change was only slight, because these risks have already been incorporated as physical risks in other categories.

As mentioned above, even for the same portfolio, there is a significant difference in the CVaR analysis results caused by the revision of the calculation model. Having said that, comparing this year's portfolio with the previous fiscal year using the new model, climate change-related risks were shown to have decreased, indicating that CVaR this year did not substantially deteriorate from the previous fiscal year.

Figure 1. Changes in GPIF Portfolio CVaR (Total of Equities and Corporate Bonds) Due to Analysis Model Revision

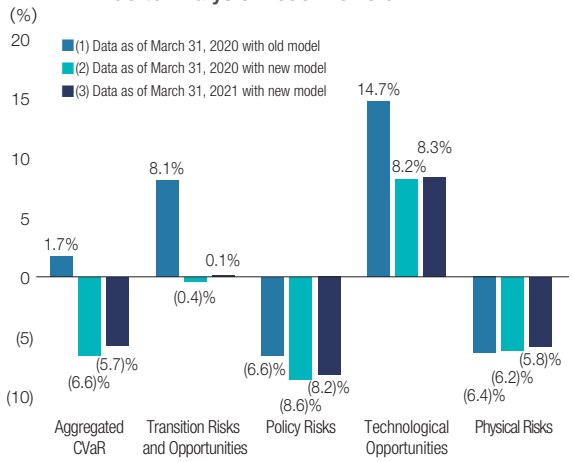


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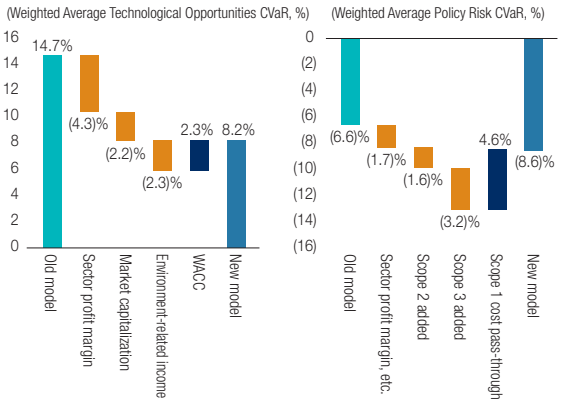
Figure 2. Breakdown of Changes in GPIF Portfolio CVaR (Total of Equities and Corporate Bonds) Due to Analysis Model Revision by Factor



(Note) Data is current as of March 31, 2020
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CVaR by Temperature Increase Scenario

In this report, we calculated CVaR for a scenario in which the global temperature rise from the pre-industrial period to the end of this century does not surpass 2°C (the 2°C scenario) and conducted our analysis based on the result of those calculations. As CVaR results vary depending on the temperature increase scenario being assumed, we first confirm the CVaR of GPIF's equity and corporate bond portfolio under scenarios in which policies are implemented to limit temperature increase to 1.5°C, 2°C, and 3°C (Figure 3).

To understand the overall trend represented by each of the scenarios, we focused first on aggregate CVaR for the total portfolio and found that the risks to the portfolio are smallest in the 1.5°C scenario, while the negative impact increases more as we move toward the 2°C and 3.0°C scenarios (i.e. less policy restrictions). Compared with last year's report, the gaps in CVaR between each scenario are smaller, owing largely to the analysis model revision. However, for both equities and corporate bonds, the impact of technological opportunities and policy risks are higher in the scenarios with greater curbs in temperature rises, indicating that climate policy trends are likely to have a significant impact on corporate value. Investors will have to pay close attention to climate change policy trends going forward as these will play a pivotal role in investment decisions.

Figure 3. CVaR by Temperature Increase Scenario (%)

CVaR for 3°C Scenario	Equities	Corporate Bonds	Total Portfolio
(1) Transition Risks and Opportunities	0.07	(0.18)	0.06
Policy Risks	(1.12)	(0.23)	(1.07)
Technological Opportunities	1.19	0.05	1.13
(2) Physical Risks	(6.08)	(0.90)	(5.82)
(3) Aggregate	**(6.01)**	**(1.08)**	**(5.76)**

CVaR for 2°C Scenario	Equities	Corporate Bonds	Total Portfolio
(1) Transition Risks and Opportunities	0.33	(3.68)	0.11
Policy Risks	(8.42)	(3.90)	(8.19)
Technological Opportunities	8.75	0.22	8.30
(2) Physical Risks	(6.08)	(0.90)	(5.82)
(3) Aggregate	**(5.75)**	**(4.58)**	**(5.71)**

CVaR for 1.5°C Scenario	Equities	Corporate Bonds	Total Portfolio
(1) Transition Risks and Opportunities	0.72	(8.11)	0.25
Policy Risks	(17.54)	(8.49)	(17.08)
Technological Opportunities	18.26	0.38	17.33
(2) Physical Risks	(6.08)	(0.90)	(5.82)
(3) Aggregate	**(5.36)**	**(9.01)**	**(5.57)**

(Note) Physical risks are analyzed under assumptions corresponding to a 4°C–6°C scenario.
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Technological Opportunities: Remarkably High Scores for Domestic Equities

We saw on the previous page that technological opportunities have changed dramatically from the previous year due to revisions made to the analysis model. Here, we investigate the patent scores used to calculate technological opportunities for companies included in GPIF's equity and corporate bond portfolios. While analysis results are affected by the amounts invested in individual companies, the portfolio as of March 31, 2021 examined in this analysis is generally in line with the policy asset mix. As such, in terms of equities, the portfolios do not deviate significantly from policy benchmarks. The patent score calculation tabulates all low-carbon technology patents held by a given company and reflects any change in the number of such patents.[1] The results of this analysis do not differ greatly from the previous year, with domestic companies in the automotive and energy supply sectors scoring exceptionally high. The inter-industry transfer of transition risks and opportunities analysis introduced on page 65 employs a different methodology to assess the patent competitiveness of decarbonization technologies by county and region.

Looking at patent scores by sector, the consumer discretionary sector, which includes automotive manufacturers, scored markedly higher compared with other sectors in the domestic equities portfolio. Within this sector, "automobiles" had the highest patent score, followed by "energy supply," "electric vehicles," and "chemicals" (Figure 1). In the information technology sector, patent scores are high in "energy supply" and "automobiles." Meanwhile, in the case of foreign equities, the scores for industrials are the highest, with patents related to aircraft, wind power, and automobiles making major contributions. In the information technology sector, "information technology" scored highly, while "automobiles" scored highly in the consumer discretionary sector, similar to domestic equities (Figure 2).

In the domestic bond portfolio as well, "automobiles" tend to have higher scores in the consumer discretionary sector as in the domestic equity portfolio, as does "energy supply" in the information technology sector. For foreign corporate bonds, there was an increase in the weighted average patent scores in "automobiles" and "energy supply" for the consumer discretionary sector (Figures 3 and 4).

Figure 1. Technological Opportunities: Domestic Equity Portfolio

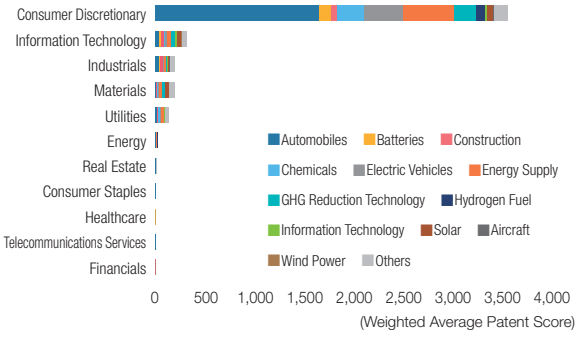

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Figure 2. Technological Opportunities: Foreign Equity Portfolio

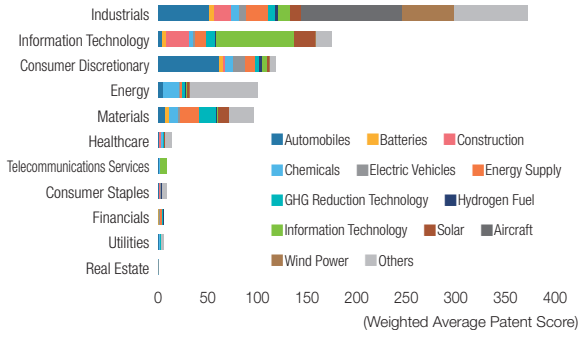

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Figure 3. Technological Opportunities: Domestic Corporate Bond Portfolio

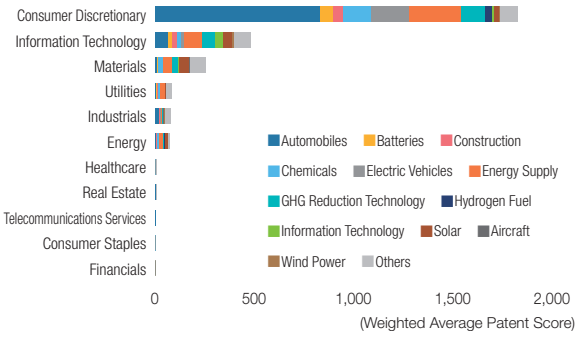

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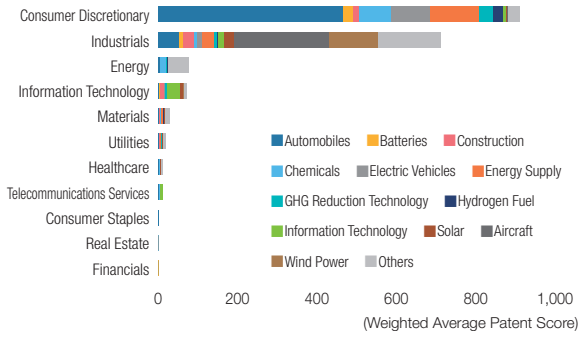
Figure 4. Technological Opportunities: Foreign Corporate Bond Portfolio



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1 The evaluation of patent scores is based on "forward citations," which is the number of patents cited in other parties' patent applications, "backward citations," which is the number of other parties' patents cited when filing one's own patent application, "market coverage," or the total GDP of countries to which the patent application was filed, and "cooperative patent classification (CPC) coverage." Please refer to *Analysis of Climate Change-Related Risks and Opportunities in the GPIF Portfolio* (a supplementary guide to the *ESG Report 2019*) for details.

Policy Risks: Expanding the Scope of Analysis Enables Evaluation of a Wider Variety of Risks

We also analyzed policy risks, which, together with technological opportunities, constitute transition risks and opportunities. In the policy risk evaluation conducted in the supplementary guide to last year's *ESG Report 2019*, we analyzed the Scope 1 and Scope 2 emissions of companies in the portfolio. This year, the scope of the analysis was expanded to include Scope 3 emissions. These emissions consist of "upstream Scope 3," which encompasses the raw materials, services, and labor inputs to companies' production activities, and "downstream Scope 3," which covers the sale of produced goods and services. In the analysis, we focused on changes in Scopes 1 and 2 from the previous year and the magnitude of Scope 3 risks (Figures 1–4).

For overall policy risk CVaR including Scope 3, results for domestic equities showed that there were greater risks in the energy sector (which includes companies such as fossil fuel mining companies), the utilities sector (which includes electric power and other companies), and the materials sector, while risks in the healthcare, telecommunications services, and financial sectors remain low. This was a similar trend to last year. Scope 1 and 2 risks decreased across all sectors (industries) from the previous year, including energy (11.5 percentage points), utilities (4.8 percentage points), and materials (9.1 percentage points). This may be largely attributable to the fact that a portion of the costs of reducing emissions were passed through to the corporate value chain as a result of the introduction of Scope 3 in the current fiscal year. Meanwhile, Scope 3 risks tend to be smaller than those of Scopes 1 and 2 in all sectors as a whole. This is due to the fact that, although absolute Scope 3 greenhouse gas emissions are generally large, this is not necessarily the case when companies' assumed burden rates are taken into account. By sector, energy and utilities have the highest Scope 3 policy risks, followed by the consumer discretionary sector, which includes automobiles. Conversely, for Scopes 1 and 2, risks for the materials sector exceed those for the consumer discretionary sector.

Foreign equities showed the same trend as last year, with risks in the utilities, energy, and materials sectors remaining high. Policy risks in the utilities sector also increased from last year. Compared with foreign equities, domestic equity policy risks are greater in the energy sector, because certain companies in the sector are weighted more heavily than others.

In the corporate bond analysis, the three industries with the highest risks remain the energy, utilities, and materials industries, both domestically and overseas. Changes in Scopes 1 and 2 differ from those of equities, however, due to the fact that the equity portfolio and corporate bond portfolio have different constituent companies. In terms of Scope 3, we found there to be meaningful policy risks in the energy sector, which is impacted greatly by the use of fossil fuels, in both domestic and foreign portfolios.

Figure 1. Policy Risk: Domestic Equity Portfolio (%)

Sector	Policy Risk CVaR			Change from previous year (percentage points)
		Scopes 1 + 2	Scope 3	
Healthcare	(1.1)	(0.5)	(0.6)	0.1
Telecommunications Services	(1.2)	(0.6)	(0.7)	0.3
Financials	(2.1)	(0.8)	(1.3)	0.0
Real Estate	(2.7)	(1.3)	(1.4)	0.5
Information Technology	(2.8)	(1.5)	(1.3)	0.5
Consumer Staples	(6.5)	(3.5)	(3.0)	0.6
Industrials	(10.0)	(6.5)	(3.5)	1.9
Consumer Discretionary	(11.0)	(2.6)	(8.4)	1.6
Materials	(30.1)	(25.3)	(4.8)	9.1
Utilities	(69.7)	(46.8)	(23.0)	4.8
Energy	(95.2)	(63.2)	(32.0)	11.5

(Note) Changes from the previous year refers to changes in Scopes 1 + 2
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Figure 2. Policy Risk: Foreign Equity Portfolio (%)

Sector	Policy Risk CVaR			Change from previous year (percentage points)
		Scopes 1 + 2	Scope 3	
Information Technology	(0.8)	(0.5)	(0.4)	0.2
Healthcare	(1.3)	(0.8)	(0.5)	0.1
Real Estate	(1.6)	(1.3)	(0.3)	0.1
Financials	(1.7)	(1.1)	(0.6)	0.2
Telecommunications Services	(1.7)	(1.5)	(0.3)	0.3
Consumer Discretionary	(3.6)	(1.3)	(2.3)	0.5
Consumer Staples	(6.0)	(4.2)	(1.8)	1.7
Industrials	(7.6)	(6.5)	(1.1)	3.5
Materials	(23.9)	(21.2)	(2.6)	12.3
Utilities	(36.8)	(32.9)	(3.9)	(3.8)
Energy	(46.6)	(31.3)	(15.3)	17.9

(Note) Changes from the previous year refers to changes in Scopes 1 + 2
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Figure 3. Policy Risk: Domestic Corporate Bond Portfolio (%)

Sector	Policy Risk CVaR			Change from previous year (percentage points)
		Scopes 1 + 2	Scope 3	
Telecommunications Services	0.0	0.0	0.0	0.0
Financials	(0.1)	0.0	0.0	0.0
Real Estate	(0.1)	0.0	(0.1)	0.1
Information Technology	(0.2)	(0.2)	0.0	0.1
Healthcare	(0.3)	(0.1)	(0.2)	0.0
Consumer Staples	(0.4)	(0.2)	(0.2)	0.1
Consumer Discretionary	(0.8)	(0.1)	(0.7)	0.1
Industrials	(2.2)	(2.0)	(0.2)	1.7
Materials	(19.3)	(18.7)	(0.6)	9.3
Utilities	(24.7)	(23.6)	(1.1)	(15.2)
Energy	(39.7)	(11.7)	(28.0)	35.4

(Note) Changes from the previous year refers to changes in Scopes 1 + 2
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Figure 4. Policy Risk: Foreign Corporate Bond Portfolio (%)

Sector	Policy Risk CVaR			Change from previous year (percentage points)
		Scopes 1 + 2	Scope 3	
Real Estate	(0.1)	(0.1)	0.0	0.0
Information Technology	(0.2)	(0.2)	0.0	(0.1)
Healthcare	(0.2)	(0.2)	(0.1)	0.0
Telecommunications Services	(0.2)	(0.2)	0.0	0.1
Consumer Discretionary	(1.0)	(0.5)	(0.6)	(0.1)
Financials	(1.3)	(1.1)	(0.1)	(1.0)
Consumer Staples	(1.9)	(1.4)	(0.6)	(0.6)
Industrials	(6.7)	(6.6)	(0.2)	(2.8)
Materials	(13.5)	(13.2)	(0.3)	1.1
Energy	(17.7)	(13.1)	(4.6)	(0.5)
Utilities	(20.6)	(20.4)	(0.2)	4.2

(Note) Changes from the previous year refers to changes in Scopes 1 + 2
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Physical Risks: Coastal Flooding Risk Particularly Notable

Next, we conducted an analysis of the physical risks[1] in GPIF's portfolio. In the physical risk analysis, we examined potential deterioration in corporate revenues arising from asset damage and productivity declines caused by climate change-induced abnormal weather, such as floods and extreme heat. At the same time, we also analyzed the potential for increased revenues resulting from such extreme weather. For example, if rising temperatures lead to an improvement in operating rates and a reduction in heating costs in cold regions, the results of the physical risk analysis will be positive. This year, we started analyzing fluvial flooding risk to evaluate the impact of river overflows caused by heavy rain and other factors.

As was the case last year, physical risks by sector and by portfolio continue to show different trends from policy risks (Figures 1 and 2). First, in the domestic equity portfolio, the utilities and energy sectors were shown to have significant physical risks in addition to policy risks, followed by the financials and consumer staples sectors. On the other hand, the risk to telecommunications services, which was high last year, has decreased due to an increase in the ratio of investment in companies with relatively low physical risks. In the foreign equity portfolio, the financials, real estate, and telecommunications services sectors have significant physical risks. Most of these are caused by coastal flooding and extreme heat. It is likely that financials are affected by the location of physical offices, and the consumer staples sector is affected by the fact that many production bases and distribution facilities are located at low altitudes, exposing them to the risk of flooding. For both domestic and foreign portfolios, extreme heat has a significant impact on the energy sector, where temperature increases and other factors are likely to impact fossil fuel mining efficiency and the refining business. Industrials were considered to have high policy risks in both the domestic and foreign portfolios, but the analysis showed that physical risks for this sector are low.

For domestic bonds, physical risks were found to be highest in the utilities sector, followed by the healthcare, consumer staples, and materials sectors, while for foreign bonds, the consumer discretionary, real estate, and financials sectors had the highest risk (Figures 3 and 4). It is likely that the risk of coastal flooding is high in any of these portfolios because of the location of facilities such as offices and factories.

Figure 1. Physical Risks: Domestic Equity portfolio

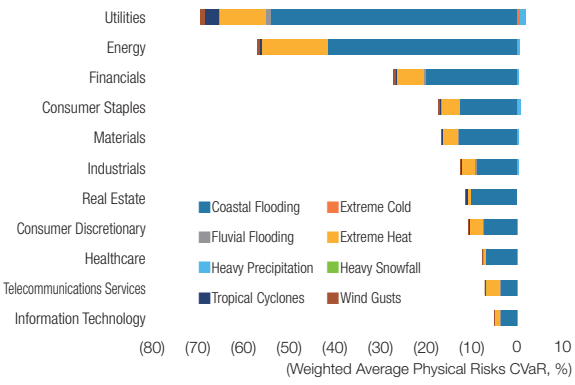


Figure 2. Physical Risks: Foreign Equity Portfolio

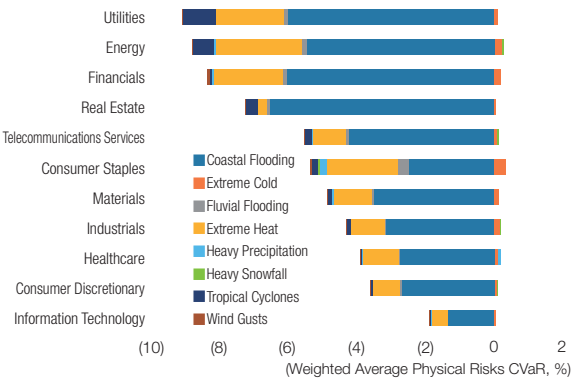


Figure 3. Physical Risks: Domestic Bond Portfolio

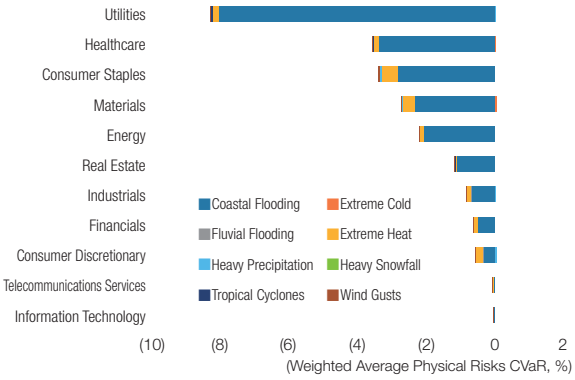
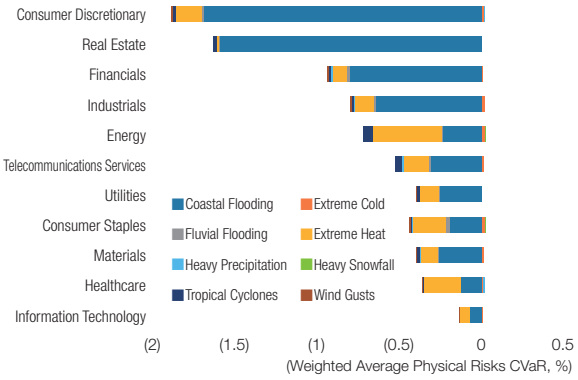


Figure 4. Physical Risks: Foreign Bond Portfolio



1 In this year's ESG Report, we used the term "physical risks," as opposed to "physical risks and opportunities" used in last year's report. However, as stated in this report, as was the case last year, the positive and negative effects on corporate earnings have been offset.

Analysis of Portfolio Global Warming Potential

Global warming potential is a measure of the extent to which greenhouse gases emitted by the companies reviewed can potentially contribute to global warming, expressed as an increase in temperature. Specifically, we estimate individual companies' greenhouse gas emission trends through 2100, and gauge how much global average temperatures would increase if all greenhouse gas emissions followed the same path.

In estimating warming potential, we (1) derive a function linking carbon intensity to warming potential for each sector based on literature such as the Emissions Gap Report published by UNEP, (2) estimate the future carbon intensity of each company, (3) calculate the warming potential for each company in the portfolio using the function derived in (1) and the carbon intensity of each company estimated in (2), and (4) calculate the weighted average warming potential of the portfolio using the portfolio weight of each company.

In previous years' reports, we used Scope 1 (direct) and Scope 2 (indirect) emissions for this analysis, but this year, we also included Scope 3 emissions in addition to factoring in companies' emission reduction targets.

The results of the analysis showed that the warming potential of GPIF's portfolio as a whole was 3.40°C for domestic equities, 3.26°C for domestic bonds, 3.49°C for foreign equities, and 4.34°C for foreign bonds (Figures 1–4). In all asset classes, warming potential is well above 2°C. Looking at domestic and overseas trends, the warming potential for foreign companies was generally higher than that for domestic companies.

A breakdown of trends by sector reveals that warming potential tended to be high in the energy and materials sectors across all asset classes (Figures 1–4), while a comparison of the domestic and overseas portfolios shows that the warming potential of foreign companies is higher than that of Japanese companies, particularly in the energy and materials sectors.

In all cases, warming potential is naturally lower when emission reduction targets are factored in than when they are not. To bring the global warming potential closer to 2°C, it is critical for companies to set reduction targets and take action to achieve them.

Global Warming Potential in GPIF Portfolio by Sector

Figure 1. Domestic Equities

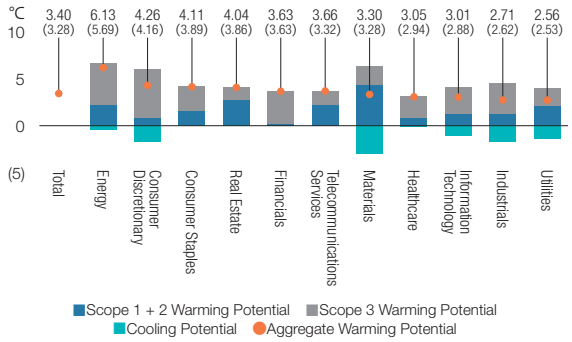


Figure 2. Domestic Bonds

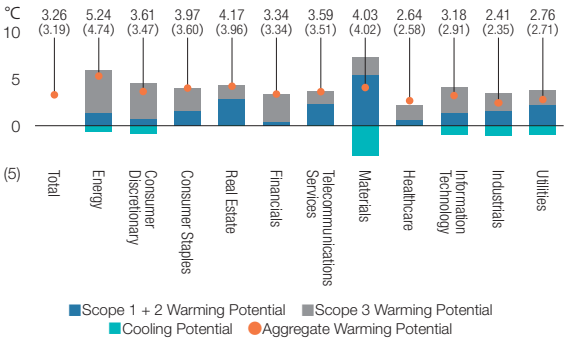


Figure 3. Foreign Equities

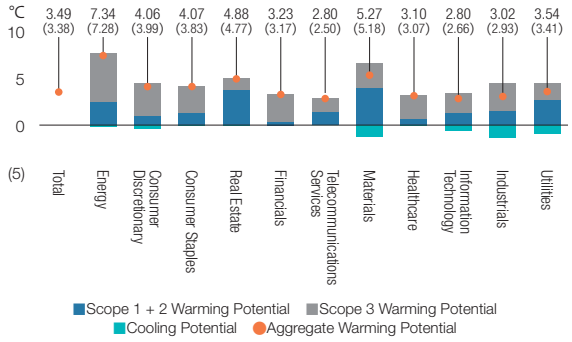
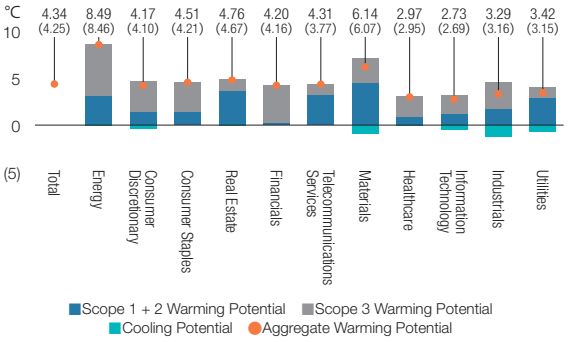


Figure 4. Foreign Bonds



(Note) Global warming potential figures do not have emission reduction targets factored in. Figures in parentheses ( ) indicate global warming potential with emissions reduction targets factored in.

Greenhouse Gas Emission and Climate Value-at-Risk Analysis of Government Bond Portfolio

Understanding how the many risks related to climate change will affect government bond prices is an extremely complex problem. These risks, however, undeniably have the potential to affect GPIF's portfolio considering the fiscal burden and other impacts from the response to climate change-related transition and physical risks. In this report, we conducted an analysis based on several assumptions to gauge the potential impact of climate change risks to GDP for the countries in which we invest.

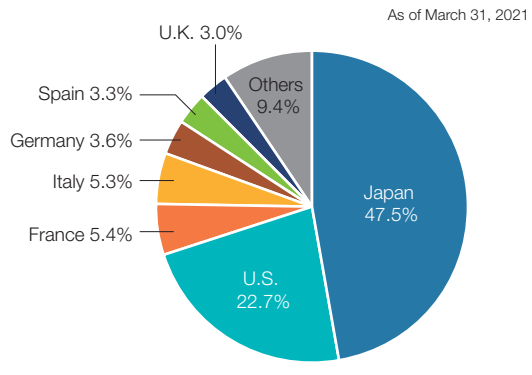
Analysis of Government Bond Greenhouse Gas Emissions, etc.

The greenhouse gas emissions and other analyses covered so far have examined the equities and corporate bonds issued by companies in which GPIF invests. This section, meanwhile, analyzes sovereign bonds issued by national governments. There are basically two ways of analyzing climate change risk for government bonds: one is to consider only greenhouse gas emissions produced by the government sector of the nation issuing the bond, while the other takes into account the entire sphere of influence of the nation as a whole, including greenhouse gas emissions generated by the activities of that country's corporations and individuals. The analysis conducted for this report adopts the latter approach.

In the analysis of government bonds, just as when analyzing equities and corporate bonds, it is important to understand that results are greatly influenced by factors such as which specific sovereign bonds make up the portfolio. The overall GPIF portfolio of foreign and domestic government bonds (hereinafter, "GPIF's overall government bond portfolio") is made up of about half foreign and half domestic government bonds (Figure 1). In addition, when we examined the difference between the country weights of GPIF's overall government bond portfolio versus a weighted average benchmark of foreign and Japanese government bonds derived from the ratios in the policy asset mix, GPIF's overall government bond portfolio was shown to be similar to the benchmark, albeit with slightly lower holdings in Japanese bonds.

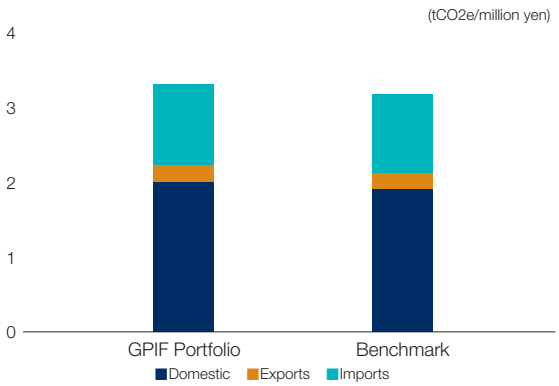
Based on the concept of weighted average carbon intensity (WACI), we compared greenhouse gas emissions per million yen of gross domestic product (GDP) for countries in the government bond portfolio against the GPIF's overall government bond portfolio and the benchmark. In this analysis, WACI for GPIF's overall government bond portfolio was found to be slightly higher than the benchmark (Figure 2). This was partly because the portfolio is overweight in bonds issued by countries where greenhouse gas emissions are relatively high, such as Indonesia and South Africa.

Figure 1. Weight by Country in GPIF Government Bond Portfolio



(Source) GPIF, S&P Trucost Limited © Trucost 2021

Figure 2. Carbon Intensity of Government Bond Portfolio



(Source) GPIF, S&P Trucost Limited © Trucost 2021
(Note) Greenhouse gas emissions are categorized as "domestic" or "imports" for demand inside a region, and as "exports" for emissions associated with domestic production to meet overseas demand.

CVaR Analysis of Government Bonds

Last year, we conducted a CVaR analysis of equities and corporate bonds only, but this year, we also conducted the same analysis for government bonds. While the analysis for equities and corporate bonds estimates the impact on securities values, the CVaR methodology for government bonds assesses how the implementation of policies to achieve the 2°C target would affect GDP trends for individual countries through 2050.

For this analysis, we used the REMIND model developed by the Potsdam Institute for Climate Impact Research and adopted by the Network of Central Banks and Supervisors for Greening the Financial System (NGFS).1 There is no one single path to achieving the 2°C target by the end of this century; for this analysis, we assumed (1) an immediate 2°C scenario, in which proactive climate action is taken immediately, and (2) a delayed 2°C scenario, in which climate action is delayed.

For (1) the immediate 2°C scenario, we assume that the power generation capacity from renewable energy will rapidly expand in the 2020s, carbon prices will surge throughout the world in the 2030s, and decarbonization efforts will accelerate across the entire economy. Meanwhile, for (2) the delayed 2°C scenario, we assume that by 2030 each country will achieve the national targets set in 2016 at the conclusion of the Paris Agreement, but conversely that environmentally friendly energy technologies will not become widespread until that year. The analysis also assumes that carbon prices will not rise significantly until 2030 and will increase sharply thereafter.

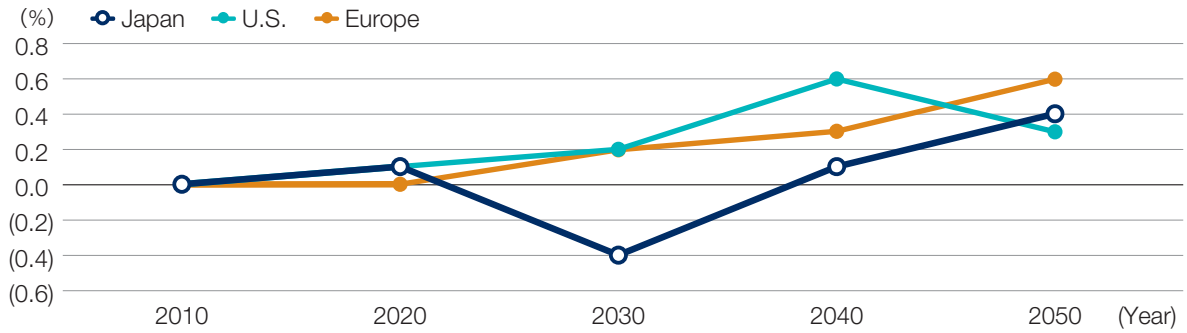
In this report, we analyzed the impact on GDP in Japan, the United States, and Europe in each of these two scenarios. Each region showed a decline in GDP when climate measures were taken, although the magnitude of the impact varies by scenario and region.

Figure 3 shows the difference in the impact on GDP between the immediate 2°C scenario and the delayed 2°C scenario (difference in GDP between the two scenarios). If the value on the graph is positive (negative), it can be interpreted as a positive (negative) impact on GDP if the immediate 2°C scenario is implemented.

In the case of Japan, the immediate 2°C scenario has a negative impact on GDP as of 2030, but a positive impact on GDP as of 2040 and 2050. In the United States and Europe, the immediate 2°C scenario has a positive impact on GDP at all time points—2030, 2040, and 2050. The result of this analysis shows that the immediate 2°C scenario can be expected to have a positive impact on GDP in the long term compared with the delayed 2°C scenario.

Figure 3. Analysis of GPIF Government Bond Portfolio: Difference in GDP between Immediate 2°C Scenario and Delayed 2°C Scenario

Country/Region	Immediate 2°C Scenario vs Delayed 2°C Scenario (%)		
	2030	2040	2050
Japan	(0.4)	0.1	0.4
U.S.	0.2	0.6	0.3
Europe	0.2	0.3	0.6



(Note) Delayed 2°C scenario set at 0%. Some estimates at the time of publication of the model (June 2019) are used in the figures for 2020.
(Source) MSCI ESG Research LLC, REMIND-MAgPIE 1.7-3.0, NGFS Phase I Scenarios of June 2020, IIASA 2020

1 Please refer to page 40 for information about the NGFS. Of NGFS Phase 1's three models, we used the REMIND model (REMIND 1.7-MagPIE 3.0 Integrated Assessment Model) only.

Analysis of Real Estate Portfolio Using Climate Value-at-Risk

In last year's report, GPIF conducted an analysis of climate-related financial information for traditional asset classes only. This fiscal year, however, we are including a new analysis of domestic real estate included in alternative assets. CVaR enables us to analyze the physical risks, transition risks, and global warming potential of our domestic real estate portfolio.

Features and Physical Risks of GPIF's Real Estate Portfolio

GPIF's portfolio includes traditional assets such as equities and bonds, as well as alternative assets such as infrastructure, private equity, and real estate. In this year's climate-related financial disclosures, we conducted a quantitative analysis of climate change risk for domestic real estate in which we invest through private equity funds. Among these, we are able to analyze the impact of physical risks and transition risks on the value of real estate assets. Breaking down domestic real estate properties included in the analysis by type, industrial properties such as logistics facilities account for the largest share at 61%, followed by rental housing (15%), retail (12%), and offices (10%).

In the physical risk analysis, we assessed the risks of (1) coastal flooding, (2) fluvial flooding, (3) tropical cyclones, (4) extreme heat, and (5) extreme cold, as well as comprehensive physical risks covering all of those risks by sector. If available, information on countermeasures against physical risks for each property is partially included in the analysis, but in general, we use methods that emphasize information on the location and topography of the property. Results are expressed in terms of physical risk CVaR and classified into six levels: very high, high, medium, low, very low, and no risk.

The results of the analysis indicate a high risk from (3) tropical cyclones across all sectors. Risks from (4) extreme heat were relatively high as well, except for rental housing. On the other hand, risks posed to the overall portfolio by (1) coastal flooding and (2) fluvial flooding, which are of particular concern in Japan, are low despite the inclusion of a very small number of properties with a particularly high risk of coastal and other flooding (Figure 1). As a result, comprehensive physical risks covering (1) to (5) are generally "low" or "very low" in each sector. However, when we looked at the distribution of physical risks for each property, we found that there were a small number of properties with high risks, such as coastal flooding (Figure 2).

Global Warming Potential and Transition Risks

This analysis also confirmed that the warming potential of the entire portfolio analyzed is currently 2.78°C, which is higher than the 2°C and 1.5°C targets set by the Paris Agreement (Figure 3). In the analysis of transition pathways, we measured the carbon intensity (greenhouse gas emissions per area) of each property and estimated the required reduction in carbon intensity by 2034 needed to reach the 1.5°C, 2°C, and 3°C targets. Data on environmental performance and the energy usage for each property is included in the analysis if available, but in general, we use methods that emphasize information on the location and topography of the property if such information has not been disclosed. The analysis results showed that portfolio emissions need to decline by a total of 32.8 CO_2-equivalent kilograms per square meter over the next ten years or so in order to achieve the 1.5°C target (Figure 4).

As described above, by analyzing climate-related financial information on the real estate portfolio using CVaR, we were able to evaluate physical risks from natural disasters, global warming potential, and the distance to the achievement of the 1.5°C target. However, unlike climate-related risk and opportunity

analysis for traditional asset classes, there is still a great deal of room for further development in the analysis for alternative assets. There are several reasons for this, such as data limitations that restrict the scope of analysis for alternative assets, and the fact that results differ at the portfolio level depending on whether the weighted average is calculated using gross floor area or asset price.

Figure 1. Physical Risks by Sector

	Coastal Flooding	Fluvial Flooding	Tropical Cyclones	Extreme Heat	Intense Cold	Aggregate Physical Risks
Industrial	Very Low	Low	High	High	No Risk	Low
Offices	Very Low	No Risk	High	High	No Risk	Very Low
Rental Housing	Very Low	No Risk	High	No Risk	No Risk	Low
Retail	No Risk	No Risk	High	High	No Risk	Very Low
Others	No Risk	No Risk	High	High	No Risk	Very Low

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Figure 2. Distribution of Properties by Physical Risk

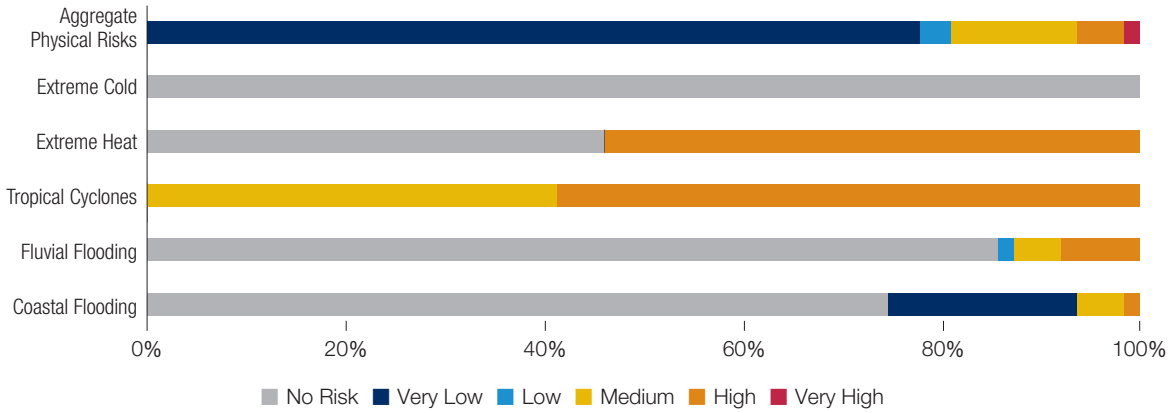

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Figure 3. Global Warming Potential: Domestic Real Estate Portfolio

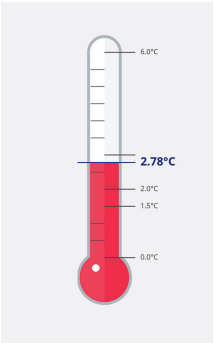

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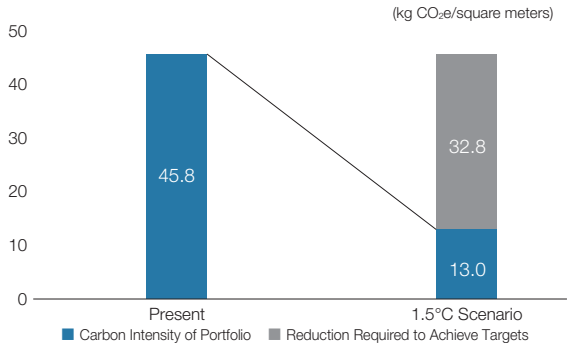
Figure 4. Reduction in GHG Emissions Required to Achieve 1.5°C Scenario



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Analysis of Inter-Industry Transfer of Transition Risks and Opportunities

As the world transitions to a net-zero society, we expect a large-scale transfer of risks and opportunities between industries to occur. Our analysis shows that the opportunities associated with the transition to a net-zero society greatly exceed the risks, particularly in the energy and chemical industries. We also discover that Japan has promising technologies in these industries.

Inter-Industry Risk and Opportunity Transfer Visualization Process

The analyses presented in previous sections of this report adopt a bottom-up approach to explore the impact of climate risks on GPIF's portfolio. This approach begins by measuring and analyzing the carbon footprint, CVaR, and other factors of individual companies and securities, then aggregating the results across all of GPIF's equity and bond holdings.

This section departs from the perspective of the direct impact on GPIF's portfolio to examine how climate change-related risks and opportunities will shift between industries over the long term to 2030 and 2050, according to an analysis performed by Astamuse. Specifically, this analysis uses data on industry-level required greenhouse gas (GHG) reductions, expected GHG reduction contributions of individual decarbonization technologies, and projections for the rate at which they will be implemented in society. As opposed to the CVaR analysis, which assumes that the transfer of risks and opportunities occur within the same industry, the purpose of this analysis is to focus more on the opportunities inherent in decarbonization and appraise different GHG reduction technologies by understanding the transfer of risks and opportunities that occur between industries. We reveal the potential for certain industries to boost growth by turning risks for other industries into opportunities for themselves.

The first step in this analysis is to identify the emissions reductions required in each industry by 2030 and 2050 to achieve the target of limiting global warming to "well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels" (Step 1 of Figure 1) as agreed in the Paris Agreement.

Next, we identified the technologies that contribute to the reduction of GHG, estimated emissions reduction rates for each technology compared with existing technologies, and forecast the implementation of each in 2030 and 2050. We then use these figures to calculate the GHG reduction contributions of individual technology fields (Step 2 of Figure 1, and Figure 2). By aggregating emissions reduction contributions for each technology by industry, we can estimate GHG reduction contributions by industry for 2030 and 2050. The analysis performed by Astamuse is unique in that its estimation of the implementation rate of GHG reduction technologies uses not only the number of global patent applications, but also competitive research and development investments (grants), such as Japan's Grants-in-aid for Scientific Research (kakenhi), as well as trends in the number of research papers published as a way to analyze the future life cycle of those technologies.

Finally, the analysis identifies potential inter-industry transfers of risks and opportunities by calculating the gap between required GHG reductions and reduction contributions for each industry. A positive value indicates a net opportunity – where the opportunity is greater than the risk – and a negative value indicates a net risk (Step 3 of Figure 1). For reference, we also multiplied these values by the carbon price forecast for 2030 and 2050 to convert them into monetary values.

Figure 1. Inter-Industry Risk and Opportunity Transfer Visualization Process

Step 1: Risk Analysis	**Estimate (1) Required GHG reductions by industry for 2030/2050.** * The Sustainable Development Scenario (SDS) developed by the International Energy Agency (IEA) is used to estimate required GHG reduction rates for 2030/2050 for each industry.
Step 2: Opportunity Analysis	**Identify technologies with the potential to contribute to GHG reductions by industry and estimate (2) GHG Reduction Contributions (= current GHG emissions × GHG reduction rate × implementation rate) in 2030/2050 for individual decarbonization technologies.**
Step 3: Risk and Opportunity Transfer Visualization	**Net Opportunities of GHG Reduction = (2) GHG Reduction Contributions – (1) Required GHG Reductions** * As a reference, the values were converted into monetary amounts using the carbon price based on the scenario of keeping the rise in global mean temperature to within 2°C in 2100 with a probability of 66%, which was proposed by the International Energy Agency and International Renewable Energy Agency.

(Source) Prepared by GPIF based on Astamuse analysis

Figure 2. Top Ten Technology Fields Expected to Contribute to GHG Reductions in 2050

Industries	Technology Fields	Present	2030			2050		
		GHG Emissions of Target Segment (a)	GHG Reduction Rate (b)	Implementation Rate (c)	GHG Reduction Contributions (a × b × c)	GHG Reduction Rate (d)	Implementation Rate (e)	GHG Reduction Contributions (a × d × e)
		billion tons	%	%	billion tons	%	%	billion tons
Energy	Hydropower energy, small and medium hydroelectric power generation	10.02	100%	65%	6.51	100%	65%	6.51
Chemicals	CCS from large emitters	8.00	90%	5%	0.36	90%	85%	6.12
Energy	Marine energy	6.64	100%	15%	1.00	100%	85%	5.65
Energy	Solar power generation, solar cells, solar thermal power generation	6.64	99%	50%	3.29	99%	85%	5.59
Energy	Bioenergy (power generation, fuel)	11.48	55%	15%	0.95	55%	85%	5.37
Telecommunications	Power semiconductors	7.27	71%	50%	2.58	71%	100%	5.16
Chemicals	Methanol production	8.83	65%	15%	0.86	65%	85%	4.88
Social Infrastructure	Power generation by anaerobic digestion of waste biomass	6.64	15%	15%	0.15	85%	85%	4.80
Energy	Green hydrogen	8.43	100%	0%	0.00	100%	50%	4.21
Energy	Hydrogen/ ammonia power generation	10.02	79%	5%	0.40	79%	50%	3.96

(Source) Prepared by GPIF based on Astamuse analysis

Inter-Industry Demand Shift Forecast

The risk and opportunity profile for each industry in 2030 and 2050 as determined by the above process is shown in Figure 3. In 2050, opportunities will outweigh risks in nine industries, including energy, chemicals, and social infrastructure, while risks will outweigh opportunities in four industries, including construction, civil engineering, and construction-related products. The energy industry, which is considered to have the greatest net opportunities in 2030 and 2050. While this industry is required to reduce GHG emissions the most in both target years, it is also expected to contribute greatly to decarbonization in other industries through a wide range of technologies, including hydrogen systems and infrastructure, hydropower energy and small and medium hydroelectric power generation (proliferation of small and medium hydroelectric power generation, optimization of weather forecasting and power generation, and improvement of flow control), and solar power generation and solar cells (weight reduction and cost reduction through the use of new materials). These GHG reduction contributions are expected to far exceed the level of reductions required for the industry.

For chemicals, although decarbonization opportunities in 2030 are not as great, from 2030 to 2050, technological developments in Carbon Capture and Storage (CCS) from large-scale sources of CO2 emissions and Direct Air Capture (DAC) are forecast to accelerate, and, as costs come down and efficiency improves, these technologies are expected to be more widely adopted. In the social infrastructure industry, progress in the utilization of useful biogases through the treatment of waste and sewage sludge and the implementation of underground and submarine carbon storage will lead the reduction of GHG emissions in a variety of different sectors, including agriculture, forestry and fisheries.

On the other hand, the construction, civil engineering, and construction-related products industry is expected to have negative net opportunities in both 2030 and 2050. While the required GHG reduction in this sector is just as high as that of the energy sector, unlike that and other industries, the technologies in construction and civil engineering, such as low-energy housing, are seen as making limited GHG reduction contributions to other industries.

Figure 3. Transfer of Risks and Opportunities by Industry in 2030 and 2050

Industries	2030				2050年			
	Reduction Contributions (a)	Required Reduction (b)	GHG Reduction Net Opportunity		Reduction Contributions (a)	Required Reduction (b)	GHG Reduction Net Opportunity	
			Volume (a - b)	(Reference) Monetary Amount			Volume (a - b)	(Reference) Monetary Amount
	billion tons	billion tons	billion tons	US $billion	billion tons	billion tons	billion tons	US $billion
Energy	16.22	3.82	12.4	1,302.1	42.74	7.97	34.77	6,258.5
Chemicals, etc.	2.20	0.53	1.67	175.7	14.92	2.95	11.97	2,154.5
Social Infrastructure	1.61	0.26	1.35	142.0	12.36	0.54	11.82	2,126.9
Electrical Equipment	2.45	0.01	2.44	256.1	5.25	0.08	5.17	930.3
Automobiles	2.18	0.17	2.02	211.9	5.75	0.92	4.83	869.4
Machinery	0.75	0.11	0.64	67.1	5.22	0.63	4.59	826.1
Telecommunications	2.58	0.34	2.24	235.2	5.16	1.34	3.82	687.4
Transportation	0.24	0.20	0.04	4.6	1.97	0.95	1.02	184.0
Durable Consumer Goods	0.60	0.09	0.52	54.3	0.86	0.49	0.38	67.9
Food	0.04	0.19	(0.15)	(16.2)	0.37	1.07	(0.7)	(126.6)
Agriculture, Forestry and Fisheries	0.32	1.39	(1.07)	(112.3)	1.85	2.77	(0.92)	(166.3)
Metals, Mining / Paper Products	1.52	0.64	0.87	91.7	2.48	3.57	(1.09)	(196.7)
Construction, Civil Engineering and Construction-Related Products	0.19	1.49	(1.3)	(136.1)	0.83	8.27	(7.43)	(1,337.9)

(Note) Carbon price is a reference value converted at US $105/ton in 2030 and US $180/ton in 2050.
(Source) Prepared by GPIF based on Astamuse analysis

Analysis of Patent Competitiveness of Decarbonization Technologies by Country/Region

This analysis also examined the patent competitiveness of decarbonizing and low-carbon technologies by country and region. In MSCI's CVaR analysis of low-carbon technologies, "forward citations," "backward citations," "market coverage," and "cooperative patent classification coverage" were factored into the estimation of patent value. The analysis performed by Astamuse, on the other hand, assigns each patent a "Patent Impact Score," which evaluates the patent's impact in terms of its exclusivity rights, in addition to factors such as the geographical scope (countries of application, etc.) and remaining term of these rights. Next, each company's "Total Patent Assets" is obtained by calculating the sum of all Patent Impact Scores for each individual company. The competitiveness of each country's patents is calculated using the Total Patent Asset indicator.

The results of this analysis indicate that the areas where Japan's technological competitiveness is highest include the energy technology field (hydropower energy, small and medium hydroelectric power generation, hydrogen/ammonia power generation, etc.) the chemical technology field (fuel cells and storage batteries), and the metal, mining and paper product technology field (low-carbon steelmaking). On the other hand, the analysis found that the United States is superior in bioenergy and marine energy within the energy technology field, the social infrastructure technology field, and the transportation technology field (Figure 4).

This analysis shows that socioeconomic trends and the evolution of technologies toward net-zero will bring about a shift in supply and demand among industries and among countries, and that many companies in Japan have the potential to benefit from this shift.

Areas for Improvement in Analysis

While many different techniques were employed to make the estimates as sound as possible, several points still need to be refined to improve the accuracy of these assessments. In particular, we recognize room for improvement in the following areas.

The first has to do with the competitive relationship between different decarbonization technologies. For example, in the energy field, hydropower energy and solar power generation compete with each other; as one technology becomes more widely adopted, the other technology will have less room to grow. This point, however, is not considered in the analysis.

The other issue beyond the scope of this analysis is investment. Although investment in research and development is taken into account in estimating the future implementation rates of decarbonization technologies, the enormous expenditures required for implementation toward 2030 and 2050 has not been factored into this analysis. Some of that investment may be covered by government expenditure, but the majority will be borne by the industries concerned. In the energy and chemical sectors in particular, it is evident that aggressive investment will be necessary going forward if major opportunities are to be gained.

Figure 4. Comparison of Total Patent Assets of Decarbonization Technologies by Country/Region

Technology Fields	Technology	Japan	U.S.	Europe	U.K.	South Korea
Energy	Bioenergy	26.3	100.0	49.4	6.7	22.5
	Hydropower energy, small and medium hydroelectric power generation	100.0	39.3	51.3	4.3	33.6
	Smart grid / smart city	100.0	81.8	38.5	4.4	43.7
	Hydrogen/ammonia power generation	100.0	42.0	38.5	2.2	12.7
	Hydrogen systems and infrastructure	100.0	68.2	36.7	9.4	54.1
	Solar power generation	100.0	78.4	69.5	5.7	76.2
	Wind Power	27.7	54.6	100.0	3.4	15.2
	Marine energy	39.0	100.0	70.2	15.7	52.9
	High-efficiency thermal power generation	59.0	100.0	21.3	3.0	20.3
	Geothermal power	100.0	98.4	65.4	12.1	89.4
	Nuclear power, nuclear fusion	34.7	100.0	31.6	21.4	29.5
Social Infrastructure	Underground and submarine carbon storage	25.3	100.0	28.7	13.1	28.2
	Underground injection, submarine storage	72.0	100.0	37.4	11.4	34.9
	Waste and sewage sludge treatment	42.7	100.0	95.8	3.1	72.9
Chemicals	Bio materials	50.7	100.0	46.9	1.9	41.2
	Materials capable of CO_2 absorption/adherence/ separation/condensation/long-term storage	78.6	100.0	39.4	11.6	37.4
	Fuel cells	100.0	32.0	18.0	4.1	36.5
	Batteries	100.0	31.6	18.8	2.0	57.3
	Reduction of CFC emissions, green refrigerants	46.4	100.0	5.2	0.0	2.7
	Carbon reuse	65.4	100.0	46.2	13.4	30.4
Metal, Mining, and Paper Products	Low-carbon steelmaking	100.0	48.0	20.9	1.3	43.9
Construction, Civil Engineering and Construction-Related Products	Energy-efficient housing	100.0	96.1	97.6	8.2	62.9
Electrical Equipment	Electrification of industrial equipment, energy management	69.2	100.0	67.4	8.1	50.0
	Energy harvesting	100.0	97.0	92.2	11.6	65.4
	Reducing losses in power transmission	100.0	88.1	25.0	5.4	25.8
Machinery	Electric drive, power supply equipment	99.7	100.0	48.2	7.9	12.0
	Ammonia drive	99.7	100.0	43.6	9.2	22.7
	Heat storage, heat transport technology, heat pumps	100.0	60.7	57.7	10.3	29.4
Automobiles	Hydrogen/fuel cell vehicles	100.0	34.1	29.1	3.2	62.1
	Clean energy vehicles	92.7	56.9	8.1	3.2	100.0
	Electric Vehicles	100.0	39.8	32.4	1.6	36.1
Durable Consumer Goods	Energy-efficient home appliances and lighting	25.2	100.0	17.0	3.1	20.0
Transportation	Smart transport, MaaS	69.1	100.0	35.2	2.3	23.1
	Modal shift	23.5	100.0	16.3	4.7	40.3
Agriculture, Forestry and Fisheries	Advanced uses of wood	90.6	94.5	100.0	18.9	26.7
	Smart agriculture	58.2	100.0	66.6	28.3	15.8
	Cultured meat/meat substitutes/dairy substitutes	20.4	99.0	100.0	9.9	14.0
	Afforestation, desert greening	81.0	87.3	19.7	0.0	100.0
Food	Reducing byproducts and food waste in manufacture of food products	100.0	70.1	49.4	7.8	59.5
Telecommunications	Power semiconductors	86.1	100.0	49.2	1.7	9.3

(Notes1) Indexed with the country with the highest total patent asset score in each technology domain assigned a score of 100.
(Notes2) "Europe" refers to EU member countries.
(Notes3) Chinese patents are not included in the analysis because it is difficult to compare them with patents from other countries from a quality perspective.
(Source) Prepared by GPIF based on Astamuse analysis

Analysis of Revenue Opportunities Through Contributions to SDGs

In this section, we expanded the discussion beyond climate change and analyzed the opportunities that will arise for individual companies with the resolution of the social issues identified by the Sustainable Development Goals (SDGs) defined by the United Nations, as well as the contributions those companies make to resolve the issues.

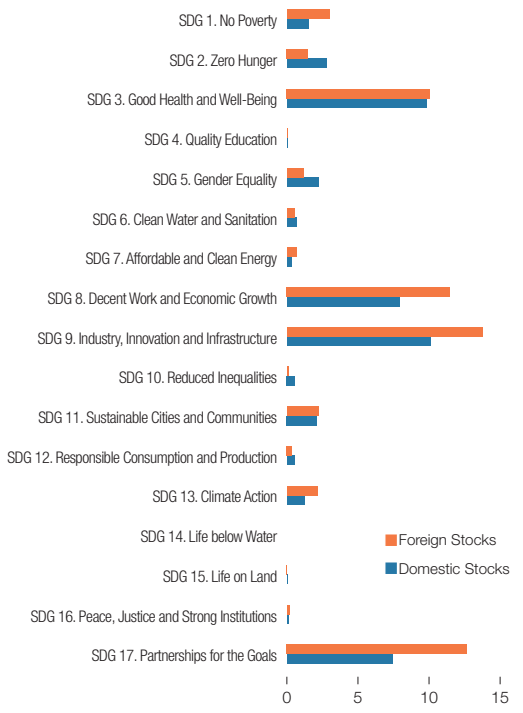
SDGs Positive Impact Analysis

In previous sections, we analyzed the risks and opportunities in the context of climate change, but this section expands the discussion beyond climate change by presenting an analysis of the indirect contributions of GPIF's equities portfolio to the resolution of social issues identified in the Sustainable Development Goals (SDGs) defined by the United Nations.

In this analysis, we determine the percentage of total revenue generated by products and services that contribute to the SDGs for the companies in GPIF's equities portfolio based on definitions by Trucost. We then measure the exposure of companies contributing to the SDGs by using portfolio holding weights to calculate the weighted average revenue exposure, or "SDGs Positive Impact," of the portfolio.

In a comparison of the SDGs Positive Impact of GPIF's domestic and foreign equities portfolios for each SDG, the foreign equities portfolio generally tends to have a greater positive impact. This result suggests that, from the perspective of contributing to the SDGs and securing profit opportunities thereby, Japanese companies have much room for growth (Figure 1).

Figure 1. SDGs Positive Impact by Individual Goal (%)



(Source) GPIF, S&P Trucost Limited © Trucost 2021

SDGs Additionality Analysis

Each year, the Sustainable Development Solutions Network (SDSN), launched in 2012 by the UN Secretary-General, releases the *Sustainable Development Report*. The report includes the "SDGs Performance Gap," which estimates the distance to the achievement of each target of the SDGs. The gap for each country is expressed as the contribution rate of the country to the global gap (Figure 2). For SDG 1: No Poverty and SDG 4: Quality Education, for example, the G20 nations' total contribution to the gap is only around 30%, indicating that, if the SDGs are to be achieved, improvement will be needed in non-G20 countries, especially African nations. On the other hand, for SDG 13: Climate Action, the G20 nations' total contribution to the gap is over 80%, indicating that this is a challenge particularly for the developed nations and China.

Figure 2. SDGs Performance Gap

	Japan	U.S.	EU	China	India	G20 Total
SDG 1. No Poverty	0.1	0.2	0.3	1.8	21.8	33.3
SDG 2. Zero Hunger	1.0	3.5	4.6	10.5	23.8	57.8
SDG 3. Good Health and Well-Being	0.3	1.5	1.5	11.7	24.5	50.8
SDG 4. Quality Education	0.0	0.1	1.1	5.4	17.3	30.2
SDG 5. Gender Equality	1.6	2.6	3.1	10.7	29.2	58.7
SDG 6. Clean Water and Sanitation	0.7	2.1	2.6	17.2	23.1	56.3
SDG 7. Affordable and Clean Energy	0.4	1.0	1.4	20.1	19.7	49.7
SDG 8. Decent Work and Economic Growth	0.9	2.8	4.7	10.3	14.0	49.2
SDG 9. Industry, Innovation and Infrastructure	0.3	0.5	2.1	10.5	21.5	47.6
SDG 10. Reduced Inequalities	0.8	5.0	3.1	16.0	17.6	62.4
SDG 11. Sustainable Cities and Communities	1.2	1.4	2.7	13.5	27.2	56.8
SDG 12. Responsible Consumption and Production	3.3	12.5	14.7	13.7	8.8	74.7
SDG 13. Climate Action	4.7	16.3	14.6	17.2	5.2	81.9
SDG 14. Life below Water	2.0	3.9	6.1	23.2	16.6	66.3
SDG 15. Life on Land	1.4	4.3	2.9	18.7	22.0	66.3
SDG 16. Peace, Justice and Strong Institutions	0.4	2.9	3.1	18.2	18.7	57.9
SDG 17. Partnerships for the Goals	1.2	3.0	4.7	22.8	20.8	65.1

(Source) Prepared by GPIF based on *Sustainable Development Report 2020*

In the SDGs Positive Impact Analysis mentioned above, we linked the SDGs targets with companies' products and services. Even if two companies provide the same products and services, their degree of contribution to the SDGs will increase if the products and services are provided in countries that are a long way from achieving the SDGs. For example, marketing a certain drug in emerging countries that have poor sanitation and high morbidity rates is likely to make a greater contribution to the SDGs than if the same drug were marketed in developed countries with low morbidity rates. From this perspective, the SDGs Additionality Analysis uses the SDGs Performance Gap to examine which products and services marketed in which countries and regions are able to contribute to what extent to the achievement of the SDGs. These contributions are aggregated for each company according to the composition of their net sales to determine their SDGs Additionality.

Comparing the weighted average SDGs additionality and the benchmark for GPIF's portfolio reveals that both domestic and foreign equities slightly exceeded the benchmark, showing that the portfolio makes a relatively large contribution to the SDGs (Figure 3).

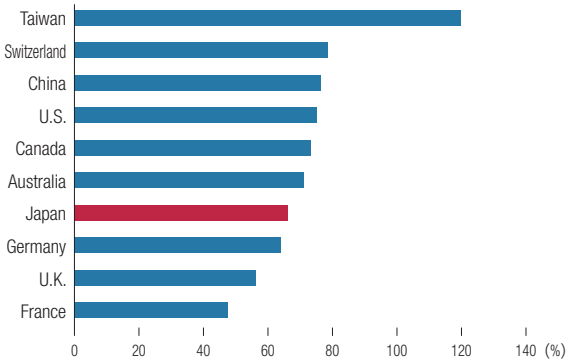
Among equities in major economies (top ten countries and regions by MSCI ACWI composition weight), we calculated the weighted average SDGs additionality by constituent country and ranked them by country and region. Taiwan came out on top, far ahead of the others, while Japan ranked seventh (Figure 4). In Taiwan, semiconductor-related companies, which have an extremely high weight in the index, are making significant contributions to SDG 9: Industry, Innovation and Infrastructure and SDG 17: Partnerships for the Goals, which seems to be largely attributable to individual company attributes.

Figure 3. GPIF Portfolio Weighted Average SDGs Additionality

		Weighted Average Additionality (%)
Domestic Stocks	GPIF Portfolio	59.9
	TOPIX	57.5
Foreign Stocks	GPIF Portfolio	77.4
	MSCI ACWI ex Japan	77.1

(Source) GPIF, S&P Trucost Limited ©Trucost 2021

Figure 4. Comparison of Weighted Average SDGs Additionality by Major Countries and Regions



(Note) Only includes constituents of MSCI ACWI. Graph shows the top ten countries/regions by composition weight in order of highest to lowest weighted average additionality.
(Source) MSCI, S&P Trucost Limited ©Trucost 2021

Editor's Note

Final Observations and Future Challenges

While ESG information is currently considered one element of non-financial information, the time is fast approaching when it will transform into financial information, particularly for information on the risks and opportunities associated with climate change. On the other hand, current analysis methods are still limited in terms of identifying the extent to which climate change will impact future corporate value and industry structure. As a cross-generational investor, GPIF believes that it needs to address this issue head on.

Importance of Disclosure Within the External Management Framework

This is GPIF's fourth *ESG Report* since it was first published in 2018 – one year after we began passive investment based on ESG indexes. The reason we started creating this report was because we believe that the effect of ESG investments cannot be measured by short-term investment performance alone; in addition to risk and return, many other different aspects need to be evaluated. In this report, we once again focus on whether GPIF's ESG investments are, as we hope, leading to the improvement of ESG evaluations and the enhancement of individual companies' ESG initiatives.

As such, compared with other pension funds and investment companies, our *ESG report* inevitably focuses more heavily on ESG scores and other quantitative evaluations and analyses. It is also frustrating that we are unable to convey how corporate engagement is progressing from a front-line perspective due to restrictions on in-house equity investment. In an effort to partially overcome these shortcomings, this ESG Report includes commentary from ESG rating officers at ESG rating companies and engagement officers at asset managers. We believe that, while paying due attention to fairness and neutrality as a public institution, communicating the state of GPIF's ESG investment and engagement is important not only to enhance transparency but also to improve the effectiveness of our ESG investment. We feel that further efforts and innovation are needed to make the more specialized contents easier for beneficiaries and companies to read and understand.

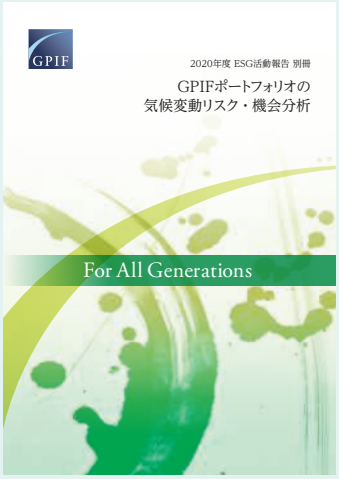
Risks and Opportunities of Climate Change Transforming into Financial Information

The introduction of carbon pricing is continuing apace around the world, and discussions and deliberations on carbon pricing are also progressing in Japan. In addition, the European Commission, which is at the forefront of climate change policy, has announced the introduction of a "carbon border tax" on imports from countries with less stringent environmental regulations. This tax targets five high-emitting product categories—steel, cement, fertilizer, aluminum and electricity. We have now entered an era in which identifying and reducing greenhouse gas emissions associated with companies' business activities are directly connected to corporate profits and value. In other words, for companies, climate change risks and opportunities are transforming from non-financial information into financial information.

This can also be applied to investors. We have entered an era in which measuring the carbon footprint and carbon intensity of portfolios is not only part of being accountable to beneficiaries, but is also considered an element of risk management and investment strategy from the perspective of assessing the impact on investee company and portfolio asset values. This understanding lead us to begin analyzing the impact of climate change on corporate value using the Climate Value-at-Risk (CVaR) method in last year's *ESG Report 2019*. In this *ESG Report 2020*, we expanded the scope of greenhouse gas emissions used in the CVaR analysis to include Scope 3[1]. While this raises the fundamental question of whether greenhouse gas emissions in the supply chain can be measured appropriately, there is another equally if not more difficult issue: how to assess the change in demand associated with cost burden and price changes.

In the new CVaR analysis, we analyzed the impact of climate change on corporate value throughout the supply chain using the assumed burden rate (assumed price pass-through rate) for the increase in costs associated with climate change. However, while the assumed burden rate is roughly set for each product transported or used, the CVaR model does not assume that price control is greatly affected in the real world by the brand power of the product or by the presence or absence of substitute products. Neither does it assume that demand structure changes as the sales price of the product or service changes. To supplement the CVaR analysis, therefore, we also conducted an analysis of inter-industry transfer of transition risks and opportunities. The relationship between the required reduction and the reduction contributions discussed in this analysis can also be summarized in the relationship between Scopes 1 + 2 and Scope 3. Although in the energy and chemical sectors, business activities themselves have a large environmental impact, their greenhouse gas reduction technologies are expected to contribute significantly to greenhouse gas reductions in downstream industries. At first glance, the introduction of carbon pricing may seem to be a major drawback for the performance of these industries, but the growing need for greenhouse gas reduction technologies and increased price competitiveness of low-carbon products can result in significant growth opportunities. Socio-economic systems and industrial structures could see major changes between 2030 and 2050 that are far more drastic than those analyzed in this report.

Although we feel that the content of our analysis is improving year by year, there is still much room for improvement before we can properly identify the impact of climate change on future corporate value and industrial structure – it is not a simple problem that we will be able to answer in just a year or two. As a cross-generational investor, however, we believe that this is an issue that we need to address head on.



For a more detailed report of the results of the analysis conducted for TCFD disclosure, please see the *Analysis of Climate Change-Related Risks and Opportunities in the GPIF Portfolio*, scheduled for publication around the fall of 2021. (*The photo above is an artist's rendition of the cover.)

Kenji Shiomura
Editor-in-Chief, ESG Report (ESG Team Head)

1 Emissions from procured products and services other than purchased electricity (upstream Scope 3) and indirect emissions from the consumption and use of sold products and services (downstream Scope 3)

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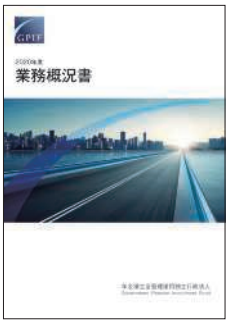

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Investment Principles

1

Our overarching goal should be to achieve the investment returns required for the public pension system with minimal risks, solely for the benefit of pension recipients from a long-term perspective, thereby contributing to the stability of the system.

2

Our primary investment strategy should be diversification by asset class, region, and timeframe. While acknowledging fluctuations of market prices in the short term, we shall achieve investment returns in a more stable and efficient manner by taking full advantage of our long-term investment horizon. At the same time, we shall secure sufficient liquidity to pay pension benefits.

3

We formulate the policy asset mix and manage and control risks at the levels of the overall asset portfolio, each asset class, and each investment manager. We employ both passive and active investments to attain benchmark returns (i.e., average market returns), while seeking untapped profitable investment opportunities.

4

Based on the idea that sustained growth of companies being invested in and the market as a whole is required for long-term investment returns on assets under management, we promote investments that take into account the non-financial elements of environmental, social and governance (ESG), in addition to financial elements, with a view to ensuring long-term returns for the benefit of pension recipients.

5

We promote a variety of activities (including ESG-conscious initiatives) that fulfill our stewardship responsibility of promoting long-term aims and sustainable growth of our investments and the market as a whole with a view to increasing long-term investment returns.

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