NOMURA

Avoided Emissions Report

Avoided emissions from the investor's perspective

Forging a link between avoided emissions and enterprise value

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A note on the publication of our avoided emissions report, titled Avoided emissions from the investor's perspective: Forging a link between avoided emissions and enterprise value

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Decarbonization is one of the pressing needs of our era, and companies' efforts to reduce their greenhouse gas emissions are key factor that investors take into account when analyzing companies for the purpose of making investment decisions. More recently, the concept of avoided emissions has been attracting attention as a new way of assessing companies' ability to solve the problems facing society through their contribution to a reduction in greenhouse gas emissions. As members of the Nomura Group, we are publishing this report specifically to consider how institutional investors might approach the topic of avoided emissions.

Disclosures on avoided emissions are a work in progress among listed Japanese companies: currently, only 15.8% of TOPIX 500 constituents make such disclosures. However, efforts are being made both at home and abroad to popularize the idea, which was given specific mention in the joint statement issued by the G7 climate, energy and environment ministers at their meeting in Sapporo in 2023. For about three years now, Nomura Holdings has been driving the discussion on avoided emissions in its role as Chair of the GX League Working Group on Disclosure and Evaluation of Climate-related Opportunities, which now consists of over 100 companies. Trailblazing corporations that calculate and disclose their avoided emissions are well represented among the working group's members. Many of these companies, while forging ahead with the disclosure of their avoided emissions in the belief that this will help to advance the project of

decarbonization throughout the broader society, have also been asking us what can be done to encourage investors to make more use of the disclosed information. Indeed, some of our analysts have been frank in letting us know that while they see value in presenting institutional investors with data on avoided emissions and other such new metrics by which to assess companies, they have to date fielded almost no questions from institutional investors on the topic. Nomura Asset Management, another member of our corporate group, is using data on avoided emissions in its assessments of companies, but the present reality is that this practice has been taken up by only a small number of investors and asset managers.

In support of raising awareness about avoided emissions, in this report we explore various approaches to the avoided emissions concept, all of which look at the question from the investor's perspective.

This report has been written for the benefit of business enterprises, institutional investors, and a broad range of other stakeholders. Our hope is that businesses will take up the suggestions for refinements to the avoided emissions concept laid out in this report and reflect those suggestions in the calculation and disclosure of their own avoided emissions. Likewise, we hope that institutional investors will make more extensive use of the findings of analyses of avoided emissions, tempering that with a solid understanding of issues still in need of addressing. In these ways, we hope that this report will help to advance the widespread recognition of avoided emissions as a valuable concept.

The report on avoidable emissions that we present here flows from this understanding of what needs to be done. In addition to guest submissions from representatives of the Ministry of Economy, Trade & Industry (METI) and the GX Acceleration Agency, this report consists of five chapters, as summarized below.

Chapter 1: Initiatives at GX League Working Group on Disclosure and Evaluation of Climate-related Opportunities: Three years of progress with avoided emissions

In this chapter, we discuss what the GX League Working Group on Disclosure and Evaluation of Climate-related Opportunities has been working on over the past three years, and introduce the fruits of those efforts, which are based on discussions with member companies. We devote part of the chapter to a reflection on Nomura Holdings' experiences as the chair of the working group. In some cases, this means touching upon accomplishments that were

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possible only because the working group is made up of more than 100 companies from across various sectors, but it also means taking a look at the path to building a consensus at times when that very diversity has made the process difficult. We also look at the approaches taken in successfully linking up with global initiatives and avoiding the trap by which efforts undertaken in Japan sometimes go off on their own tangential evolution, cut off from developments elsewhere in the world.

Chapter 2: Can a link be forged between avoided emissions and enterprise value?

Here we explain what is meant by "avoided emissions", survey the existing guidance on avoided emissions, examine the methodologies used in calculating avoided emissions, and consider the relationship between avoided emissions and enterprise value. We emphasize that the avoided emissions concept has an important part to play in any proper assessment of fresh initiatives undertaken by companies seeking to reduce their greenhouse gas emissions and the innovative technologies developed towards that end.

Chapter 3: Significance of avoided emissions for investors and how they can use them: Calculating financed avoided emissions in Nomura Asset Management portfolio

In this chapter, we explain how Nomura Asset Management, as an asset manager and thus as an investor, makes use of the avoided emissions concept in its assessments of companies. We touch upon the importance of avoided emissions as a tool for engagement. We also—for the first time—present Nomura Asset Management's estimates of what it calls financed avoided emissions for its Japanese equity assets under management, produced with the aim of gaining a quantitative understanding of the opportunities associated with climate change.

Chapter 4: Quantitative analysis based on avoided emissions data

This chapter is written from the perspective of a portfolio strategist who presents institutional investors with investment strategy ideas, and consists of an analysis of share price trends among companies that disclose data on avoided emissions. Delving into the metrics regularly used by institutional investors, the analysis finds that companies that have disclosed avoided emissions data tend to be large value stocks with low forward ROE. This chapter concludes with the observation that improvements in volume and veracity need to be made in disclosures of avoided emissions if the idea is to go into wide-ranging use among institutional investors, and that a more in-depth analysis of the results of the event study presented in this chapter may become possible if and when a larger volume of data becomes available.

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Chapter 5: Impact of GHG emission reductions on enterprise value: Strategies that involve using GHG impact to improve enterprise value

In this last chapter, quant researchers dedicated to the study of enterprise value analyze the impact that reductions in greenhouse gas emissions (Scope 1+2+3) have on the assessed value of companies. Based on the results of their analysis, the authors find that companies in high-emission sectors (those with high Scope 1+2 emissions per unit of sales) see a boost to their enterprise value when they reduce their in-house emissions (meaning a reduction in the company's negative impact), while companies in supply-chain- emission-dependent sectors (those with high Scope 3 emissions per unit of sales) see their enterprise value improve when they increase avoided emissions across their entire supply chain (meaning an increase in the company's positive impact).

The Nomura Group has a diverse portfolio of businesses. Nomura Asset Management and certain other entities within the group function as investors, but we also support the activities of business enterprises in our role as an investment bank. Our internal Content Company, meanwhile, is home to our research function. As written word-for-word in our corporate purpose statement, we aspire to create a better world by harnessing the power of financial markets. We intend to put the full force of the Nomura Group to work in pursuit of that purpose, and to that end we seek to popularize the concept of avoided emissions and contribute to the decarbonization of society.

I would like to wrap up this introduction by extending our sincerest thanks to the Ministry of Economy, Trade & Industry (METI) and the GX Acceleration Agency for their contributions to this report.

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Guest submission:
What the concept of avoided emissions is good for

Works as a means of measuring the ability of companies to solve problems through innovation

Nobuyoshi Wakabayashi

Director, Environmental Economy Office
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The GX League is a framework within which internationally competitive Japanese companies can drive the green transformation (GX) by making ambitious efforts towards the transition to Net Zero. It now encompasses more than 700 companies, which have drawn up their own greenhouse gas emission reduction targets for FY25 as well as FY30. The league has also attracted companies eager to collaborate in making the rules needed for the creation of a GX market—something they would find difficult to do acting in isolation.

The Working Group on Disclosure and Evaluation of Climate-related Opportunities was established in the context of the GX League's efforts to make such rules. Nomura Holdings chairs the working group, which now counts more than 100 companies as members, and together with those member companies it is leading the discussion on the creation of a framework in which opportunities for contributing to combatting climate change (including emissions reductions through goods and services delivered to the market) are appropriately valued. We are highly appreciative of Nomura's presence at the helm of this effort.

To achieve Net Zero by 2050 requires more than just the efforts of individual companies to reduce their emissions; it is essential to also encourage companies to come up with solutions (products and services) that contribute to the decarbonization of society as a whole. Regrettably, assessments of companies in terms of their effect on climate change have to date been narrowly focused on the risk aspect, meaning that the emphasis has been on measures of GHG emissions associated with companies' business activities

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and their efforts to reduce those emissions. What has been largely missing is a detailed examination of the opportunity aspect, by which we mean a proper assessment of the broader societal impact a company can have by providing the market with lower-carbon solutions and the positive impact this can have on enterprise value. This is where the Working Group on Disclosure and Evaluation of Climate-related Opportunities comes in, and is in fact why it was established. The concept of avoided emissions holds a great deal of promise as a means of addressing this challenge, and the topic has become a centerpiece of the working group's deliberations.

The concept of avoided emissions offers a way to look at companies' contributions to reducing society-wide GHG emissions as a measure of their ability to solve problems. The G7 Minister's Meeting on Climate, Energy and Environment held in 2023 in Sapporo emphasized the importance of this topic, and also mentioned it in the Communiqué. Japan in particular, with its energy-saving technologies and other strengths in decarbonizing innovation, has an opportunity to help reduce worldwide GHG emissions by striving to provide society with products and services that are highly effective in cutting such emissions. It is vitally important that there be mechanisms in place to ensure that the companies that possess these technologies and that provide products and services built around these technologies earn fair valuations in financial & capital markets for the contributions they are making. With such systems in place, companies that put effort into developing decarbonizing technologies that contribute to society-wide reductions in emissions ought to see those efforts pay off in the form of improvement in their enterprise value. This should liberate companies to seize on emissions reductions as a growth opportunity by pursuing innovations that go well beyond existing technologies towards the goal of achieving Net Zero by 2050.

It is essential that more investors come to make use of data on avoided emissions in their valuations of companies if companies are to be nudged further into advancing the project of innovation via the development of decarbonizing technologies, thereby realizing a reduction in society-wide GHG emissions. Avoided emissions are already becoming increasingly recognized as a useful measure to employ in evaluations of companies, thanks in part to the communiqués issued at G7 meetings and COP, and discussions on standardization have been progressing. Growing recognition of avoided emissions as an indicator now appears to be translating into more widespread use in practical contexts. Nomura Asset Management is already using avoided emissions as one yardstick in its valuations of companies in which to invest, and financial institutions in Europe have been constructing databases to help institutional investors factor avoided emissions into their

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appraisals of companies. In these and other ways, the concept of avoided emissions is increasingly being deployed in practice, not just in Japan but around the world. We welcome these developments, and look forward to seeing more investors take up the metric of avoided emissions in their evaluations of corporate issuers. On the other side of that equation, we would like companies to make earnest efforts to contribute to society-wide reductions in GHG emissions without misusing the avoided emissions idea in a way that could draw accusations of greenwashing—that is, we hope to see companies use proactive disclosures as a way to draw attention to the genuinely beneficial societal impacts of their actions. For our part, we at METI also intend to continue putting effort into measures aimed at encouraging the widespread uptake of the avoided emissions concept.

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Guest submission:
Steps towards realization of green transformation (GX)

The role of the GX Acceleration Agency and the importance of avoided emissions

Hideki Takada
Director (Finance and Sustainability)
GX Acceleration Agency

1. Role of GX Acceleration Agency

The GX Acceleration Agency commenced its operations on 1 July 2024. It is an authorized corporation established by the Japanese government to play a key role in accelerating its green transformation (GX) initiatives. GX is designed to achieve carbon neutrality in Japan by 2050 at the same time as boosting Japan's industrial competitiveness and generating economic growth. The important point here is that decarbonization and industrial competitiveness/economic growth can and have to be realized at the same time, without any trade-offs between the two. In order to achieve this, the intention is for the public and private sectors combined to invest a total of over ¥150trn in GX over the next ten years. Around ¥20trn of this will be provided as upfront support by the national government, to which end GX Economy Transition Bonds, the world's first sovereign transition bonds, were first issued in February 2024. However, the remaining ¥130trn or more will have to be funded by the private sector. The main role of the GX Acceleration Agency is to encourage private-sector investment.

In that role, the GX Acceleration Agency is mainly responsible for the following three tasks. Its most crucial task is the provision of financial support. It has received a budget from the national government for a loan guarantee fund, which enables it to provide guarantees for private-sector lending. This facilitates projects that the private sector is not able to risk on its own, such as the deployment of innovative technologies. The agency is also able to make equity investments in private-sector entities and underwrite

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their bond issuance. Since its launch in July 2024, it has discussed dozens of financial support projects with financial institutions and companies, and is currently considering how to implement some of them. Its second task will be to run the emissions trading and carbon pricing schemes that will be introduced in due course. Specifically, it will run the emissions trading market that is due to start up in FY26 as part of the emissions trading scheme. It will also collect the fossil fuel surcharges scheduled for introduction in FY28. Its third task consists of a broad range of other initiatives, including GX and sustainability surveys and research, promotion of corporate partnerships, promotion of policy discussions, and communications both in Japan and overseas. The agency, in other words, aims to promote GX throughout society as a whole by acting as a GX hub linking the worlds of industry, finance, and policy. As part of this, it has been holding regular seminars attended by relevant companies and spreading the word at various events (including in parts of Japan beyond the biggest cities and overseas) ever since its launch. It has been working proactively to establish partnerships with international stakeholders, and in early August 2024, not long after it first went into operation, it received a visit from Sean Kidney, CEO of the Climate Bonds Initiative, who held a meeting with its members. In January 2025 it established a Global Advisory Council consisting of Mr Kidney and four other internationally renowned GX and sustainable finance experts. The aim is to make use of these experts and their organizational expertise within its operations, and to strengthen Japan's international GX policy communication capabilities via this network.

Avoided emissions, the topic of this report, are an extremely important metric for the promotion of GX, and are closely entwined with the operations of the GX Acceleration Agency, which will make impact assessments when providing financial support. Its screening processes will look at the environmental and socioeconomic impact of the business in question as well as the financial risk/return equation, and avoided emissions can serve as a useful metric of environmental impact, particularly in terms of contributions to decarbonization. The Agency will also team up with METI and involve itself in the operation of the TCFD Consortium as part of its aforementioned hub function. The TCFD consortium has primarily been supporting the disclosure initiatives of Japanese companies in line with the TCFD framework. While discussions about the best way to provide effective disclosure are likely to continue between companies making them and the investors using them, the Consortium will potentially consider metrics such as avoided emissions that have a high affinity with the technological advantages and growth potential of the companies in question.

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2. Transition finance and avoided emissions

Encouragement of private-sector investment in GX requires the development new methods of finance such as transition finance. Japan has been a world leader in stressing the need for transition finance. For example, while it is important to provide funds for green bonds and other projects that are already regarded as “green” (in the narrow sense), many industries and technologies will not be able to decarbonize immediately and do not yet qualify as “green”. However, society as a whole will not be able to decarbonize unless these high-emission industries change. Transition finance is designed to help fund the transition of such industries to help advance the project of decarbonizing the broader real economy. Some Western observers were initially skeptical about transition finance, but international acceptance has been growing in recent years, as evidenced by the statement in the G7 Hiroshima Leaders’ Communiqué in May 2023 that “transition finance has a significant role in advancing the decarbonization of the economy as a whole”. The focus on avoided emissions is consistent with this kind of thinking about transition finance. Even if companies develop products or technologies that contribute to decarbonization at other companies or within society as a whole, the very act of manufacturing these products will cause their own emissions to rise. It is only by shining a light on how far these companies contribute to decarbonization of the overall economy that it becomes possible to value them correctly. Similarly, it may be misleading for financial institutions to focus solely on the absolute emissions (financed emissions) of the companies in which they have invested. If financial institutions provide funding to high-emission companies, their financed emissions will rise even if the funding is being provided for investments that will contribute to future decarbonization. If financial institutions were to stop investing in high-emission companies, their own financed emissions would immediately fall, but this would not lead to decarbonization of the economy as a whole. In view of these issues, the government (FSA, METI, and MOE) and private-sector experts established the Japan Public and Private Working Group on Financed Emissions to Promote Transition Finance in February 2023, and released a report in October 2023. The report recommends more accurate assessment of the contribution of financial institutions to decarbonization using multiple metrics, including avoided emissions, to supplement financed emissions metrics. Awareness of these issues similarly underpins the international Glasgow Financial Alliance for Net Zero (GFANZ) framework. Japan has been at the forefront of international discussions about financed emissions as well as transition finance, highlighting its approach of focusing on close coordination between the financial and industrial sectors and overall economic transition.

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3. Importance of avoided emissions to achieve GX

The Japanese government drew up its GX2040 Vision, a new strategy document, in February 2025. One of the main pillars of the GX2040 Vision is the creation of GX industrial structures, to which end it emphasizes the importance of creating markets that promote GX industries. Many so-called GX products that contribute to lower emissions require substantial investment to develop them, and production costs also tend to be higher than for regular products. However, there will be no incentives to produce GX products if there are no markets where they can be sold at appropriate prices to generate profits. Frameworks will be needed to identify and value the GX value of the products in question, and avoided emissions might constitute an important metric in this regard. According to the GX2040 Vision, one role of the GX Acceleration Agency is to reinforce R&D work and communications on GX industrial policies in its capacity as a GX hub. The creation of GX industrial structures and markets described here may become a key focus of these research and communication activities. As noted above, avoided emissions are closely entwined with GX policies, transition finance, and the work of the GX Acceleration Agency, which has been set up to promote them. It is hoped that discussions about the creation and use of this metric will continue within the public and private sectors, and spread beyond Japan too.

Note: The opinions in this piece are the personal opinions of the author and do not necessarily represent the views of the GX Acceleration Agency or the Japanese government.

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Chapter 1: Initiatives at GX League Working Group on Disclosure and Evaluation of Climate-related Opportunities

Three years of progress with avoided emissions

Yukari Saiki
Vice President, Sustainable Innovation & Investment Group
Nomura Securities

- The GX League established its Working Group on Disclosure and Evaluation of Climate-related Opportunities in September 2022 with the aim of building a framework for appropriate assessment of climate-related opportunities within the corporate sector in order to achieve a carbon neutral society. Nomura Holdings acts as the chair of this group, and over the past three years or so has led discussions about avoided emissions together with 110 member companies (as of March 2025) from a wide range of sectors.

- Recognizing how important it will be for both the companies disclosing avoided emissions and the financial institutions evaluating them to understand the issues involved, the Working Group has published three separate reports on the topic based on discussions with members: "Basic Guidelines for Disclosure and Evaluation of Climate-related Opportunities" in March 2023, "Leveraging Avoided Emissions: Financial Institution Case Studies" in December 2023, and "Hypothetical Cases for Avoided Emissions Disclosure" in May 2024. While the diverse nature of the companies participating in the working group has resulted in some differences of opinion when reports were drawn up, the common understanding has been that the foremost common goal is to popularize the concept of avoided emissions.

- The Working Group has also actively teamed up with other global initiatives in order to avoid becoming an isolated, Japan-specific project disconjoined from efforts elsewhere. In particular, it has worked together with the World Business Council for Sustainable Development (WBCSD) to popularize the concept of avoided emissions, as part of which WBCSD and METI have co-hosted sessions at both COP28 and COP29. It is essential to continue to amplify the voices of Japanese companies in the formation of global rules.

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I. Outline of the Working Group on Disclosure and Evaluation of Climate-related Opportunities

1. Background to establishment of the Working Group on Disclosure and Evaluation of Climate-related Opportunities

The Working Group on Disclosure and Evaluation of Climate-related Opportunities was established in September 2022 with the aim of building a framework for appropriate assessment of climate-related opportunities (initiatives that boost enterprise value via reductions in emissions generated in the provision of goods and services to the market) within the corporate sector in order to achieve a carbon neutral society.

One reason for the establishment of the Working Group was that the markets had hitherto failed to take an appropriate view of the efforts of Japanese companies, including the development of energy-saving technologies, one of their areas of strength. It constitutes an attempt to improve the ability of the private and public sectors in Japan to work together to create rules that in turn can be broadcast to the wider world, as opposed to simply accepting European standards as has been the case to date. Discussions at the Working Group have also been conscious of the need to avoid working in isolation. As discussed below, the Working Group has also been teaming up with relevant international initiatives to counter the tendency of Japanese initiatives to evolve separately and thereby fail to become international standards.

Nomura Holdings has played a central role in chairing the Working Group, and has led discussions together with other corporate leaders[1]

2. Features and significance of the Working Group, which comprises companies from a wide range of sectors

The Working Group has leveraged its status as a cross-sector group comprising financial institutions, evaluation bodies, and nonfinancial corporations to proactively discuss issues between companies and investors relating to the disclosure of climate-related opportunities. Nonfinancial companies have identified issues with the disclosure of avoided emissions, one of the items related to climate-related opportunities. For their part, financial institutions have taken the view that disclosing information in the correct way makes it easier to evaluate. Some financial institutions have said that disclosures on avoided emissions are hard to find, in that some companies disclose them in integrated reports, while other disclosure them in sustainability reports or ESG databooks. Another financial institution has also called for data on avoided emissions to be disclosed in a uniform location, for example close to data on greenhouse gas emissions, saying that it would be easier to find if this were the case, but that at present the information is often disclosed on a different page.

The Working Group has provided valuable and refreshing opportunities for frank exchanges of opinion between the nonfinancial companies that are disclosing their avoided emissions initiatives and the financial institutions that are evaluating them.

1. Daikin Industries, Tokio Marine & Nichido Fire Insurance, Development Bank of Japan, Panasonic Holdings, Sumitomo Mitsui Trust Bank

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II. Working Group reports

1. Avoided emissions roadmap and Working Group reports

Recognizing the need to clarify thinking around avoided emissions in order to boost their importance and profile as part of moves to popularize the concept, the Working Group first nailed down a broad definition of climate-related opportunities and a definition of avoided emissions in FY22 when it created its "Basic Guidelines for the Disclosure and Evaluation of Climate-related Opportunities".

It then published "Leveraging Avoided Emissions: Financial Institution Case Studies" in December 2023 in order to popularize the concept. This report features interviews with Japanese and non-Japanese financial institutions about how they are leveraging avoided emissions. It breaks down how various types of financial institutions, including asset owners, asset managers, and banks, are leveraging avoided emissions in the evaluation of companies and portfolios. Specifically, it provides wide-ranging examples of how various types of financial institutions are leveraging avoided emissions across the four rubrics of (1) corporate evaluation; (2) investment & portfolio analysis; (3) portfolio impact analysis; and (4) avoided emissions based on carbon accounting. In addition, it asks people why they decided to leverage avoided emissions and what their thoughts are on the subject, in order to provide pointers to financial institutions that are thinking about doing so in the future.

Fig. 1: Use of avoided emissions by financial institutions

		Asset Owners	Asset Managers	Banks
■ **Corporate Evaluation** ESG integration in investment decisions involves using ESG scores and incorporating them into company evaluations as KPIs for monitoring. This method is employed to seize climate-related opportunities, identify growing companies, and contribute to the overall growth of these businesses.	**Nomura Asset Management** **Sumitomo Mitsui Trust Bank**		✓	✓
■ **Investment & Portfolio Analysis** As one of the criteria for investment decisions, visualizing the impact of the invested companies involves utilizing avoided emissions as one of the impacts created by the companies. This is used to identify winners in the transition to a decarbonized society and for portfolio analysis.	**Schroders** **Government Pension Investment Fund**	✓	✓	
■ **Portfolio Impact Analysis** As the role of financial institutions in the real-economy decarbonization is valued this method utilizes avoided emissions in the evaluation of the portfolio.	**Impax Asset Management** **Mirova**		✓	
■ **Avoided Emissions based on Carbon Accounting** This method specifically employs the methodology proposed by Partnership for Carbon Accounting Financials (PCAF), which calculates the impact of renewable energy projects as avoided emissions. The clear identification of use of proceeds and impact contributes to a relatively high reliability.	**The Dai-ichi Life Insurance** **Mizuho Bank**	✓		✓

Taken from "Leveraging Avoided Emissions: Financial Institution Case Studies"

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The Working Group then published "Hypothetical Cases for Avoided Emissions Disclosure" in May 2024, having heard from members that something more specific than the Basic Guidelines would be needed to encourage nonfinancial corporations to disclose avoided emissions. This report collates examples of actual disclosures of avoided emissions by Working Group members in order to construct hypothetical cases that might prove useful to a larger number of companies. It is positioned as a supplement to the Basic Guidelines that provides nonfinancial companies with explanations about how to potentially calculate and disclose avoided emissions in line with the thinking and guidelines contained in the Basic Guidelines. In creating this supplement, the Working Group gathered more than 40 real-world examples from member companies, then distilled them into 11 hypothetical cases broken down by the type of goods or services provided.

Fig. 2: 11 examples of disclosure of avoided emissions

Hypothetical cases using potentially credible products and services of avoided emissions

1. Decarbonization of energy such as electricity and heat
2. Electrification
3. Electrification of transportation
4. Emission reduction during product use phase
5. Energy efficiency through lightweight material
6. Energy efficiency during product use phase
7. Manufacturing and supply of products using low-carbon and decarbonized raw materials
8. Extension of product life
9. Supply of products contributing to decarbonization of buildings
10. Emissions reduction from livestock
11. Emissions reduction in waste management

Taken from "Hypothetical Cases for Avoided Emissions Disclosure"

The GX Dashboard[2] previously only contained disclosure columns for avoided emissions at companies as a whole, but in FY24 the Working Group added extra columns covering items such as calculation methods and the validity of avoided emissions calculations on a product-by-product basis in order to encourage nonfinancial corporations to provide enhanced disclosures and make it easier for financial institutions to use them for valuation purposes. It decided on detailed disclosure items based on internal discussions about how to avoid overburdening the disclosing companies as well as interviews with financial institutions within the group about what kind of avoided emissions disclosures would be easiest to leverage.

Over the past three years or so, the Working Group has accordingly worked out what is actually necessary and useful in popularizing the concept of avoided emissions, having listened to both the nonfinancial corporations responsible for disclosing them and the financial institutions responsible for evaluating them. We think this is precisely because it encompasses a wide range of sectors that it has been able to achieve this.

2. Information platform for providing updates on GX League members' initiatives

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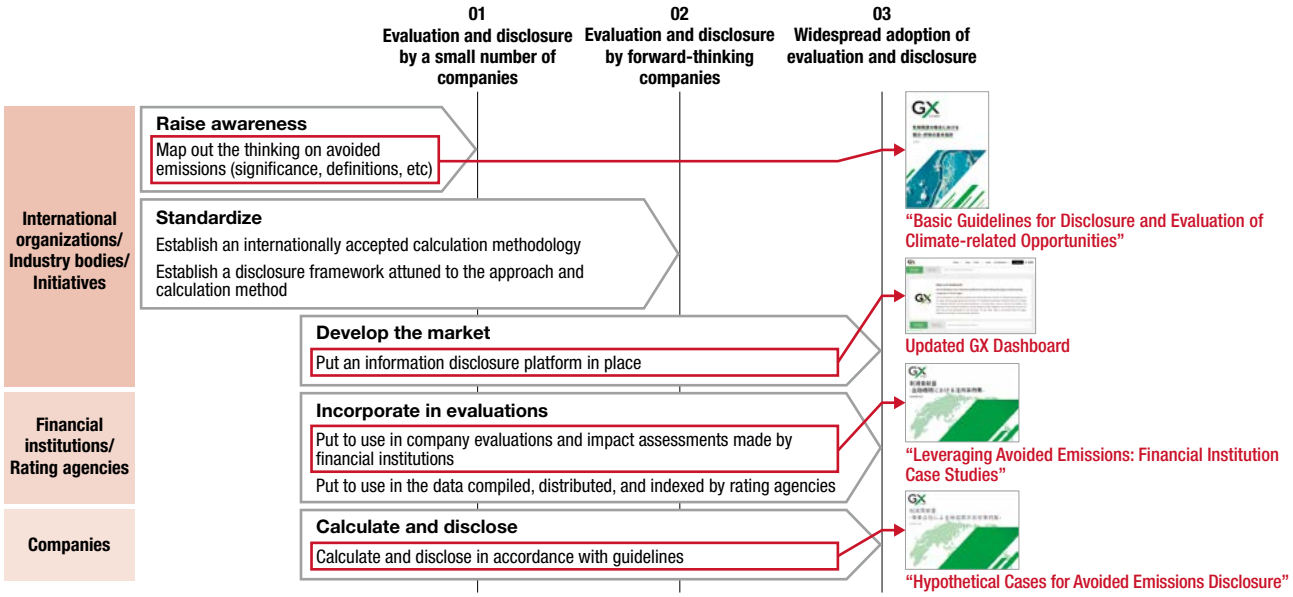
Fig. 3: Avoided Emissions Roadmap and Working Group reports



Source: Nomura, based on materials from Working Group on Disclosure and Evaluation of Climate related Opportunities

2. Discussions among members when reports are drawn up

While the Working Group has only been able to engage in initiatives of this sort because it encompasses members from a wide range of sectors, this very diversity has also meant that achieving consensus has been a lengthy and painstaking process. In particular, the draft stage of formulating the Basic Guidelines attracted a wide range of opinions. While there was some common ground about the definition of avoided emissions, nonfinancial corporations, financial institutions, and evaluation bodies expressed a variety of opinions about which products and services should be covered and how avoided emissions should be calculated and disclosed.

There were particular disagreements about (1) whether companies should be allowed to offset greenhouse gas emissions (Scope 1, 2, 3) and avoided emissions, and (2) whether products and services derived from fossil fuels should be included in the scope of avoided emissions.

With respect to point (1) above, some members of the Working Group said that companies should be allowed to offset greenhouse gas emissions and avoided emissions. However, other members—especially nonfinancial companies with a long track record of engagement with overseas institutional investors—drew on their experience in insisting that such offsetting should not be allowed, as it could attract accusations of greenwashing. It was ultimately decided that for the sake of popularizing the concept of avoided omissions, such offsetting would not be recognized.

With respect to point (2) above, there was considerable disagreement among Working Group members, depending on what sector they came from, about whether products and services derived from fossil fuels should be included in the scope of avoided emissions. Some members argued that as the Guidance on Avoided Emissions drawn up at the same time by the WBSCD did not allow any products and services derived from fossil fuels to be included in the scope of avoided emissions, the Working Group should accordingly follow suit. However, the Working Group followed METI's

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Technology Roadmap[3] for certain sectors in not excluding them after many members argued that the energy landscape in Japan differed from that of elsewhere, including the West, and that it is was currently not feasible to exclude emissions derived from natural gas and other fossil fuels during the transition process.

Ultimately, the membership of the Working Group, which comprises more than 100 companies from various sectors, reached a consensus based on the assumption that while alignment with global standards is a must, the path to a decarbonized society should take the specific current conditions of individual countries or regions into account.

III. Aiming to avoid working in isolation

As discussed above, discussions at the Working Group have also been conscious of the need to avoid working in isolation. In particular, it has been aware of the need to collaborate with the WBCSD, and has been working to amplify the effectiveness of its reports by publishing them to coincide with relevant global events such as COP summits.

1. Collaboration with WBCSD

The Working Group has exchanged views with asset managers and leading international initiatives in order to ensure consistency with the latest international thinking on avoided emissions and create rules that make it easy for overseas investors to evaluate them. It also invited Schroder Investment Management, which published a report on avoided emissions in collaboration with GIC, the Singaporean sovereign wealth fund, to talk about its initiatives and exchange views. Furthermore, WBSCD discussed the contents of its Guidance on Avoided Emissions with the Working Group prior to its publication, and the two bodies recognized its overall consistency with the Basic Guidelines drawn up by the Working Group while acknowledging some partial differences.

Various publications by WBSCD and the Working Group also stress the mutual collaboration between them, as evidenced by the foreword by Dominic Waughray, Executive Vice President of WBSCD, in the Working Group's "Leveraging Avoided Emissions: Financial Institution Case Studies", and the endorsement by the GX League of WBSCD's insight paper "Avoided emissions & Sustainable finance"[4], published in June 2024.

2. Messaging at global forums and involvement in rulemaking

METI and WBCSD co-hosted a session at the Japan Pavilion during COP28 in Dubai in December 2023 at which they talked about how best to evaluate avoided emissions on the path to net zero and emphasized the collaboration between WBCSD and the GX League by presenting the "Leveraging Avoided Emissions: Financial Institution Case Studies" report drawn up by the latter's Working Group. They also held a lively session on the standardization of avoided emissions within the industrial and financial sectors at the Japan Pavilion during COP29 in Baku in November 2024.

3. METI Technology Roadmap Formulated for Transition Finance toward Decarbonization
4. WBCSD_Accelerating-decarbonization-by-aligning-the-efforts-of-business-and-finance.pdf

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As of February 2025, the International Electrotechnical Commission (IEC) has been drafting IEC 63372, an international standard that will provide the principles, methodologies and guidance for the quantification and communication of avoided emissions from electric and electronic products, services and systems. Furthermore, WBCSD invited public comments on revisions to its Guidance on Avoided Emissions between November 2024 and January 2025. We think it will become increasingly important for the GX League to involve itself in global rulemaking in response to these global initiatives, for example by amplifying the voices of leading Japanese companies with a wealth of experience in the quantification and disclosure of avoided emissions.

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Chapter 2: Can a link be forged between avoided emissions and enterprise value?

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- Japanese companies have been making progress with efforts to reduce greenhouse gas (GHG) emissions since the Paris Agreement was adopted at the 21st Session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21) in December 2015. With companies making steady progress with their initiatives, the concept of avoided emissions has come under the spotlight as a means by which to properly assess the development of new technologies and other such endeavors for their contributions to society-wide reductions in GHG emissions.
- In 2022, the World Business Council for Sustainable Development (WBCSD) set up a working group on avoided emissions, and in March 2023 it issued its Guidance on Avoided Emissions. While many countries have yet to fully integrate their definitions and calculation methods for avoided emissions, we think this guidance is highly valuable as a pioneering effort in the creation of a global standard.
- At present, it is not easy to judge the relationship between avoided emissions and enterprise value. That said, because avoided emissions represent the result of company-led efforts in the service of decarbonization, we think it is likely that a link can be forged between the two, provided that emissions trading systems are put in place and that definitions and measuring methods for avoided emissions are settled upon so that the financial value of avoided emissions becomes more broadly understood. Japan is moving towards a full-scale launch of an emissions trading system in FY26 with the intent of making emissions trading fairer and more practical.

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I. What are avoided emissions?

Japanese companies have been making progress with efforts to reduce greenhouse gas (GHG) emissions since the Paris Agreement was adopted at the 21st Session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21) in December 2015. With companies making steady progress with their initiatives, we have seen a growing trend for companies to treat the global issue of climate change not just as a risk but also as an opportunity for fresh innovation.

With companies making steady progress with their initiatives, the concept of avoided emissions has come under the spotlight as a means by which to properly assess the development of new technologies and other such endeavors for their contributions to society-wide reductions in GHG emissions. The idea of avoided emissions is to quantify the reduction in emissions in the supply chain resulting from the use of a company's products and services instead of the products and services that were previously used.

Generally speaking, we use the concepts of Scope 1, Scope 2, and Scope 3 when gauging GHG emissions. Scope 1 refers to greenhouse gases emitted directly by companies and organizations via activities such as fuel combustion and product manufacturing. Scope 2 refers to greenhouse gases emitted indirectly through the use of electricity, heat, and steam supplied by other companies. Scope 3 refers to greenhouse gases emitted upstream and downstream within the supply chain. In most cases, however, avoided emissions are not reflected in the numerical figures of Scope 1, Scope 2, or Scope 3 emissions.

In its materials, the Ministry of the Environment (MOE) uses the example of a fictitious home appliance manufacturer to explain this (Figure 1). It depicts a scenario in which a home appliance manufacturer starts to sell refrigerators with annual emissions that are 30 tonnes less than the industry average. The home appliance manufacturer did not previously sell refrigerators, so its Scope 3 emissions from the use of refrigerators (prior to the release of this refrigerator model) were zero. In this case, the greater the number of environmentally friendly refrigerators sold, the greater the increase in total Scope 3 emissions and GHG emissions will be. However, based on the concept of avoided emissions, it is possible to argue that the company's contribution to reduced emissions is 30 tonnes per refrigerator.

Generally speaking, companies' GHG emissions tend to increase as they grow. We think avoided emissions represents a useful indicator to gauge the appropriateness of these initiatives in the case where GHG emissions rise at an individual company as it grows but emissions for society as a whole are reduced.

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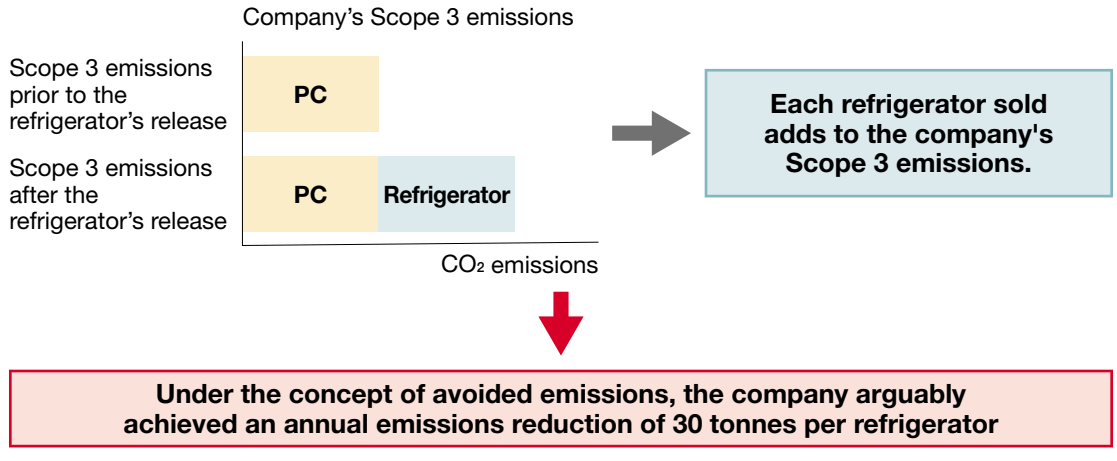
Fig. 1: Explanation of avoided emissions

Example of Scope 3 emissions rising even when new product contributes to lower emissions

- An appliance manufacturer brings its first refrigerator to market
- Annual CO_2 emissions from this refrigerator model are 30t less than the industry average
- The company had no refrigerator on the market before, so its Scope 3 emissions from refrigerators were previously zero.
  Each refrigerator sold adds to the company's Scope 3 emissions.



Under the concept of avoided emissions, the company arguably achieved an annual emissions reduction of 30 tonnes per refrigerator

Source: Nomura, based on Ministry of the Environment's Green Value Chain Platform "Reference 1: Avoided emissions". English translation by Nomura.

II. Current guidance on avoided emissions

Using avoided emissions as an indicator will require a unified definition.

Various groups have been considering definitions, calculations, and disclosure methods for avoided emissions both in Japan and overseas. For example, the World Business Council for Sustainable Development (WBCSD) and the Institute for Climate Change and Adaptation (ICCA) presented their thoughts on and calculation methods for avoided emissions for the chemicals industry in 2013. The World Resources Institute also released its views on avoided emissions in 2019. In Japan, the Ministry of the Environment (MOE) published its guidelines for quantifying companies' contribution to reducing GHG emissions in March 2015, and METI also published its guidelines for quantifying their contribution in 2018.

Recently, the WBCSD set up a working group on avoided emissions in 2022, and in March 2023 it issued its Guidance on Avoided Emissions.

According to this guidance, company contributions to global mitigation should not be limited to the reduction of their own direct and indirect emissions, but they should also strive to accelerate global decarbonization efforts by delivering solutions that are compatible with a 1.5°C pathway and enable emission reductions in society. The guidance also has six core principles: (1) ensuring company strategies are aligned with the latest climate science and global climate goals; (2) prioritizing the reduction of GHG emissions across the value chain; (3) separate reporting of Scope 1, 2, and 3 GHG emissions and avoided emissions; (4) emphasizing the long-term viability of 1.5°C compatible solutions; (5) driving high-quality GHG emissions reporting; and (6) delivering actionable

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recommendations (this guidance was drawn up using existing materials).

While many countries have yet to fully integrate their definitions and calculation methods for avoided emissions, we think this guidance is highly valuable as a pioneering effort in the creation of a global standard.

III. Methodology for calculating avoided emissions

There are two main methods for calculating avoided emissions during the assessment period: (1) the flow-based method; and (2) the stock-based method. The guidelines for quantifying companies' contributions to reducing GHG emissions explain the flow-based method as follows: "a method of showing cumulative contributions to reducing GHG emissions resulting from the use of products and services that are manufactured and sold during the assessment period (eg, one year) through the end of their lifecycle"; they explain the stock-based method as follows: "a method of showing avoided emissions resulting from the use of all assessed products and services that are in operation during the assessment period, including those sold in the past". In its guidance on avoided emissions issued in March 2023, the WBCSD presented similar concepts: "forward-looking avoided emissions" and "year-on-year avoided emissions".

In theory, the figures generated by the flow-based and stock-based methods will ultimately match. In reality, however, the flow-based method recognizes avoided emissions for the entire useful lifetime of a product at the point of sale, whereas the stock-based method recognizes avoided emissions from products sold in the past, including the period in question, over the useful lifetime of the product. This means that the flow-based calculation is likely to show higher avoided emissions at the initial stage, when sales start.

We also note the need for avoided emissions to be reported separately from Scope 1, 2, and 3 GHG emissions, as called for in the WBCSD guidance. In the past, the concept of avoided emissions was often referred to as Scope 4. That said, the WBCSD guidance recommends against the use of the terms Scope 4 as it could be misleading and place these emissions on the same continuum with Scope 1, 2 and 3 emissions.

IV. Avoided emissions and enterpirse value

How should we view the relationship between avoided emissions and enterprise value?

At present, it is not easy to see a clear relationship between enterprise value and avoided emissions. However, because avoided emissions represent the result of company-led efforts in the service of decarbonization, we think it is likely that the two will become linked over time, provided (1) that emissions trading systems are put in place, and (2) that definitions and measuring methods for avoided emissions are settled upon so that the financial value of avoided emissions becomes more broadly understood.

In terms of creating emissions trading systems (item number one above), the fifth meeting of the government's working group of carbon pricing experts for achieving GX, held in December 2024, included a debate about emissions trading systems. The GX League is currently trialing an emissions trading system and pushing ahead towards a full-fledged launch in FY26 with improvements in

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fairness and practicality. The trading system will target enterprises with (nonconsolidated) average direct CO_2 emissions of at least 100,000t over the previous three fiscal years (Figure 2). The plan is to start operating the trading market around fall FY27 and allocate emission quotas in FY27. This demonstrates the steady progress being made towards establishing an emissions trading system in Japan.

However, as suggested in point number two above, absent any clear definition of avoided emissions, such as the extent to which they are recognized, it will be difficult to account for their financial value. At this juncture, we have seen differences in avoided emissions of over 10-fold between companies in the same industries or the same formats. In our view, the establishment of an emissions credit market and a clear definition of avoided emissions will boost market expectations for recognizing financial value, resulting in a clear relationship between avoided emissions and enterprise value.

Fig. 2: Overview of emissions trading system due to start in FY26

Companies covered

- The system will cover companies (nonconsolidated) with average direct CO_2 emissions of at least 100,000t over the three years to the previous fiscal year
- Establish a certification system that will allow parent companies and other obligated parties to carry out procedures as integrated entity, including for closely related subsidiaries (if obligated)

Drafting of transition plans

- Targeted companies to draft and submit plans that include emission reduction targets and other related items to realize carbon neutrality by 2050

→ **For example, the Japanese government will collate and publish longer-term emission forecasts including FY30 targets for direct and indirect emission reductions**

Mandatory amortization of emission quotas

(1) Application for emission quota allocation

- Companies will apply for emission quotas calculated using government guidelines (all allocations free of charge)

(2) Emission calculations and reporting

- Companies will report their own emissions to the Japanese government every year after third-party verification

(3) Amortization of emission quotas

- Companies will have to reduce their emission quotas by the amount of verified emissions they report each year

(4) Treatment in the event of default

- Companies will have to pay down the unfulfilled amortization obligation at a 1.x multiple of the maximum price

Price stabilization measures

- The government will set minimum and maximum prices for emission quotas
- Companies with insufficient emission quotas (because of high emission quota prices etc) will be treated as having fulfilled their obligations by paying the shortfall multiplied by the maximum price
- If market prices remain below the minimum price for more than a set period of time, the GX Acceleration Agency will carry out a reverse auction to adjust the volume of emission quotas on the market and consider strengthening the allocation criteria

Emission quota trading market

- The GX Acceleration Agency will open an emission quota trading market to ensure the fair and stable operation of said market
- Market participants shall include: (1) companies with some experience in trading carbon credits; and (2) companies trading on behalf of companies covered by the system, as well as covered companies themselves

Source: Nomura, based on materials from the 5th meeting of the Carbon Pricing Expert Working Group for the Realization of GX. English translation by Nomura.

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Chapter 3: Significance of avoided emissions for investors and how they can use them

Calculating financed avoided emissions in Nomura Asset Management portfolio

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- As an asset management company, Nomura Asset Management has set a target of net zero emissions by 2050, and it measures and discloses financed emissions as part of its engagement activities. Meanwhile, we reflect avoided emissions in ESG scores, which we use to make investment decisions.
- Few companies disclose avoided emissions, even in Japan, which is relatively proactive about the topic. We expect rising demand for products and services that form part of transition plans and measures to combat climate change, given the climate change targets of governments around the world. On that basis, we think disclosure of avoided emissions will become increasingly important for corporate valuations and environmental engagement, as they provide investors with an easy way to understand social contributions accompanying this increase in demand. In particular, as users of this sort if information, we would like to see companies that disclose data on avoided emissions begin making clear mention of whether the calculation methods employed are flow-based or stock-based.
- Some industries appear to have drafting standards related to avoided emissions in a bid for standardization. Unfortunately, some secondary market participants are still not very aware of these developments. For relatively new non-financial data such as avoided emissions, a passive stance towards analysis that waits for standardized databases to appear is not going to lead to increased data usage. The analysts themselves have to acquire the primary data and then seek to understand the criteria behind the data, although this is true for nonfinancial data more generally as well.
- Nomura Asset Management has acted as secretary of the avoided emissions subcommittee of the Japan branch of PCAF[1], and has hosted briefings featuring explanations on the topic of avoided emissions and presentations

1 The Partnership for Carbon Accounting Financials (PCAF) is an international initiative by financial institutions that aims to calculate and disclose the GHG emissions from companies that financial institutions invest in and finance.

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by standard-setting bodies (including the WBCSD) and disclosure staff from Japanese companies. We have taken the longstanding model of proactive global exchanges of ideas in the accounting sphere and have applied it to the subject matter of avoided emissions. We think this kind of mutual exchange of information on the topic of nonfinancial data will prove crucial going forward.

- Recognizing the avoided emissions disclosed by companies and linking them with associated assets allows for a comprehensive view that not only identifies investment risks resulting from climate change but opportunities too. We evaluate climate change risks and opportunities by combining avoided emissions with our existing analysis of financed emissions, and factor these into our investment decisions. Here, we calculate financed avoided missions for our asset portfolio for the first time. This allows us to gain a quantitative picture of the opportunities in our portfolio. Going forward, we plan to continue with this analysis and to issue information about opportunities related to climate change within our portfolio.

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I. Avoided emissions and initiatives at Nomura Asset Management

1. Greenhouse gas emissions and avoided emissions

We will not go into detail here about the definition of avoided emissions or their necessity, as other authors have written about it, and instead look at the close relationship between avoided emissions and intervention accounting. Intervention accounting is an accounting method designed to manage, evaluate, and improve organizations. Avoided emissions are an indicator of the extent to which specific products or services reduce greenhouse gas (GHG) emissions. The two are closely related in that they are designed to evaluate and improve the environmental performance of organizations. For example, when a company develops a new product that offers lower GHG emissions than existing products, we can use intervention accounting to recognize this, and also measure the avoided emissions.

Meanwhile, GHG emissions using the GHG Protocols are based on inventory accounting. To be more precise, this involves the measuring and reporting of the inventory of sources of GHG emissions from with the operational boundaries of an organization itself.

Both of these methods are important for gauging societal GHG emission levels. That said, to date disclosures have been primarily about companies' GHG emissions specifically. Because of this, if a company increases sales of products or services that contribute to reducing GHG emissions for society as a whole, overall GHG emissions will go down, but the company's own GHG emissions will go up, which is an issue. The concept of avoided emissions is a powerful means of resolving this issue.

Fig. 1: Comparison of intervention accounting and inventory accounting

Item	Intervention accounting	Inventory accounting
Definition	Method for assessing the impact of projects, products, or other interventions on GHG emissions	Method for measuring and reporting sources of GHG emissions within the operational boundaries of a company or organization itself
Purpose	Measuring avoided emissions and evaluating the benefit from interventions	Gauging overall GHG emissions and tracking progress towards targets
Targets	Reduction in emissions versus case in which the product or service does not exist	Overall GHG emissions, including direct emissions from companies (Scope 1) and value chain emissions (Scope 3)
Evaluation characteristics	This method measures how far emissions fall because of the intervention and evaluates opportunities for corporate economic activity	This indicator evaluates climate change risk, recognizing the inherent nature of increased economic activity to push up GHG emissions
Measurement method	Comparison of emissions in presence or absence of intervention	Comparison of historical and current data
Specific items	Avoided emissions	GHG emissions

Source: Nomura Asset Management, based on various materials

2. Nomura Asset Management's ESG score

When evaluating Japanese equities, we assess companies from an ESG perspective using a proprietary ESG score that identifies and analyzes nonfinancial data for companies covering dozens of items. We use our ESG scores to make investment decisions about our investment portfolio, to develop new products, and to provide information to customers.

Fig. 2: Overview of Nomura Asset Management's ESG scoring framework

Main category	Sub-category	Sub-items
Environmental	Environmental strategy, senior management's initiatives	
	Climate change	
	Natural capital, other environmental issues	
Social	Social strategy, senior management's initiatives	Evaluate individual sub-items in line with the theme of the larger grouping. Dozens of sub-items set in FY24
	Working environment	
	Human capital	
Governance	Evaluation of senior management	
	Evaluation of voluntary advisory committee	
	Evaluation of board of directors	
SDGs	-	

Source: Nomura Asset Management

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While we review our evaluation items annually, we have long considered the disclosure or nondisclosure of avoided emissions in our ESG scores. On top of that, we started making quantitative evaluations of avoided GMG emissions with our 2023 revisions. Specifically, we calculate economic value by multiplying avoided emissions disclosed by a company by the value of internal carbon prices used in evaluation of that company, and calculate the ratio of this figure to operating profits. This enables us to assess climate-related opportunities.

Fig. 3: Climate change-related items included in ESG scores since 2023

GHG emissions	Avoided emissions
Already in use	Assessment as individual item started in 2023
Climate-related risk assessment item	Climate-related opportunity assessment item

Source: Nomura Asset Management

Fig. 4: Quantitative evaluation formula for avoided emissions

$$\text{Quantitative evaluation formula for avoided emissions} = \frac{\text{Avoided emissions } (tCO_2e) \times \text{internal carbon price } (\$/tCO_2e)}{\text{Operating profits } (¥)}$$

Note: Internal carbon prices converted to yen
Source: Nomura Asset Management

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II. Disclosure of avoided emissions in Japan (flow basis and stock basis)

Assessing avoided emissions requires the acquisition of direct data from primary sources such as company integrated reports. While there are some organizations that provide databases of GHG emissions based on the data in corporate disclosures, at this juncture we have not been able to find any such databases for avoided emissions. Some ESG data organizations provide this data based on estimates. In this chapter we take up the topic of flow-based vs stock-based methods of calculating avoided emissions over a given assessment period—something touched upon in Chapter 2—and attempt to break down the avoided emissions data we have collected as an investor.

1. Flow-based and stock-based methods

In Japan, the flow-based method and stock-based method are both used to measure and disclose avoided emissions. Here we provide an overview of both methods.

The flow-based method is used when the objective is the avoided emissions over the lifetime of the products or services being assessed. It measures the total GHG emissions that have been avoided by using the products or services manufactured or sold during the assessment period (such as one year) through to the end of their useful lives.

The stock-based method looks at avoided emissions from the products or services being assessed over the assessment period, and shows avoided emissions from all the subject products or services being used during the assessment period including those sold beforehand. Normally, it shows avoided emissions in any given year.

As the flow-based method recognizes avoided emissions from the initial fiscal year of manufacture or sale through to the end of the useful life, it measures substantial avoided emissions from the initial fiscal year of disclosure. However, once the product in question is no longer on sale, the avoided emissions are not recognized. By contrast, the stock-based method measures avoided emissions from products in use over a year, and shows only limited avoided emissions at first disclosure. However, it recognizes avoided emissions as long at the products in question remain in use, even if they are no longer sold. The two methods produce the same value for cumulative avoided emissions over the lifetime of a product or service.

Japan uses a mix of both methods for disclosing avoided emissions, and we think that if we are to see greater use of avoided emissions among people making investment decisions, companies will need to make clear which method they are using.

Fig. 5: Comparison Flow-based and stock-based methods

Item	Flow-based method	Stock-based method
Definition	Method that looks at avoided emissions over the lifetime of the products/services being assessed	Method that looks at all avoided emissions from products/services in use over the assessment period, including from those products/services sold in the past
Calculation targets	Avoided emissions over the lifetime of products manufactured and sold during the assessment period	Avoided emissions from all products in use during the assessment period
Recognition of avoided emissions	Substantial avoided emissions recognized in first fiscal year of manufacture/sale; avoided emissions not recognized after sales have ended	Measures avoided emissions over one year from products in use; recognizes avoided emissions as long as products are in use, even if they are no longer on sale
Feature 1	Gauges substantial avoided emissions from first fiscal year	Gauges avoided emissions based on long-term use
Feature 2	Avoided emissions no longer recognized once product in question is no longer on sale	Limited avoided emissions in initial disclosures

Points in common	
Point in common 1	Assessment period is normally 1 year
Point in common 2	No difference in cumulative avoided emissions over entire lifetime

Source: Nomura Asset Management, based on various materials

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2. Disclosure of avoided emissions in Japan

1) Collated data on avoided emissions

We have collated data on avoided emissions reported in 2024 from a total of 500 companies (the TOPIX Core 30, the TOPIX Large 70, and the TOPIX Middle 400). We looked at the companies' integrated reports, sustainability reports, and websites in collecting this data. We also used a one-year assessment period and excluded companies that only disclosed cumulative avoided emissions from projects (data recognition as of end-December 2024). This was because of the need for a one-year assessment to compare avoided emissions and assets under management, as discussed below. In terms of calculation method, we referenced the flow-based method, the stock-based method, and data from financial institutions on avoided emissions at companies that they have invested in or provided financing to (shown as "financial institutions" in the data below).

We found avoided emissions disclosures from 79 companies this time around. Chapter 4 of this report shows a detailed breakdown.

We attempted to use AI when collating data on avoided emissions, but it proved unworkable. Accordingly, our staff collected the data by reading company integrated reports and other materials themselves. We realized that there is a challenge ahead in developing more efficient ways of extracting the data on avoided emissions from company disclosures.

2) Breakdown of calculation methods for avoided emissions

Of the 79 companies in our analysis, it appears to us that 35 use the flow-based method in their disclosures of avoided emissions, 37 use the stock-based method, and three companies use both. In addition, we found data from four financial institutions. The sectors in which the flow-based method is used were primarily in manufacturing, namely electric appliances (eight companies), chemicals (six companies), and machinery (six companies). Companies tend to be proactive about disclosing lifetime avoided emissions when selling products that contribute to decarbonization in society. By contrast, the main sectors using the stock-based method are electric power & gas (six companies), wholesale trade (five companies), information & communication (five companies), and electric appliances (five companies). Many companies in the electric power & gas and commercial trade sectors recognize the avoided emissions associated with switching to low-carbon fuels.

Avoided emissions that we found in our research totaled 1,275mn tCO_2e. This broke down as 835mn tCO_2e from companies using the flow-based method, 279mn tCO_2e from companies using the stock-based method, 117mn tCO_2e from companies using both methods, and 44mn tCO_2e from financial institution data. There was a substantial difference in avoided emissions between the flow-based and stock-based groups despite then having more or less the same number of companies. The flow-based method recognizes all future avoided emissions at the point of sale, whereas the stock-based method recognizes avoided emissions over one year from the products and services in use. This means that the flow-based method tends to yield higher numbers at present, as we are in the early stages of disclosures of avoided emissions.

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Fig. 6: Breakdown of calculation methods for avoided emissions in Japan

Calculation method	No of companies	Avoided emissions (mn t of CO_2e)
Flow only	35	835
Stock only	37	279
Both flow and stock	3	117
Financial institutions	4	44
Total	79	1,275

Source: Nomura Asset Management

III.Initiatives by sector and proposals for utilization

The Institute of Life Cycle Assessment, Japan (ILCAJ) has issued its Guidelines for Assessing the Contribution of Products to Avoided Greenhouse Gas Emissions as comprehensive guidelines for avoided emissions in Japan. These guidelines are limited to avoided emissions of GHGs and were drawn up to provide some guidance. However, they also say that voluntary calculation activity should take place irrespective of the guidelines. A second version of the guidelines was published on 8 March 2022 following discussions with study groups and a review of the guidelines themselves. Below, we also list initiatives within specific industries.

1. Initiatives by sector

1) Initiatives in the electric appliances sector

As of February 2025, the International Electrotechnical Commission (IEC) is working to draft international standards (IEC 63372) on the calculation and reporting of avoided emissions from electric and electronic products, including software. The Japan Electronics and Information Technology Industries Association (JEITA) also released its Guidance on Calculating GHG Emission Reduction Contributions of Electronic Components in 2022. In response to company disclosures related to avoided emissions resulting from these initiatives, the Japan Electrical Manufacturers' Association (JEMA) published its JEMA-GX Report 2023 in 2024, which provides an overview of corporate efforts by continuously reviewing the status of initiatives in the sector aimed at tackling environmental issues and decarbonization in particular, and this report collated data on avoided emissions.

2) Initiatives in the chemicals sector

In the chemicals sector, the Japan Chemical Industry Association (JCIA) published its Guidelines for Calculating the Avoided CO_2 Emissions in 2012. The JCIA calculated avoided CO_2 emissions from the use of products manufactured in the year under review across their entire lifecycles, using 2020 as the evaluation year. It looked at the areas of renewable energy, reducing energy consumption, reducing resource consumption, recyclable resources, and curbing N_2O emissions, and analyzed 15 examples in Japan (including residential insulating materials, solar power-related materials, and

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LED-related materials) and four global examples (including desalination plant materials and aircraft materials). Based on thee results of this, it revised its Life Cycle Analysis of Chemical Products in Japan, which it first published in July 2011, with a third version in March 2014 and a fourth version with 2030 as its evaluation year in December 2021.

3) Initiatives in the gas sector

The Japan Gas Association released its guidelines for calculating avoided GHG emissions in the city gas industry in 2024. The city gas industry has been contributing to GHG reductions by encouraging the use of city gas, which consists primarily of natural gas. Natural gas emits less CO_2 than coal or oil, and it also produces lower NOx and SOx emissions. That said, increased usage of natural gas has a downside in that it results in higher GHG emissions at individual companies. Because of this, the Japan Gas Association issued the guidelines to quantify avoided emissions from the shift to natural gas and renewable energy from the perspective of the need for decarbonization via the uptake of products and services across society as a whole and not just efforts at individual companies, and to provide increased transparency and reliability to these figures. Some companies have used avoided emissions based on these guidelines as KPIs in their medium-term business plans.

2. Proposals for disclosure and use of avoided emissions

These initiatives in Japan have resulted in a rise in the number of companies making disclosures about avoided emissions. In view of this, Nomura Asset Management has attempted to use avoided emissions in our ESG scores and in engagement too.

We think equity market participants should also make proactive use of this in their analysis. At this juncture, however, we think they need to actively collect primary data and analyze it themselves and avoid seeking out standardized data related to avoided emissions. This is because recognition, measurement, and the drafting of disclosure standards has only just begun, not just for avoided emissions but also for nonfinancial data overall. It is difficult to build standardized and normalized databases under such circumstances. If anything, we think stock market participants should take a proactive stance on finding and analyzing primary data for nonfinancial information while standards are still being drawn up.

IV. Measuring and disclosing financed avoided emissions

We have analyzed disclosures of avoided emissions by Japanese companies whose shares form part of our assets under management. We calculated avoided emissions from our assets under management by multiplying investments and loans outstanding by the attribution factor minus EVIC (enterprise value including cash).

Efforts to quantify climate change-related factors in assets under management have already taken place with regards to GHG emissions, and have been defined as financed emissions. We think that the avoided emissions covered by the initiatives discussed here can by the same logic be thought of as financed avoided emissions.

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Total avoided emissions for our assets under management come to 42.92mn tCO_2e. This breaks down as 30.04mn tCO_2e under the flow-based method and 9.64mn tCO_2e under the stock-based method. By way of reference, financed emissions (Scope 1 + 2) from Japanese equities under management come in at roughly 15mn tCO_2e.

To date, the emphasis has been financed emissions, which looks only at the risk aspect of GHG emissions. However, calculating financed avoided emissions has allowed us to gain a quantitative picture of climate change-related opportunities in terms of future avoided contributions from products and services sold in this financial year (flow basis) and avoided contributions from products in operation that had been sold up to the present fiscal year (stock basis). We intend to carry on measuring and sharing data on financed avoided emissions as an indicator to quantify our portfolio holdings' society-wide contributions to GHG emission reductions.

Fig. 7: Financed avoided emissions in Nomura Asset Management portfolio (Japanese equities)

Calculation method	Avoided emissions (mn t of CO_2e)	Weighting
Flow only	30.02	70%
Stock only	9.64	22%
Both flow and stock	2.94	7%
Financial institutions	0.30	1%
Total	42.92	100%

Source: Nomura Asset Management

V. Nomura Asset Management at PCAF Japan avoided emissions subcommittee

Nomura Asset Management took on the role of secretary of the avoided emissions subcommittee of the Japan branch of PCAF in FY23, and has remained in this role in FY24. This subcommittee brings together financial institutions as users of avoided emissions and hosts study groups on how to use avoided emissions. During this process, we have come to understand the limits of learning about avoided emissions as users alone.

In dealing with this, we have taken inspiration from study groups and information-sharing meetings that cover financial information. The accounting industry has held study groups featuring the preparers, auditors, and users of financial information. Some of them have even featured the Accounting Standards Board of Japan (ASBJ) and the International Accounting Standards Board (IASB) to provide insight from the standards-setting process side too. By contrast, we think there has been little such interaction when it comes to avoided emissions and other nonfinancial information. In view of this, we held study groups in FY24 that included sustainability representatives from nonfinancial companies involved in standards setting and information disclosure.

The first meeting of the subcommittee group included a representative of GX League Working Group on Disclosure and Evaluation of Climate-related Opportunities, who provided examples of disclosure in Japan. The second meeting was attended by representatives from WBCSD and

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PCAF involved in avoided emissions overseas, who spoke about the current state of deliberations about standardization. This underlined the way that avoided emissions are being actively discussed internationally and not attracting attention in Japan alone.

The third subcommittee meeting featured sustainability representatives from multiple Japanese companies, who talked about the background and purpose of avoided emissions disclosures. This provided an opportunity for information exchange between the creators and users of avoided information disclosures, which we think was significant.

Setting standards for nonfinancial information tends to be slower than for financial information. In some cases too, each sector comes up with its own detailed standards, as has been the case for avoided emissions. Furthermore, there has been little progress with creating databases of nonfinancial information. Because of this, the understanding of users has not kept up with the progress being made with the disclosure and standardization of nonfinancial information such as avoided emissions. The subcommittee has been working to narrow this gap.

VI. Conclusion

As an asset management company, we have set a target of net zero emissions for 2050, and have been active in engagement aimed at reducing financed emissions. Meanwhile, we have been reflecting avoided emissions in our ESG scores and using them in our investment decisions.

We think it highly important to recognize avoided emissions disclosed by companies and to link them with assets under management. This is because this information can provide a comprehensive view not only of risks associated with climate change in our investment portfolio but the opportunities too. Combining avoided emissions with an analysis of existing financed emissions allows one to simultaneously evaluate both the risks and the opportunities related to climate change.

The analysis carried out in this report was only for companies that have already made disclosures about avoided emissions. Few companies have made these disclosures even in Japan, where companies have been more proactive than in the West. Given the climate change targets of governments around the world, we think demand for products and services that form part of climate change countermeasures and transition plans will only grow further. Accordingly, we see even greater importance in the disclosure of avoided emissions an easy way for investors to gauge the social contributions made by this rising demand.

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Chapter 4: Quantitative analysis based on avoided emissions data

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- The percentage of TOPIX 500 constituents that have recently disclosed data on avoided emissions is 15.8%, although the disclosure rate varies from sector to sector. In terms of key investment indicators, these companies tend to be large value stocks with low forward ROE, relative to the respective averages for the TOPIX 500.
- Our analysis of the market reaction to environment-related events for companies that have disclosed avoided emissions data reveals that these companies' share price performance (excess return) was slightly positive on average before and after these events, but that their liquidity (their share of total trading value) barely changed at all. In view of this, while we would not go so far as to claim that avoided emissions have now become a key stock market theme, we do think that we will need to continue to investigate the impact that avoided emissions disclosures have on share price returns going forward.
- Looking at the avoided emissions data that is currently available from the perspective of the concept of the four Vs of valuable big data, as discussed by Japan's Ministry of Internal Affairs and Communications, among others, we see that there are a number of issues with this data in terms of both volume and veracity. We think these issues will need to be overcome if institutional investors are to use this data for a wide range of purposes in future. For example, if there was more data, it would likely be possible to analyze the results of the event study discussed below in greater depth.

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I. Characteristics of companies that have disclosed avoided emissions

1. Disclosure rate of 15.8% for TOPIX 500 constituents, with rate varying from sector to sector

We analyzed the characteristics—in terms of disclosure status and investment indicators, for example—of companies that have and have not disclosed data on avoided emissions. Firstly, we found that 15.8% (79 companies) of the companies that were TOPIX 500 constituents in 2024 disclosed the numerical value of their avoided emissions in the same year. In terms of the TSE's TOPIX-17 Series sectors (Figure 1), the electric power & gas sector had the highest disclosure rate (46.2%), followed by steel & nonferrous metals (30.8%), and commercial & wholesale trade (28.0%). We also found that there were four sectors—pharmaceutical, real estate, retail trade, and food—in which not a single TOPIX 500 constituent had disclosed data on its avoided emissions.

Fig. 1: Avoided emissions disclosure rates by sector

Rank	TOPIX-17 Series sectors	Disclosure rate (%)	Number of companies without disclosures	Number of companies with disclosures	Total number of companies
1	Electric power & gas	46.2	7	6	13
2	Steel & nonferrous metals	30.8	9	4	13
3	Commercial & wholesale trade	28.0	18	7	25
4	Raw materials & chemicals	27.1	35	13	48
5	Automobiles & transportation equipment	26.1	17	6	23
6	Energy resources	25.0	3	1	4
7	Electric appliances & precision instruments	22.2	49	14	63
8	Financials (ex banks)	22.2	14	4	18
9	Construction & materials	18.9	30	7	37
10	Machinery	18.8	26	6	32
11	Banks	12.5	21	3	24
12	IT & services, others	8.2	67	6	73
13	Transportation & logistics	6.3	30	2	32
14	Pharmaceutical	0.0	17	0	17
14	Real estate	0.0	13	0	13
14	Retail trade	0.0	35	0	35
14	Foods	0.0	29	0	29
	Total	**15.8**	**420**	**79**	**499**

Note: Universe is TOPIX 500 constituents. Based on TOPIX-17 Series sectors. "Companies that have disclosed avoided emissions" are those for which value of 2024 avoided emissions is positive. "Companies that have not disclosed avoided emissions" are those for which value of 2024 avoided emissions is zero. "Disclosure rate" is number of companies in each category that disclosed avoided emissions data divided by total number of companies in each sector (or in universe as a whole).

Source: Nomura, based on Nomura Asset Management data

2. Compared to universe average, companies that have disclosed avoided emissions data tend to be large value stocks with low forward ROE

On average, compared to the respective averages for the universe, we found that companies that have disclosed avoided emissions data tend to be large value stocks. Specifically, compared to the average (ie, the arithmetic mean) for the universe of TOPIX 500 constituents, companies that have disclosed data on their avoided emissions look undervalued in terms of value indicators such as B/P (the inverse of P/B), forward E/P (the inverse of forward P/E), and forward dividend yield, and they

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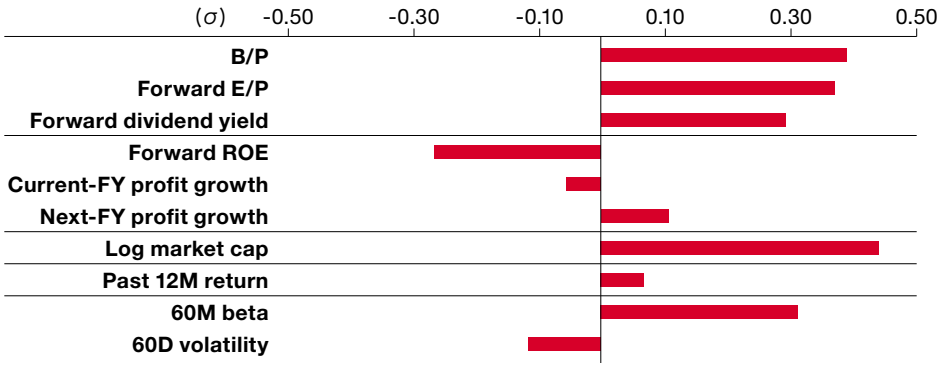
also have low forward ROE (Figure 2). In addition, their log market is cap is a large positive value. The trends are essentially the same when we look at the figures on a median basis too (Figure 3).

Moreover, the electric power & gas, steel & nonferrous metals, and commercial & wholesale trade sectors, which have high disclosure rates, are generally regarded as value sectors. We therefore carried out a sector-neutral analysis (ie, a comparison of stocks in the same sector) and found that, based on average values, the tendency for companies that have disclosed avoided emissions data to be large value/low forward ROE companies remained the same (Figure 4). When we looked at the median values, however, we found that while the companies that have disclosed avoided emissions tended to be large stocks, with a low forward ROE, there was virtually no tendency towards value (Figure 5). This suggests that some of the companies that have disclosed avoided emissions are substantially undervalued.

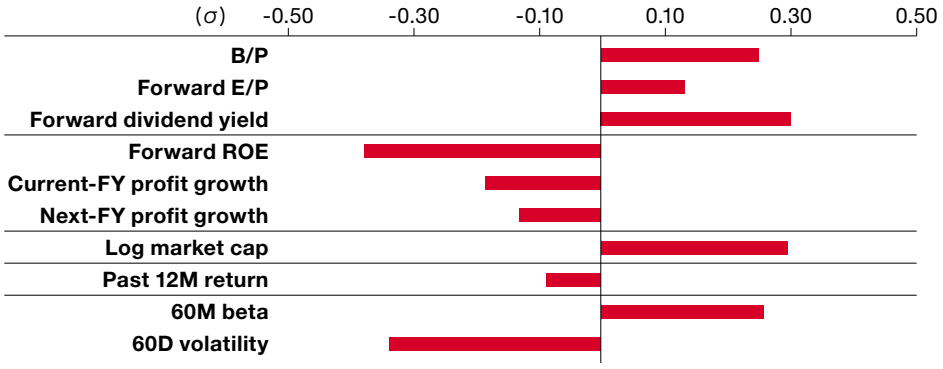
Fig. 2: Standardized values within universe (average)



Note: We used factor values as of end-December 2024. Values standardized within universe (or within sector), with zero representing market average (total of companies that have disclosed avoided emissions and those that have not).

Source: Nomura, based on Nomura Asset Management data

Fig. 3: Standardized values within universe (median)



Note: We used factor values as of end-December 2024. Values standardized within universe (or within sector), with zero representing market average (total of companies that have disclosed avoided emissions and those that have not).

Source: Nomura, based on Nomura Asset Management data

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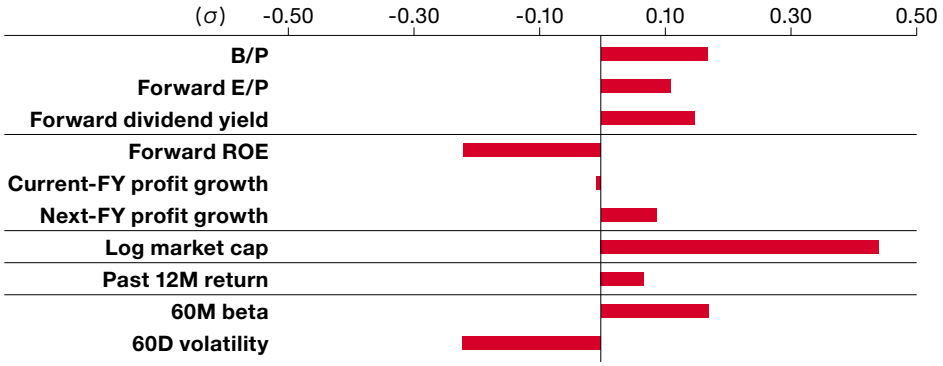
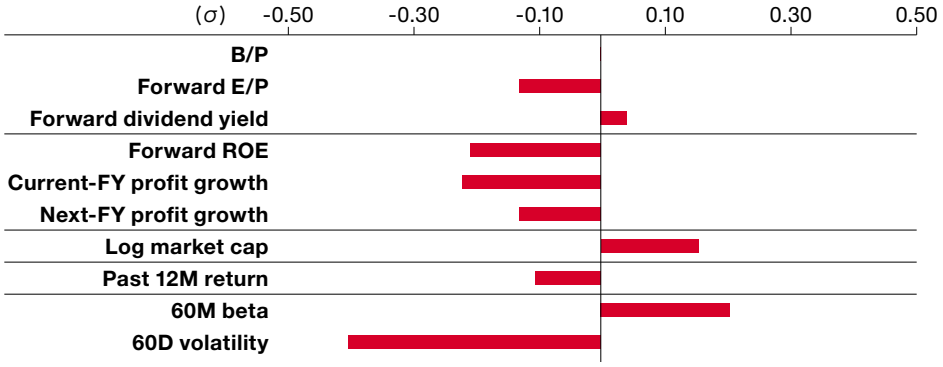
Fig. 4: Standardized values within sector (average)



Note: We used factor values as of end-December 2024. Values standardized within universe (or within sector), with zero representing market average (total of companies that have disclosed avoided emissions and those that have not).

Source: Nomura, based on Nomura Asset Management data

Fig. 5: Standardized values within sector (median)



Note: We used factor values as of end-December 2024. Values standardized within universe (or within sector), with zero representing market average (total of companies that have disclosed avoided emissions and those that have not).

Source: Nomura, based on Nomura Asset Management data

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II. Market reaction to environment-related events for companies that have disclosed avoided emissions

1. Stock market reaction to five categories of environment-related events

We get the impression that avoided emissions are not currently attracting a great deal of attention among stock market participants—presumably a varied group with diverse perspectives. On the basis of this assumption, we have looked at the stock market reaction to environment-related events since 2020 with respect to companies that have disclosed avoided emissions. Looking specifically at five categories of events (Figure 6), we have examined changes in share price performance (cumulative excess returns versus the universe average) and liquidity (share of total trading value accounted for by companies that have disclosed avoided emissions) before and after the events (Figures 7 and 8). Please note that because historical data on companies that have disclosed avoided emissions is limited, we have used the most recent data in our assessment of the market reaction to past events.

Fig. 6: Five categories of events

Number	Category	Specific events	Date
1	Date of establishment of JPX decarbonization-related indexes	FTSE JPX Net Zero Japan 200 Index	2022/04/21
		FTSE JPX Net Zero Japan 500 Index	2022/04/21
2	Date of announcement of Nikkei decarbonization-related index	Nikkei 225 Climate Change 1.5°C Target Index	2022/05/16
3	Date of announcement of establishment of new environment-related market	Carbon credit market	2023/06/09
4	Date of establishment of environment-related listed ETFs	MAXIS Carbon Efficient Japan Equity ETF (2560)	2020/02/06
		NZAM ETF S&P/JPX Carbon Efficient Index [2567]	2020/09/10
		SMT ETF Carbon Efficient Index Japan Equity [2642]	2021/06/23
		IShares MSCI Japan Climate Action ETF [2250]	2023/06/08
		Global X MSCI Japan Climate Change ETF [2848]	2022/03/24
		NEXT FUNDS MSCI Global Climate 500 Japan Selection Index Exchange Traded Fund [294A]	2024/12/03
5	First day of COP conferences	COP26 (UK)	2021/10/31
		COP27 (Egypt)	2022/11/06
		COP28 (UAE)	2023/11/30
		COP29 (Azerbaijan)	2024/11/11

Note: For events in categories (4) and (5) we used average for all events to calculate market reaction.
Source: Nomura, based on Japan Exchange Group, Nikkei, FTSE, S&P Global, and Japanese Ministry of Foreign Affairs websites

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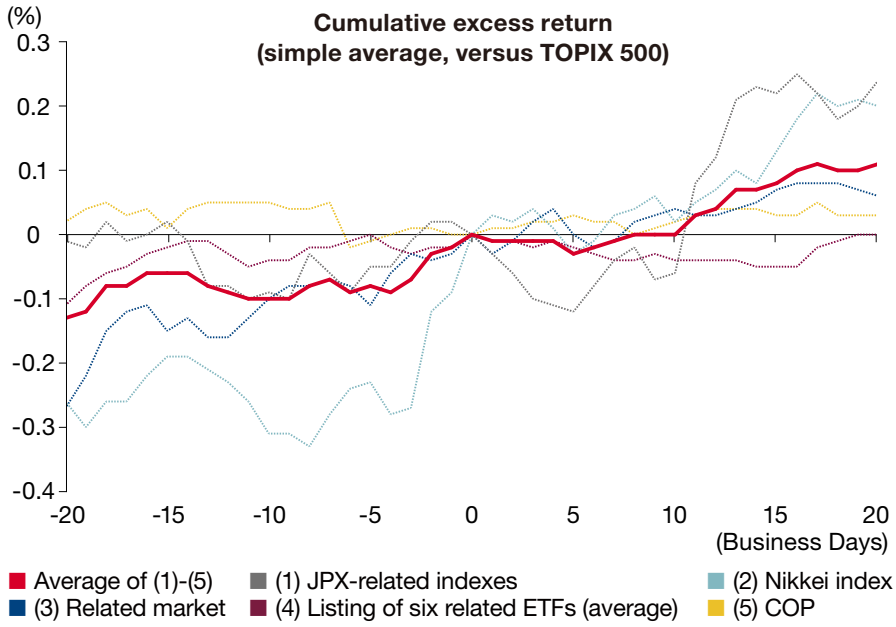
2. Slight upward trend in share prices, almost no change in liquidity

Figures 7 and 8 show the average cumulative excess return and the share of total trading value before and after these five categories of events.

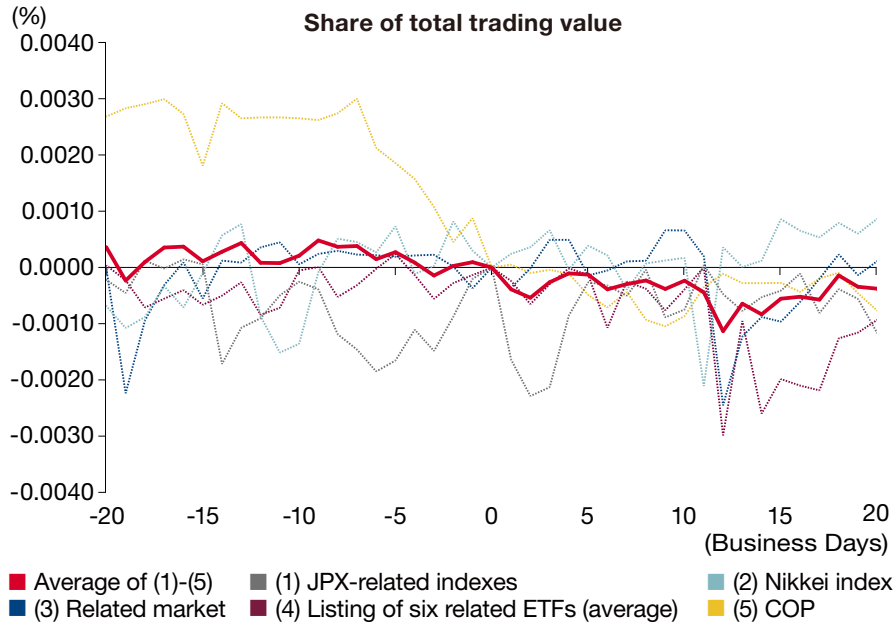
Fig. 7: Excess return before and after events



Note: Shows share price reaction to events listed in Figure 6 for companies that have disclosed avoided emissions. Cumulative excess return is simple average return versus universe (TOPIX 500). t=0 is day of each event, and cumulative excess return at t=0 is 0%.

Source: Nomura, based on Nomura Asset Management data

Fig. 8: Share of total trading value before and after events



Note: Shows share of total trading value before and after events listed in Figure 6 for companies that have disclosed avoided emissions. Share of total trading value is defined as total daily trading value of companies that have disclosed avoided emissions divided by total daily trading value of TOPIX 500 constituents. t=0 is day of event, share of total trading value shown on relative basis, with share on t=0 of 0%.

Source: Nomura, based on Nomura Asset Management datg

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The results of our analysis show a modest upward trend in excess return for all five categories of event as a whole. One reason for this may be that, as we pointed out above (in "I. Characteristics of companies that have disclosed avoided emissions"), a large proportion of the companies that have disclosed their avoided emissions are value stocks or in value sectors, relative to the market as a whole. We think the results of our analysis might reflect the substantial outperformance of value stocks versus the Japanese equity market as a whole since 2021. Moreover, the level of cumulative excess returns is low, and the share price impact of the events themselves (changes immediately before the event, including at t=0) is not particularly large. Going forward, we think that we should, ideally, accumulate more data and look at the situation from a variety of angles, in order to assess whether or not the share prices of companies that have disclosed avoided emissions tend to show a substantial share price reaction to environment-related events. That said, we think it interesting that, despite the limited data on which we based the analysis set out above, excess returns were nevertheless positive.

Meanwhile, although companies that have disclosed avoided emissions saw their share of total trading value fall slightly after the environment-related events, in our view there were virtually no substantial changes. In other words, at the very least, we do not think there was much trading based on expectations for these events.

Above, we looked at the market reaction to environment-related events for companies that have disclosed avoided emissions, in terms of share price performance (excess return) and liquidity (share of total trading value). While these companies' share prices rose slightly, on average, before and after the events, their liquidity barely changed. On this basis, while we would not go so far as to claim that avoided emissions are now a key stock market theme, we do think that we will need to continue to look into the impact they have on share price returns going forward.

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III. What is needed for institutional investors to make greater use of avoided emissions data?

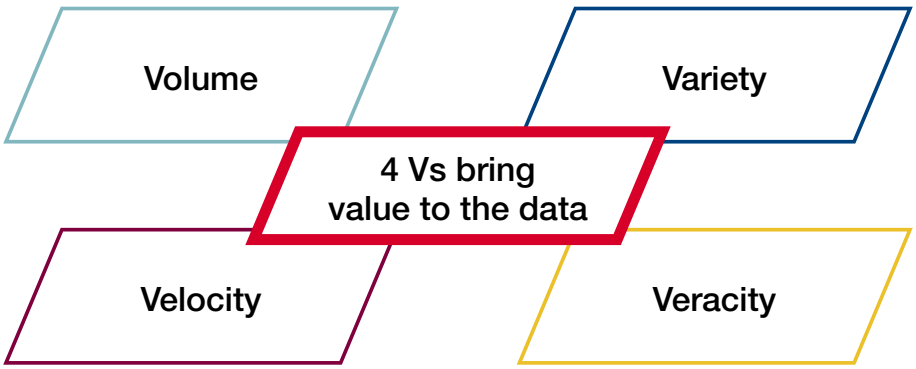
1. The concept of the 4 Vs for large volumes of valuable data

The results of the analysis set out above under the heading "I. Characteristics of companies that have disclosed avoided emissions" were based solely on recent data. In order to capture trends at companies that disclose avoided emissions, we should, ideally, analyze their characteristics using data covering a fairly long period as well as the most recent data. However, the concept of avoided emissions has not been around for long, and long-term data has yet to accumulate.

Generally speaking, institutional investors are accustomed to using large volumes of data, such as share price data and financial data, in performing investment analyses. For these investors to be convinced to make active use of some new form of data, the data would need to appear to have some obvious investment relevance, and it furthermore would need meet certain criteria showing it to be amenable to analysis. The Ministry of Internal Affairs and Communications' 2019 White Paper on

Information and Communications in Japan[1] introduces the concept of the 4Vs for so-called "valuable big data". Below, we quote its explanation of the concept and the four Vs (Figures 9 and 10).

Fig. 9: Overview of 4 Vs concept



Source: Nomura, based on Ministry of Internal Affairs and Communications data 2019 White Paper on Information and Communications (https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/r01/html/nd121210.html, available in Japanese only)

Fig. 10: Explanation of the 4 Vs

	Explanation
Volume	Taking consumers' purchasing histories as an example, while very little can be learned from the data if just one person buys something once, analysis of the purchasing histories of multiple people on multiple occasions can reveal trends in people's purchasing behavior. This can make it possible to predict people's future purchasing behavior and to use advertising, for example, to encourage their purchasing behavior.
Variety	Using the same example, if we can obtain data not only on the age and gender of the buyer, but also on his or her address and family situation, friends, hobbies, and concerns, this should make it possible to carry out a more detailed analysis. Moreover, more granular data regarding time, place, and behavior, for example, further increases the value.
Velocity	As an example of nowcasting, Google is said to be able to use search data to estimate the number of people infected with influenza in real time and before any official announcement.
Veracity	With statistical data, for example, samples are selected from the target universe, but with big data, because the sample is more like the universe, it is possible to estimate the characteristics of the target universe as a whole with a greater degree of accuracy.

Source: Nomura, based on Ministry of Internal Affairs and Communications data 2019 White Paper on Information and Communications (https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/r01/html/nd121210.html, available in Japanese only)

1. https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/r01/html/nd121210.html (Available in Japanese only)

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2. Data on avoided emissions has a number of issues in terms of volume and veracity

Below, I would like to share my personal opinion on the current state of avoided emissions data and what improvements need to be made to this data to ensure that institutional investors make greater use of it in future, from the perspective of the 4Vs discussed above.

1) Volume

As we noted at the beginning of this chapter, the most recent cross-sectional avoided emissions disclosure rate for the TOPIX 500 is 15.8%. This might be considered sufficient if disclosure of avoided emissions was a rare and highly significant event. My current view on this point can be said to be that set out above, under the heading "II. Market reaction to environment-related events for companies that have disclosed avoided emissions".

With respect to the fundamental significance of this item, companies should also be assessed on the basis of the size of their avoided emissions. Ideally, all the companies analyzed would record data on avoided emissions as a general rule (it would not be possible to assess companies that have not disclosed this data). From this perspective, I would have to say that the current cross-sectional coverage ratio is very low.

It is important to build up time series data simultaneously with increasing the cross-sectional coverage ratio. Trends and changes over time in the characteristics of companies that disclose avoided emissions and the scale of their avoided emissions could also be used for investment analysis purposes. For example, if sufficient time series data could be obtained on the characteristics of companies that disclose avoided emissions, it should be possible to use this data to determine whether there are differences between sectors in terms of the trend in disclosure rates, and whether there are any consistent trends in investment indicators the long term, taking actual market fluctuations into account. In addition, under the heading "II. Market reaction to environment-related events for companies that have disclosed avoided emissions" we looked at the market reaction to past environment-related events for companies that have disclosed data on avoided emissions recently. Ideally, it would have been better to look at the market reaction to each event for the companies that had disclosed avoided emissions at the time of the events in question. However, this was not actually possible, as time series data has not yet been accumulated. I would like to gather at least around five years' worth of data in order to gain some idea as to whether or not this data would have been effective for investment performance in the past and also whether my analysis is valid.

2) Variety

Generally speaking, sustainability-related data can come from a wide range of sources and sometimes the concepts overlap too, which means that if data has been gathered for a number of different items, the handling of this data can be quite complicated. In view of this, I think it may sometimes be necessary to aggressively trim down the available data on sustainability if one wishes to actually take these ideas on board in making investment decisions. I therefore think it would be best to stick to a small number of fairly straightforward data points.

Having said that, I would also argue that if one wants to understand how this data relates to market

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movements, one must also keep track of other items such as the dates of announcements, as well related information whose significance can vary considerably depending on how it is defined, including whether avoided emissions are disclosed using the flow-based method or the stock-based method.

3) Velocity

This concept is likely to depend in large part on the investment period used by the investor. As sustainability-related data such as data on avoided emissions is unlikely to change appreciably in the near term, there is no need for this data to be recorded frequently, and measuring it frequently might also be impossible in practice. As with regular sustainability reports, we think it is best to disclose avoided emissions data once a year only.

4) Veracity

This concept is based on the assumption that a large amount of data will include noise (inaccurate data). Inaccuracies in data can come not only from simple recording errors but also from unclear definitions and the mixing up of units or scale, for example. Such inaccuracies can make it impossible to compare the data and can therefore raise doubts about whether or not any resulting evaluations are valid. At present, some of the data on avoided emissions shows substantial differences in numbers between companies of a similar size within the same sector, and this is bound to lead to suspicions that the data is not accurate. We think it may be necessary for some appropriate organization to come up with examples of avoided emissions disclosures that can serve as a framework.

Overall, the avoided emissions data that is currently available has many issues in terms of volume and veracity. We think these issues will need to be overcome if institutional investors are to use this data for a wide range of purposes in future. If they can be overcome, as well as making it more likely that the data will be used, this might also lead to the discovery of surprising investment ideas.

We hope that data that avoids these issues will come to be put together in due course. If there were more data, it might also be possible to carry out a more in-depth analysis of the results of the event study set out in “II. Market reaction to environment-related events for companies that have disclosed avoided emissions" above.

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Chapter 5: Impact of GHG emission reductions on enterprise value

Strategies that involve using GHG impact to improve enterprise value

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- For major Japanese companies, Scope 1+2 emissions (emissions generated by the companies themselves), Scope 3 Category 1 emissions (emissions generated by purchased goods and services), and Scope 3 Category 11 emissions (emissions generated by the use of sold products) make up the majority of the GHG (greenhouse gas) emissions generated across the whole of their supply chains.
- Chapter 4 consisted of an analysis of emissions data compiled by Nomura Asset Management. This analysis notwithstanding, the number of companies disclosing data on avoided emissions, while rising, is still currently less than 100, and is thus not a large enough sample for the statistical analysis discussed in this chapter[1]. In addition, future disclosure standards have not yet been set. In this chapter, therefore, we take the data on reductions in Scope 3 emissions and treat this as representing avoided emissions.
- Our statistical analysis of the relationship between actual disclosed data and share valuations (P/E, P/B) for global companies suggests that the following strategies may be an effective way for companies to boost their enterprise value.

(i) High-emission sectors

(1) Among high-emission sectors, those with high Scope 1+2 emissions per unit of sales are utilities, energy, materials, and transportation

(2) Among high-emission sectors, the share prices of companies with high Scope 1+2 emissions per unit of sales are discounted

(3) Strategies that aim to boost value by reducing in-house emissions (ie, by reducing the company's negative impact)

1. See 4.I.1 for details.

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(ii) Supply-chain-emission-dependent sectors

(1) Supply-chain-emission-dependent sectors with high Scope 3 emissions per unit of sales are electrical equipment, machinery, automobiles & components, building products, and consumer durables & apparel

(2) Among supply-chain-emission-dependent sectors, the share prices of companies with high Scope 3 emissions per unit of sales are discounted

(3) Strategies that aim to boost value by increasing avoided GHG emissions across the entire supply chain (ie, by increasing the company's positive impact)

I. Theoretical discussion of impact of GHG emissions on enterprise value

Global disclosure of GHG emissions has been steadily increasing in recent years[2]. In Japan, disclosure of information about sustainability, governance, and risk management in annual securities reports has been mandatory since the fiscal year that ended in March 2023[3]. Simultaneously, companies disclose information about their strategies, metrics, and targets based on their own assessment of their importance. In addition, companies are also being urged to disclose their GHG emissions.

Furthermore, at end-March 2023 the Tokyo Stock Exchange requested that companies listed on the Prime and Standard markets take "Action to Implement Management that is Conscious of Cost of Capital and Stock Price", and called on them to analyze the current situation, draw up and disclose plans, and implement initiatives[4].

Japanese companies are thus being asked to draw up and implement strategies for disclosing and reducing their GHG emissions, as well as strategies for boosting enterprise value that take their cost of capital and share price into account.

In this chapter, we start by examining the characteristics of Japanese companies' GHG emissions and analyzing them on a sector-by-sector basis in order to identify "high-emission sectors" and "supply-chain-emission-dependent sectors". We then look at the relationship between GHG emissions and share prices from a quantitative and statistical perspective, and will show that companies could use strategies that involve reducing their own GHG emissions (ie, reducing their negative impact) or increasing their avoided emissions across the entire supply chain (ie, increasing their positive impact) as a way of boosting their enterprise value. Lastly, we look at examples of individual companies' strategies for reducing their negative impact or increasing their positive impact.

2. TCFD Consortium "Trends in TCFD supporters" (https://tcfd-consortium.jp/en/about)
3. FSA website—sustainability disclosure page (in Japanese only) (http://www.fsa.go.jp/policy/kaiji/sustainability-kaiji.html)
4. TSE's "Action to Implement Management that is Conscious of Cost of Capital and Stock Price" (https://www.jpx.co.jp/news/1020/cg27su0000004ybo-att/cg27su0000004yem.pdf)

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1. GHG emissions in the supply chain

Greenhouse Gas Protocol (GHG Protocol) standards are internationally recognized guidelines for calculating and reporting of GHG emissions, which are divided into Scope 1, Scope 2, and Scope 3 emissions. A company's Scope 1 and Scope 2 (Scope 1+2) emissions are its direct and indirect emissions. A company's Scope 3 emissions are the emissions generated in connection with the sale of its products or services across its entire supply chain, including everything from raw materials, transportation, and post-sale use to the discarding of the products at the end of their life (excluding the emissions that the company has generated itself), and are divided into 15 categories (Figure 1). A company's Scope 1 + Scope 2 + Scope 3 (Scope 1+2+3) emissions can thus be seen as the GHG emissions across its entire supply chain.

Simultaneously, a company's avoided emissions are the reduction in emissions across the entire supply chain that result from replacing the products and services that were previously used with its own products and services, focusing mainly on reductions in Scope 3 emissions. The idea is that companies can use the concept of avoided emissions to show how the use of their products and services helps to reduce others' emissions[5]. Refer to Chapter 2 of this report for details.

Fig. 1: The 15 categories within Scope 3

	Scope3 categories		Examples
Upstream	1	Purchased goods and services	Procurement of raw materials, outsourcing of packaging, procurement of consumables
	2	Capital goods	Increases in production capacity
	3	Fuel- and energy-related activities (not included in scope 1 or scope 2)	Upstream processes for fuel and electricity purchased
	4	Upstream transportation and distribution	Inbound logistics, internal logistics, outbound logistics
	5	Waste generated in operations	Transportation and disposal of waste materials (excluding transportation and disposal carried out in-house)
	6	Business travel	Business travel by employees
	7	Employee commuting	Staff commuting to and from work
	8	Upstream leased assets	Use of assets leased by the company
Downstream	9	Downstream transportation and distribution	Transportation of shipments, storage in warehouses, sales via retail outlets
	10	Processing of sold products	Processing of intermediate products by business operators
	11	Use of sold products	Use of products by users
	12	End-of-life treatment of sold products	Transportation of products by users at products' end-of-life
	13	Downstream leased assets	Use of leased assets owned by the company and leased to third parties
	14	Franchises	Activities that correspond to Scope 1 and Scope 2 emissions of members of the company's franchises
	15	Investments	Investment in equities and bonds, project finance
	Other		Includes items not directly related to companies' business activities, such as the daily activities of employees and consumers

Source: Nomura, based on Greenhouse Gas Protocol's Corporate Value Chain (Scope 3) Accounting and Reporting Standard

5. Greenhouse Gas Protocol website (https://ghgprotocol.org/)

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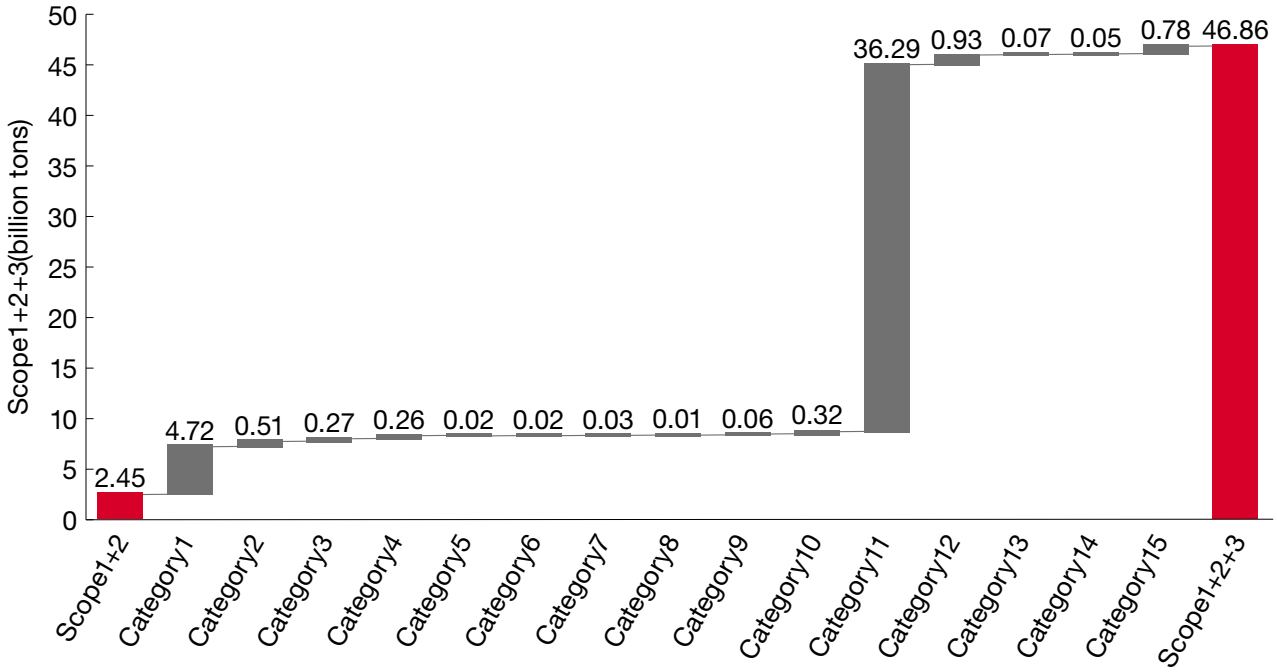
Figure 2 shows the total emissions generated by major Japanese companies across their entire supply chains[6]. As the figure shows, for major Japanese companies, Scope 1+2 emissions (emissions generated by the companies themselves), Scope 3 Category 1 emissions (emissions generated by purchased goods and services), and Scope 3 Category 11 emissions (emissions generated by the use of sold products) make up the majority of the GHG emissions generated across the whole of their supply chains. Consequently, when companies want to reduce their GHG emissions across their entire supply chains, it is important for them to reduce their own Scope 1+2 emissions and also to increase their avoided emissions in Scope 3 Categories 1 and 11.

In Chapter 4 we looked at avoided emissions data compiled by Nomura Asset Management. However, while the number of companies disclosing avoided emissions is rising, it is currently less than 100, which is not a large enough sample for the statistical analysis set out in this chapter, in addition to which future disclosure standards have yet to be set. In this chapter, therefore, we assume that reductions in Scope 3 emissions are the same as avoided emissions.

Fig. 2: Total emissions generated by major Japanese companies across their entire supply chains



Note: Shows data for 87 TOPIX 100 (ex financials) constituents for which data was available as of end-January 2025.
Source: Nomura, based on Bloomberg data

6. Japanese companies' total Scope 1+2 emissions are the total emissions generated by their business activities in Japan. Their total Scope 3 emissions are greater than their total Scope 1+2 emissions because there is some overlapping of Scope 3 emissions within the supply chain (for example, when materials are transported from a material manufacturer to a wholesaler and then to a material user company, greenhouse gas emissions during transportation are double-counted) and because in some cases the individuals who are the end users emit greenhouse gases when using the companies' products or services (these emissions are counted under Category 11).

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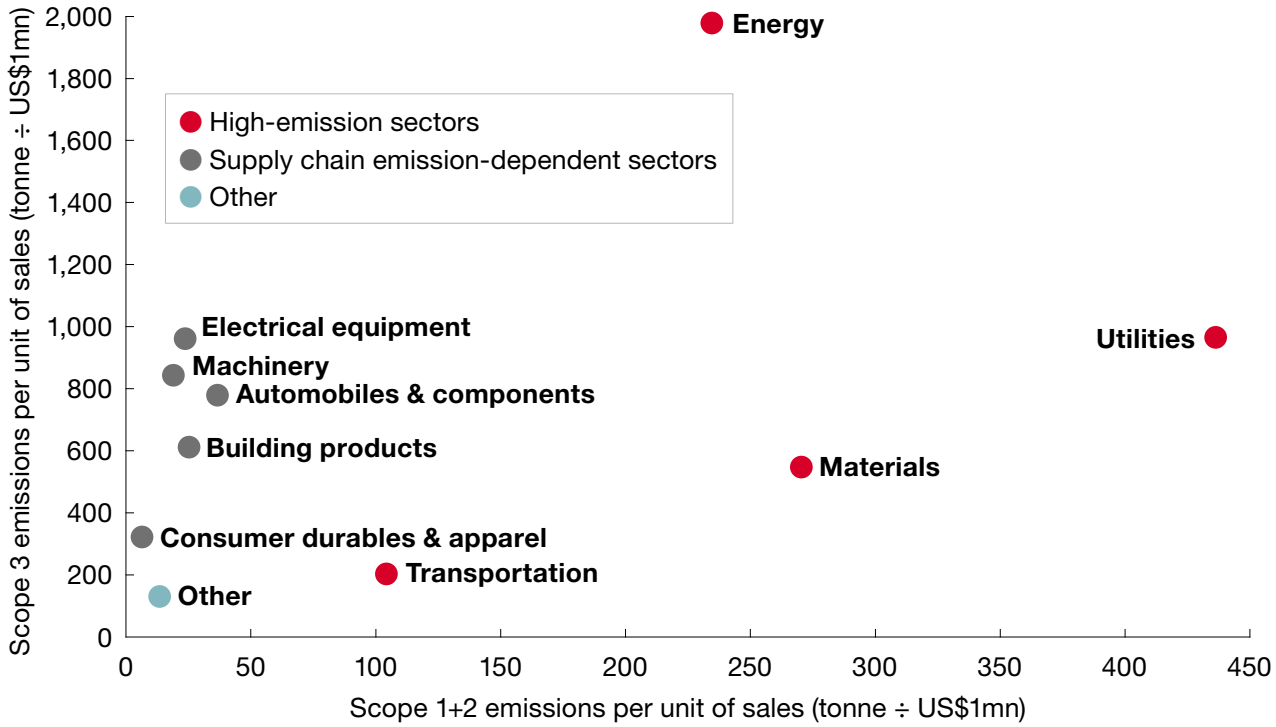
2. Greenhouse gas emissions: sector characteristics and steps taken by companies

In the section above, we showed that from the vantage point of GHG Protocol standards as applied to Japan's overall industrial structure, there is a need to reduce both Scope 1+2 emissions and Scope 3 Category 1 and Category 11 emissions. However, when examining companies on an individual basis, it is clear that the areas they need to focus on in terms of reducing their GHG emissions vary depending on each company's business model.

Figure 3 shows Scope 1+2 emissions per unit of sales and Scope 3 emissions per unit of sales, by sector[7], for major companies around the world. Emissions per unit of sales (also referred to as "emissions intensity") is, as the wording suggests, a way of expressing GHG emissions per unit of sales booked. The sectors with substantial Scope 1+2 emissions per unit of sales—utilities, energy, materials, and transportation (these sectors, shown with red dots, are further to the right along the horizontal axis in Figure 3)—are "high-emission sectors" that generate substantial emissions as a result of their in-house use of fossil fuels and electricity consumption. Simultaneously, the sectors where Scope 3 emissions per unit of sales are higher than Scope 1+2 emissions per unit of sales—electrical equipment, machinery, automobiles & components, building products, and consumer durables & apparel (shown with grey dots in Figure 3)—can be thought of as "supply-chain-emission-dependent sectors" in which companies generate substantial emissions per unit of sales across their entire supply chains.

Fig. 3: Emissions per unit of sales by sector



Note: Shows data for 1,921 companies included in MSCI IMI (ex REITs, financials, and trading companies) as of end-December 2024 for which sales and Scope 1+2 and Scope 3 emissions data were available, divided up by GICS industry group (identified by four digits). However, because of the large number of companies included in the GICS capital goods industry group, we used GICS industries (identified by six digits), which are smaller than GICS industry groups, instead (figure only shows major industries within capital goods industry group).

Source: Nomura, based on MSCI and FactSet data

7. Global Industry Classification Standard (GICS) is an industry classification system that is jointly managed by MSCI and S&P Dow Jones Indices and is one of the classification systems that is used as standard for investment decisions and company comparisons.

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Figure 4 shows the characteristics of companies in the high-emission sectors and supply chain-dependent sectors noted above, and the respective approaches they have taken to reducing their emissions. For companies in high-emission sectors, reducing their Scope 1+2 emissions (ie, reducing their negative impact) by investing in energy-saving businesses or reshuffling their business portfolios, including by selling high-emission businesses, is effective, while in supply-chain-emission-dependent sectors it is important for companies to increase their avoided emissions (ie, to increase their positive impact) by reducing their Scope 3 emissions through the procurement of environmentally friendly materials and the development of energy-saving products.

Fig. 4: Types of GHG-emitting companies and their approach to reducing their GHG emissions

Item	High-emission sectors/companies	Supply chain emission-dependent sectors/ companies
Characteristics	■ High Scope 1+2 emissions per unit of sales ■ High Scope 1+2 emissions ■ High proportion of in-house emissions (ie, Scope 1+2 ÷ Scope 1+2+3 is high)	■ High Scope 3 emissions per unit of sales ■ High Scope 3 emissions ■ Supply chain and/or consumption stage account for large proportion of emissions (ie, Scope 3 ÷ Scope 1+2+3 is high)
Main GICS industry groups (identified by four digits)	■ Utilities ■ Materials ■ Energy ■ Transportation	■ Electrical equipment ■ Machinery (GICS six-digit industry) ■ Automobiles & components ■ Building products (GICS six-digit industry) ■ Consumer durables & apparel
Approach to reducing GHG emissions	■ Reduction of Scope 1+2 emissions (ie, reduction of negative impact)	■ Increase in avoided emissions (ie, increase in positive impact) via reduction in Scope 3 emissions
Examples of strategies aimed at reducing GHG emissions	■ Reshuffling business portfolio ■ Investment in energy-saving equipment or businesses ■ Use of renewable energy ■ CCUS (carbon capture, utilization, and storage)	■ Procurement of environmentally friendly materials (which helps to reduce Category 1 emissions) ■ Development and sale of energy-saving products (which helps to reduce Category 11 emissions) ■ Logistics reforms (which help to reduce Category 4 and 9 emissions)

Source: Nomura

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3. Theoretical discussion of impact of GHG emissions (Scope 1+2 and Scope 3 emissions) on enterprise value

We now look at how to quantify the impact of GHG emissions on enterprise value. While it is presumably the case that the level of GHG emissions can affect both investors' evaluations of companies and companies' brand image as viewed through the eyes of consumers, in this chapter we consider the impact that GHG emissions have on enterprise value from the perspective of transactions between companies.

Many companies appear to choose which companies they do business with on the basis of factors such as the nature of their business dealings and their track record of business transactions.

- Company X can buy a certain product from either company A or company B
- The cost of purchasing the product from Company A and Company B is the same. The two companies have a similar trading history and similar financial and nonfinancial profiles.
- The difference between the two companies is that the GHG emissions resulting from the production of one unit of the product in question (counted as Scope 1+2 emissions) at Company A are half the level of those at Company B, and that Company A's suppliers' emissions (counted as its Scope 3 Category 1 emissions) are also half the level of those of Company B's suppliers.

Conventionally, Company A and Company B would have had the same probability of being selected, but if Company X takes its Scope 3 emissions into account when it chooses which companies it trades with, it will opt for Company A. This will increase sales at Company A in the near term and give Company A a competitive advantage in terms of enterprise value. In order to take Company A's place as Company X's trading partner, Company B will have to invest in decarbonization until its GHG emissions fall to the same level as those of Company A, and it will also have to procure environmentally friendly materials. This will squeeze its finances in the near term, which will also give Company A a competitive advantage in terms of enterprise value.

In this example, the impact of GHG emissions on enterprise value comes from the difference in GHG emissions (Scope 1+2 and Scope 3) per unit at the time of unit production. Generally speaking, it is difficult to ascertain GHG emissions for each category of product from publicly disclosed information alone. One potential way of assessing enterprise value in practice would be to take into account the competitive advantage arising as a result of the difference in GHG emissions per unit of sales versus the benchmark, as shown in Figure 5. The average for sector peers with the same end products could be used as the benchmark. However, when selecting companies in the same sector that produce the same end product (eg, steel), it is important to take companies' business models into account (eg, whether the company is a blast furnace steelmaker or an electric furnace steelmaker).

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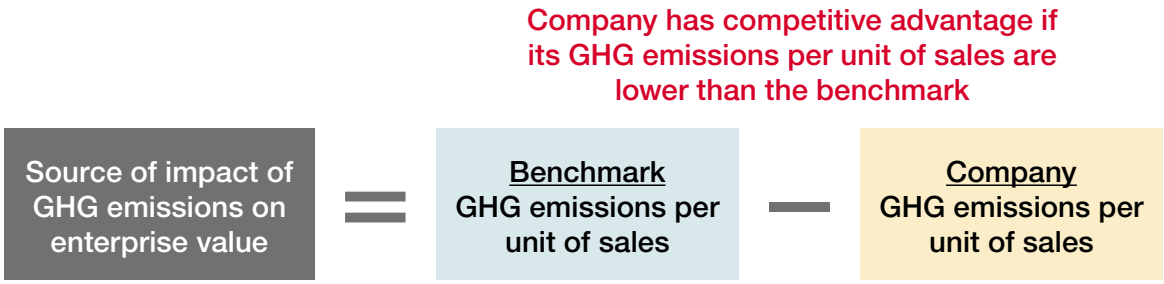
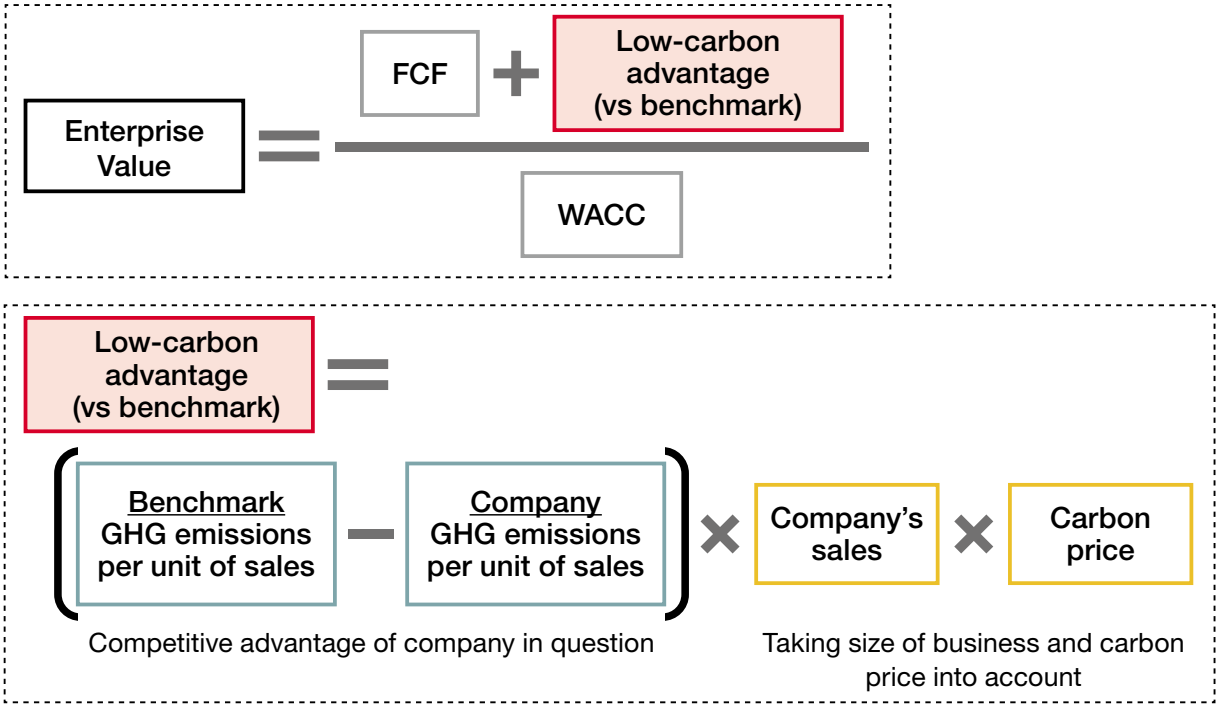
Fig. 5: Difference in GHG emissions per unit of sales is a source of competitive advantage



Source: Nomura

As Figure 6 shows, when assessing the enterprise value of companies in high-emission sectors, the framework in which the difference in GHG emissions per unit of sales versus the benchmark is treated as the source of competitive advantage[8] turns out to be consistent with the way analysts covering high-emission sectors calculate their target prices for sector companies[9], as well as with the prices at which the companies' shares trade on the market. Many investors and companies seem to welcome this sort of framework, and it has also been taken up by the media[10].

Fig. 6: Framework for assessing enterprise value in a decarbonized society



Source: Nomura

8. Spring 2023 edition of Nomura Sustainability Quarterly, available in Japanese only
9. See our 2 November 2021 Global Research report Sanyo Special Steel: Upgrading to Buy on solid earnings in Europe - We also factor in value of low CO_2 emissions.
10. Article in Nikkei on 21 December 2022 Nikkei (in Japanese): financial analysis upgrade, support for companies' real-world decarbonization

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II. Correlation between share prices and GHG emissions/avoided emissions - empirical analysis

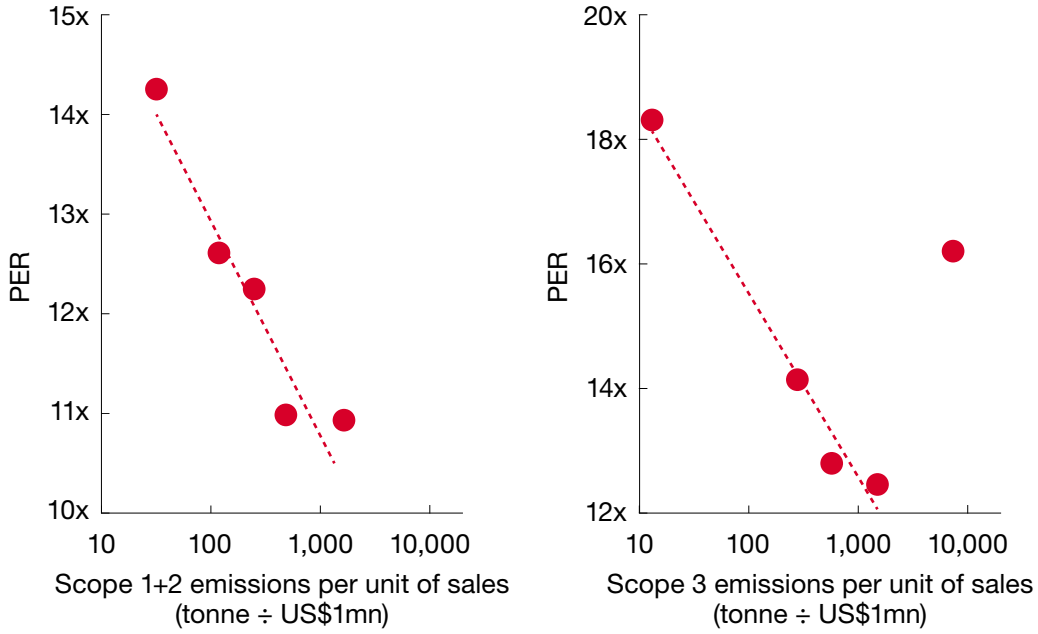
1. Correlation between GHG emissions/avoided emissions and P/E ratios

The left-hand chart in Figure 7 shows price-to-earnings ratios (P/E) for 473 major Japanese, US, and European companies in high-emission sectors. From this, we can see that, within high-emission sectors, companies with relatively high Scope 1+2 emissions per unit of sales tend to trade at a P/E discount.

The right-hand chart in Figure 7 shows P/E ratios for 347 major Japanese, US, and European companies in supply-chain-emission-dependent sectors. From this we can see that, within supply-chain-emission-dependent sectors, companies with relatively high Scope 3 emissions per unit of sales similarly tend to trade at a P/E discount. However, we did not observe a P/E discount for the group with the highest Scope 3 emissions per unit of sales. We think this may reflect factors other than Scope 3 per unit of sales, such as companies' business models or financial characteristics (growth potential, shareholder returns, etc). In the next section we look at the relationship between share prices and Scope 3 emissions per unit of sales, taking into account differences in corporate characteristics and finances.

As we discussed in the previous chapter, we think these discounts reflect a lack of competitive advantage for companies in high-emission sectors with relatively high Scope 1+2 emissions per unit of sales and companies in supply chain emissions-dependent sectors with relatively high Scope 3 emissions per unit of sales.

Fig. 7: (Left) Scope 1+2 emissions per unit of sales and P/E in high-emission sectors (Right) Scope 3 emissions per unit of sales and P/E in supply-chain-emission-dependent sectors



Note: Universe is MSCI IMI constituents in Japan, US, and Europe as of end-December 2024 for which Scope 1+2 and Scope 3 emissions data and financial indicators were available. Left-hand chart shows median values for 473 companies in high-emission sectors divided into five groups based on Scope 1+2 emissions per unit of sales. Dotted line is estimated regression line based on five points. Right-hand chart shows median values for 347 companies in supply-chain-emission-dependent sectors divided into five groups based on Scope 3 emissions per unit of sales. Dotted line is estimated regression line for four points, excluding group with highest Scope 3 emissions per unit of sales.

Source: Nomura, based on MSCI and FactSet data

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2. Correlation between share prices and GHG emissions/avoided emissions - regression analysis

Figure 8 shows the results of a multiple regression analysis of 1,921 major Japanese, US, and European companies' P/B ratios versus forward ROE, debt ratio, forecast dividend payout ratio, sales growth, and Scope 1+2 emissions per unit of sales in high-emission sectors and Scope 3 emissions per unit of sales in supply-chain-emission-dependent sectors. We found a statistically significant P/B discount for companies with high Scope 1+2 emissions per unit of sales in the high-emission sectors and companies with high Scope 3 emissions per unit of sales in supply chain emissions-dependent sectors (we were able to confirm a statistically significant negative correlation between emissions per unit of sales and P/B when t-value was generally less than -2).

In view of the above, we think it is important for companies in high-emission sectors to reduce their Scope 1+2 emissions per unit of sales and for companies in supply-chain-emission-dependent sectors to reduce their Scope 3 emissions per unit of sales. Overall, we think our analysis suggests that reducing GHG emissions may be an important strategy that companies can implement in order to boost share prices.

Fig. 8: Relationship between P/B and Scope 1+2 emissions per unit of sales in high-emission sectors and Scope 3 emissions per unit of sales in supply-chain-emission-dependent sectors (multiple regression analysis)

		Coefficient	t-value
Financial factors	Forward ROE	0.822	51.3
	Debt ratio	-0.0940	-3.64
	Forecast dividend payout ratio	0.139	6.32
	Sales growth	1.12	14.4
GHG-related factors	Scope 1+2 emissions per unit of sales: high-emission sectors	-0.0896	-5.62
	Scope 3 emissions per unit of sales: supply chain emission-dependent sectors	-0.0275	-2.27
Coefficient of determination		75.2%	

Note: Universe is 1,921 MSCI IMI constituents in Japan, US, and Europe as of end-December 2024 for which Scope 1+2 and Scope 3 emissions data and financial indicators were available. Dependent variable is (log)P/B, independent variables are FactSet consensus in case of forecasts, most recent fiscal year-end data in case of actual financial data, and logarithms for emissions per unit of sales. Top and bottom 0.5% of stocks in terms of financial factors and top and bottom 5% of stocks in terms of GHG-related factors treated as outliers.

Source: Nomura, based on MSCI and FactSet data

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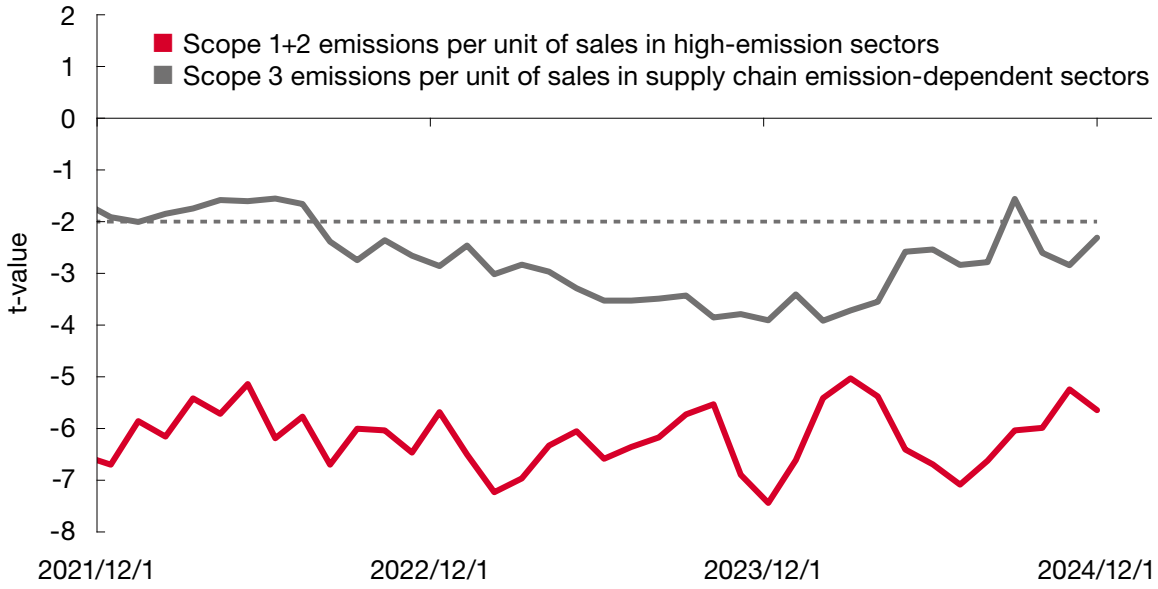
Figure 9 shows t-values for "Scope 1+2 emissions per unit of sales" and "Scope 3 emissions per unit of sales" based on the multiple regression analysis described above, using monthly end-month data from end-December 2021 onwards. The t-value for "Scope 1+2 emissions per unit of sales" in high-emission sectors is around -6, and we were able to confirm stable statistical significance. Moreover, the t-value for Scope 3 emissions per unit of sales in supply-chain-emission-dependent sectors ranged from around -4 to -2, demonstrating statistical significance overall.

Fig. 9: Statistical significance (t-value) for Scope 1+2 emissions per unit of sales in high-emission sectors and Scope 3 emissions per unit of sales in supply-chain-emission-dependent sectors



Note: Universe is MSCI IMI constituents in Japan, US, and Europe as of end-December 2024 for which Scope 1+2 and Scope 3 emissions data and financial indicators were available. Dependent variable is (log)P/B, independent variables are FactSet consensus in case of forecasts, most recent fiscal year-end data in case of actual financial data, and logarithms for emissions per unit of sales. Top and bottom 0.5% of stocks in terms of financial factors and top and bottom 5% of stocks in terms of GHG-related factors treated as outliers.

Source: Nomura, based on MSCI and FactSet data

3. Strategies that involve using GHG impact to improve enterprise value

1) Business portfolio strategy for companies high-emission sectors: Reduction of negative impact

The multiple regression analysis set out above indicates that there is a strong correlation between companies' Scope 1+2 emissions per unit of sales and their P/B ratios, for companies in high-emission sectors. We therefore think it is important for companies to focus on their Scope 1+2 emissions per unit of sales when they are considering making changes to their business portfolios. For example, when deciding whether to invest in or carry out in M&A a business, or to withdraw from a business, we think it is important for companies to take into account not only indicators such as their ROI and internal rate of return (IRR) but also their Scope 1+2 emissions per unit of sales. We expect companies using this kind of business portfolio strategy to see an improvement in their competitive advantage, as we showed in section I 3 above.

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2) Product strategy for companies in supply-chain-emission-dependent sectors: Increase in positive impact

As automakers, for example, belong to a supply-chain-emission-dependent sector, a reduction in their Scope 3 emissions per unit of sales could boost their share prices (P/B ratios). If the development of new technologies were to enable an automaker to sell more fuel-efficient automobiles, we think it would gain a competitive advantage from the perspective of its GHG impact because of the resulting increase in its avoided emissions. As well as developing new technologies in-house, companies could also carry out M&A with companies that have new technologies that improve fuel efficiency.

III. Future disclosure of avoided emissions from the perspective of quantitative research

In this chapter we have compared companies' GHG Protocol Scope 1+2 and Scope 3 emissions in terms of emissions intensity (ie, emissions divided by sales). Ideally, it would be preferable to evaluate avoided emissions through year-over-year Scope 3 emission comparisons. However, given the increasing number of firms that have only recently begun to disclose Scope 3 data, we based our evaluation on emissions intensity levels as it allows for a robust and adequate sample size for meaningful analysis. GHG Protocol has made a number of proposals aimed at making it easier to make comparisons between companies, but this effort dates back only to 2023, and it should be noted that it would be premature to compare companies on a quantitative basis at this point. Some ESG rating agencies, stock market index providers, and institutional investors are currently using GHG Protocol standards, but going forward we expect more interested parties to compare companies' GHG emissions not just on the basis of GHG Protocol standards but also on the basis of standards that include avoided emissions. If this turns out to be the case, more and more companies will presumably start to disclose the percentage reduction in their GHG emissions and the size of their avoided emissions as a way of encouraging investment.

Writing this report has given us an opportunity to reexamine the materials that companies have disclosed. Many large companies have set disclosure formats for Scope 1, 2, and 3 emissions, and it is now easy to confirm various types of figures for these companies. By contrast, however, we were unable to find Scope 3 emission disclosures for many small companies in Japan, the US, and Europe. One way for Japan to ensure that Japanese companies take the lead in GHG disclosures would be to work on encouraging and systematizing these disclosures, including the disclosure of data on avoided emissions, ahead of other countries. The disclosure of this information could in itself even help medium-sized companies to establish a competitive advantage and expand their businesses. On the other hand, even among large corporations, self-reporting of emission reduction achievements and reductions in supply chain emissions (avoided emissions) varies considerably from company to company, with some reporting percent reductions ("a reduction of x percent through new products") and others reporting volume reductions ("a reduction of y tonnes through new products"). Our takeaway from this is that companies, rather than waiting for standardized criteria to be established, need to take proactive steps such as disclosing data on avoided emissions in a way that includes both the reduction rate and the absolute figures for avoided emissions volumes.

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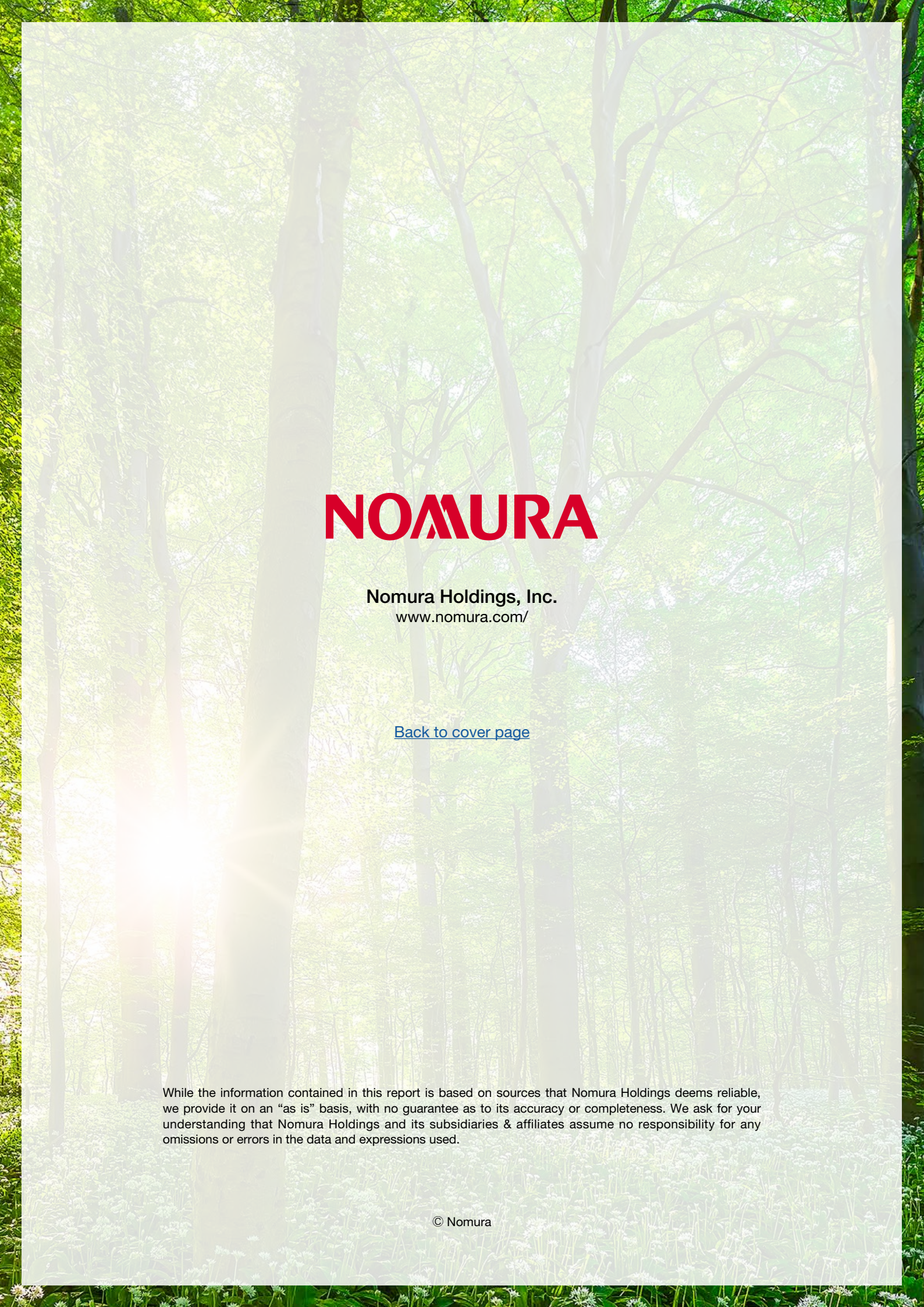

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