

Guidance on Climate-related Financial Disclosures 3.0

(TCFD Guidance 3.0)

**Sector-Specific Disclosure
Guidance**

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1. Objectives of Sector-Specific Disclosure Guidance

The main text of TCFD Guidance 3.0 explained topics common to all industrial sectors in the four thematic areas in which the Task Force recommends disclosure: Governance, Strategy, Risk Management, and Metrics and Targets. In the case of disclosure on Strategy or Metrics and Targets, however, different sectors have different climate-related risks and opportunities, which may lead to variance in the methods for presenting strategies and in the metrics and targets used to measure them.

The Annex to the TCFD Recommendations (Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures) include sector-specific supplemental guidance¹. This provides recommendations for disclosure to the financial sector (Banks, Insurance Companies, Asset Owners, and Asset Managers) and non-financial groups (Energy, Transportation, Materials and Buildings, and Agriculture, Food and Forest Products Groups), for groups of sectors or for individual sector. For those belong to the financial sector, specific guidance are provided on Strategy, Risk Management and Metrics and Targets. For the non-financial groups, guidance common to the non-financial group is provided for Strategy, whereas sector-specific guidance on Metrics and Targets is provided.

With reference to “Key Issues considered and Areas for Further Work,” the TCFD Recommendations also stated that “the Task Force encourages further research and analysis by sector and industry experts to increase organizations’ understanding of climate-related risks and opportunities.” This left the guidance for the sector-specific disclosure as a remaining issue. Following this, the “TCFD Guidance” published by the Ministry of Economy, Trade and Industry in 2018 included sector-specific recommended disclosures for five sectors focusing on energy-intensive industries. The “TCFD Guidance 2.0” published by the TCFD Consortium in 2020 additionally included the food industry as well as three financial sectors (banking, life insurance and non-life insurance) to expand the sector-specific recommended disclosures, with international shipping being added in 2021. With the publication of “TCFD Guidance 3.0”, the recommended disclosures are published as a separate volume.

The recommended disclosures explained below are not presented as “tick-boxes.” Each disclosure item presented in this Guidance is an example of a recommended disclosure for a company if climate change is deemed to have material impacts on its business model. In addition, such disclosures by companies can be expected to facilitate dialogue with investors and other stakeholders, and to thereby deepen their understanding of industry-wide efforts and contributions to climate change issues.

In formulating the recommended disclosures, characteristics of each industry were considered. For automobiles, iron and steel, chemicals, electrical and electronics sectors, recommended disclosures are classified into efforts in the manufacturing phase, use phase

¹ <https://www.fsb-tcf.org/publications/final-implementing-tcf-recommendations/>

and others. For other sectors, the value chain structure of corporate activities and the expected risks and opportunities differ from one sector to another. The recommended disclosure Items have therefore been developed according to the characteristics of the respective sectors.

Note that disclosure based on the TCFD Recommendations is still evolving worldwide. The disclosed contents are expected to be improved as case examples accumulate. Under these circumstances, this Guidance has been developed as a first step to respond to the TCFD Recommendations. Revisions to the content are assumed to be forthcoming, and sectors are expected to be added based on reviews of the contents and sectors as the disclosure practice makes progress in the future.

2. Sector-Specific Recommended Disclosures

(1) Automobiles

The TCFD Recommendations describe climate-related risks and opportunities for the Transportation group, including the automobile industry, as shown below. This section provides supplemental guidance focusing on the automobile industry.

Description of the Transportation group in the TCFD Recommendations

2. Transportation Group

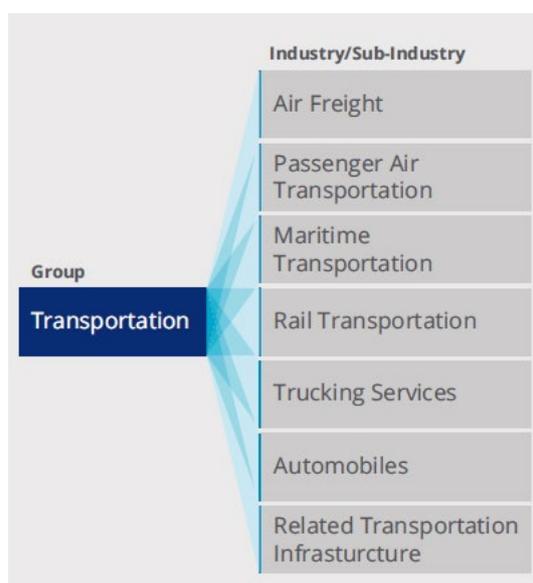
The Transportation Group includes, but is not limited to, industries listed in Figure 10.

Transportation is critical to the economy and drives a significant portion of emissions and demand for energy through the production and, more important, the use phase. The industry is under increasing policy and regulatory pressure to achieve emission targets for the use phase. Increasing constraints on emissions fuel efficiency will continue to impact costs in this group, particularly around investments in innovation (new technologies and efficiencies).¹²⁶

The Transportation Group, therefore, will likely face financial challenges from two major drivers. First, policymakers are setting stricter targets for emissions and fuel efficiency from transportation carriers. Second, new technology around low-emission/fuel-efficient carriers (e.g., electric cars) is creating a shift in the competitive and investment landscape. New technological innovations and new market entrants can weaken companies' market position, resulting in lower revenues, higher costs, and narrower margins. The effects of these two drivers may be compounded by the length of product cycles for transportation products, such as cars and trucks, and especially for air and rail and marine equipment. As with the Energy Group, investments in long-lived assets (e.g., manufacturing facilities, airplanes, ships) and longer planning horizons are relevant factors that must be taken into account when considering the climate-related risks and opportunities.

Consequently, disclosures should focus on qualitative and quantitative assessments and potential impacts of the following:

Figure 10 Transportation



- financial risks around current plant and equipment, such as potential early write-offs of equipment and R&D investments or early phasing out of current products due to policy constraints or shifts or the emergence of new technology;
- investments in research and development of new technologies and potential shifts in demand for various types of transportation carriers; and
- opportunities to use new technologies to address lower-emissions standards and increased fuel-efficiency requirements, including transport vehicles (cars, ships, planes, rail) that run on a range of traditional and alternative fuels.

Transportation Group organizations should consider providing additional industry-specific metrics.¹²⁷ Examples of potential metrics include sales weighted average fleet fuel economy by region and weight/number of people transported, Energy Efficiency Design Index (EEDI) for new ships, life cycle reporting of GHG emissions of transportation products (air, ship, rail, truck, auto).

Original footnote 126: Moody's Global Credit Research, "Moody's: Auto sector faces rising credit risks due to carbon transition," September 20, 2016.

Original footnote 127: or more sector-specific information, see SASB, "Climate Risk Technical Bulletin," April 12, 2021 and WBCSD, "TCFD Auto Preparer Forum," May 26, 2021.

Source: TCFD, 2021, Annex: Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures, p.65

The number of vehicles sold in the automobile industry is expected to continue growing, particularly in emerging countries. On the other hand, vehicles with improved environmental performance are required around the world more than ever with tightening regulations on fuel consumption. The industry has also faced a wave of technological innovation called CASE² in recent years, which requires innovations to significantly change the existing business models.

One of the new possibilities expected of automobiles is an active contribution to global efforts to combat climate change.

From a climate change perspective, the use phase of vehicles emits the largest amount of GHG in the automobile lifecycle. Contributions to climate change measures can thus be well demonstrated by describing efforts to develop next-generation vehicles (HV, EV, FCEV, etc.) or to reduce emissions through "Well-to-Wheel" as an emissions reduction strategy.

I. Efforts to reduce GHG emissions in the manufacturing phase

Efforts to reduce GHG emissions in the manufacturing process

Automobiles with high environmental performance like EVs may actually emit more GHG in

² Connectivity, Autonomous, Shared and Electric

the vehicle manufacturing phase than conventional vehicles. An important point, therefore, is to reduce GHG emissions in the manufacturing phase as well as the use phase.

(Disclosure example)

- Targets and results of GHG emissions per vehicle manufactured

Another important point is to assess environmental impacts through the entire automobile lifecycle from the design stage of vehicles, and to reflect the results in the design planning. Doing so will lead to GHG emission reductions through the entire lifecycle encompassing the manufacturing phase as well as use and disposal phases.

Efforts to reduce GHG emissions in procurement

Efforts to reduce the GHG emissions from suppliers are important for the overall reduction of GHG emissions in the procurement phase, as the automobile industry consists of a large number of suppliers.

(Disclosure examples)

- Establishment of Green Procurement Guidelines
- Introduction of mechanisms to manage supplier GHG emissions

II. Efforts to reduce GHG emissions at the usage stage

Efforts to reduce GHG emissions from the use of products

Given the policy trend of national governments (fuel consumption regulations, etc.) and the increasing consumer awareness of environmental issues, efforts to reduce emissions from the use phase, the phase that accounts for the major part of GHG emissions in the automobile lifecycle, are a crucial point to present in disclosures on GHG emissions in the automobile industry.

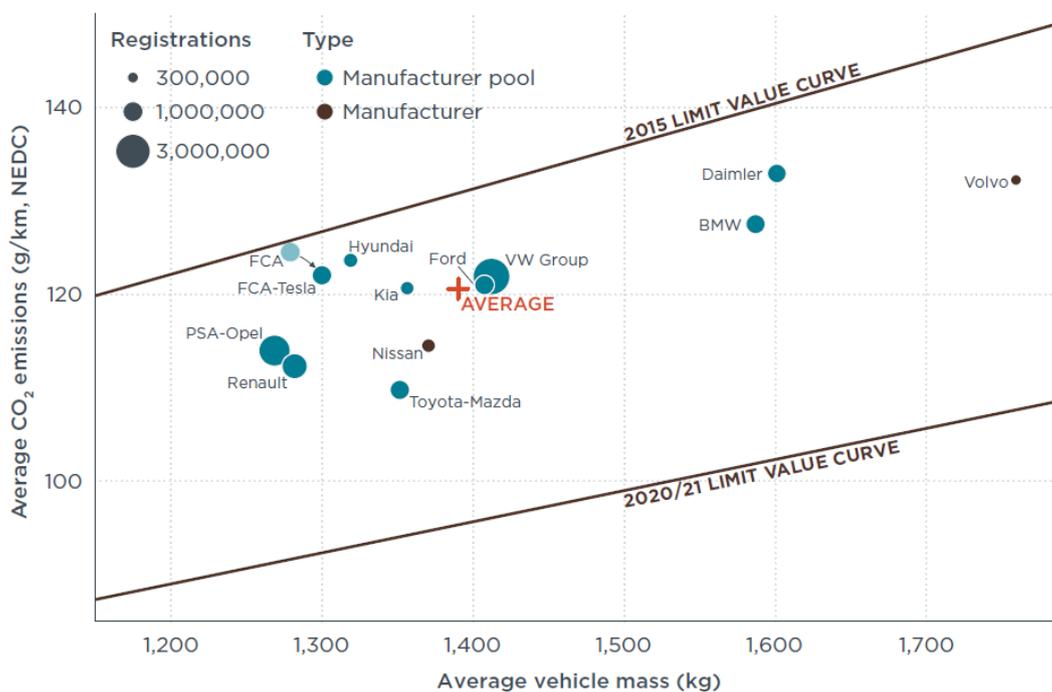
(Disclosure example)

- Medium- and long-term targets and results related to GHG emissions (or fuel consumption) from an average new vehicle

An effective way to show a company's technological level compared with the world or industry average is to refer to benchmark values. A comparison with benchmark values for each major market is also important to include, as consumer needs differ from market to market.

Reference example: A comparison of the average fuel consumption of companies in Europe

The International Council on Clean energy Transportation (ICCT) calculates the average fuel consumption of passenger vehicles sold in a given year by automaker using data compiled by the European Environment Agency. The average fuel consumption depends not only on the fuel economy performance of each vehicle model, but also the sales mix of vehicles. The average fuel consumption of vehicles produced by each automaker is compared by the average vehicle weight class.



Source: ICCT (International Council on Clean Transportation), “CO₂ emissions from new passenger cars in the EU: Car manufacturers’ performance in 2018”

Efforts to contribute to GHG emissions reduction through the value chain

Another important point to present is the amount of avoided GHG emissions by those vehicle models, as the introduction of energy-efficient vehicles is expected to contribute to reduced GHG emissions by replacing conventional vehicles. Efforts are also underway to contribute to reduced GHG emissions by efficient energy management through the use of EVs.

(Disclosure example)

- Amount of avoided GHG emissions through the improvement of vehicle energy efficiency, etc.

Efforts to develop and disseminate emerging technologies that reduce GHG emissions in the use phase

Another effective approach to presenting a company's strategy to reduce GHG emissions in the use phase is to present the efforts taken to develop and disseminate emerging technologies, particularly those related to vehicle models that contribute to reduced GHG emissions among the company's products. Given the variety of the vehicle models that contribute to reduced GHG emissions, such as hybrid vehicles, electric vehicles (EV), and fuel cell vehicles (FCV), a company needs to present its competition strategy in addition to the types of vehicle models it is to develop to contribute to reduced GHG emissions.

(Disclosure examples)

- Definition of vehicle models that contribute to reduced GHG emissions
- Specific technological development efforts and future goals (the number of vehicles sold or the market share)

Zero-emission vehicles (ZEVs) such as EVs and FCVs emit GHGs not from the use phase, but during the phases of extraction, manufacturing, and supply of fuel. An effective way to present the contribution of a ZEV to GHG emission reduction in its lifecycle is to compare the GHG emissions from a "Well-to-Wheel" perspective.

(2) Iron and Steel

The TCFD Recommendations describe climate-related risks and opportunities for the Materials and Buildings group, including the iron & steel industry, as shown below. This section provides supplemental guidance focusing on the iron & steel industry.

Description of the Materials and Buildings group in the TCFD Recommendations

3. Materials and Buildings Group

The Materials and Buildings Group includes, but is not limited to, industries listed in Figure 11.

Materials and Buildings Group organizations are typically capital intensive, require high investments in plants, equipment, and buildings that are (relatively) fixed in terms of location, and dependent on sources of raw and refined materials. This may reduce the flexibility of organizations in this group to adapt to risks of climate change.

Many of this group's activities result in financial exposures around high GHG emissions and high energy consumption. Furthermore, a number of industries in this group are dependent on water availability and/or vulnerable to the effects of acute or chronic physical risks from weather events.

Since the group is capital intensive and the plants and facilities have a long life span, accelerated R&DDD (research, development, demonstration, and deployment) is critically important. Thus, disclosures relating to R&DDD plans and progress are valuable to see the current and future situation and risks of organizations in the group.

Consequently, disclosures should focus on qualitative and quantitative assessments and potential impacts of the following:

- Stricter constraints on emissions and/or pricing carbon emissions and related impact on costs.
- The construction materials and real estate sectors should assess risks related to the increasing frequency and severity of acute weather events or increasing water scarcity that impact their operating environment.
- Opportunities for products (or services) that improve efficiency, reduce energy use, and support closed-loop product solutions.

Materials and Buildings Group organizations should consider providing additional industry-specific metrics.¹²⁹ Examples of potential metrics include building energy

Figure 11 Materials and Buildings



intensity by area, building water intensity (by occupants or square area), percent of fresh water withdrawn in regions with high or extremely high baseline water stress, and area of buildings, plants, or properties located in designated flood hazard areas.

Original footnote 129; For more sector-specific information, see SASB, “Climate Risk Technical Bulletin,” April 12, 2021 and WBCSD, “Construction and Building Materials TCFD Preparer Forum,” July 1, 2020.

Source: TCFD, 2021, Annex: Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures, p.66

The largest amount of GHG emissions from the iron & steel industry occurs in the manufacturing phase. A company in this industry can therefore demonstrate its contributions to solving climate change by indicating the efforts taken to reduce GHG emissions through efficiency improvements in the manufacturing phase. Steel manufacturing technologies can be categorized into blast furnaces and electric furnaces. Since raw materials for electric furnaces are scrap steel manufactured by the blast furnace process and used as products, the World Steel Association (worldsteel) developed and defined ISO 20915, the idea of GHG emissions that regards the blast furnace method and the electric furnace method as a single steel material recycling system.

For blast furnaces, hydrogen reduction iron manufacturing and other innovative technologies are being developed as fundamental technologies to reduce GHG emissions. It is also important to disclose climate change measures through such efforts.

I. Efforts to reduce GHG emissions in the manufacturing phase

Efforts to reduce GHG emissions in manufacturing processes

In the iron & steel lifecycle, the manufacturing process emits the largest amount of GHG. As the demand for iron & steel is expected to endure worldwide, companies in the iron & steel industry can adopt the strategy of improving the efficiency of the iron & steel manufacturing process. Given that improved operation techniques and improvements from capital investment at a company are reflected in intensity (GHG emissions per unit of output), information is preferably disclosed on an intensity basis.

In understanding the numerical value quantified on an intensity basis, each company should take into account the setting of boundaries, the ratio of blast furnaces to electric furnaces, etc.

(Disclosure example)

- Efforts to improve efficiency in the manufacturing process (energy intensity)

Furthermore, in order to show the company’s technological level compared with the world or industry average, it is effective to refer benchmark values.

Efforts to develop and disseminate emerging technologies that reduce GHG emissions in the manufacturing phase

An important approach, in presenting a strategy related to future climate change measures, is to present efforts to develop emerging technologies.

(Disclosure example)

- Progress in or prospects for efforts to dramatically reduce GHG emissions in the manufacturing phase (e.g., development of hydrogen-reduction iron manufacturing technologies)

Reference: COURSE50 technology

A project designed to develop technologies to reduce CO₂ emissions by approx. 30% by reducing the emissions through the adoption of hydrogen reduction processes in blast furnaces and the separation and collection of CO₂ using a separation system. The project aims to establish technologies by around 2030 and to practically utilize and diffuse them by 2050.

Efforts for resource circulation through recycling

The iron & steel industry has been promoting efforts focused on resource circulation through the recycling of used products and byproducts generated from the manufacturing phase, as well as through the utilization of waste plastics, in order to indirectly contribute to reduced GHG emissions. Demonstrating the contributions of those recycling efforts to reduced GHG emissions is important.

(Disclosure examples)

- Material flow of manufacturing processes
- Recycling rate of byproducts generated from the manufacturing process
- Efforts to substitute coke through the use of waste plastic as a fuel and chemical feedstock

II. Efforts to reduce GHG emissions in the use phase

Efforts to contribute to GHG emissions reduction through the value chain

In addition to presenting the GHG emission reductions in the manufacturing phase, it is also important to present a strategy for the development and dissemination of products that contribute to the realization of final products with lighter weights, longer lives, and improved energy efficiency.

(Disclosure examples)

- Introduction of products that contribute to reduced GHG emissions
- Avoided emissions by each product

III. Other efforts

Efforts to contribute to GHG emissions reduction through the provision of technologies

Based on the recognition that the transfer of energy-efficiency technologies overseas is effective in reducing GHG emissions at a global level, the iron & steel industry has been actively disseminating advanced energy-efficiency technologies to developing countries in various ways. It is therefore important to disclose such efforts.

(Disclosure example)

- Amount of a contribution to reduced GHG emissions through the provision of technologies

(3) Chemicals

The TCFD Recommendations describe risks and opportunities for the Materials and Buildings Group, including the chemical sector, as shown below. This section provides supplemental guidance focusing on the chemical sector.

Description of the Materials and Buildings Group in the TCFD Recommendations

3. Materials and Buildings Group

The Materials and Buildings Group includes, but is not limited to, industries listed in Figure 11.

Materials and Buildings Group organizations are typically capital intensive, require high investments in plants, equipment, and buildings that are (relatively) fixed in terms of location, and dependent on sources of raw and refined materials. This may reduce the flexibility of organizations in this group to adapt to risks of climate change.

Many of this group's activities result in financial exposures around high GHG emissions and high energy consumption. Furthermore, a number of industries in this group are dependent on water availability and/or vulnerable to the effects of acute or chronic physical risks from weather events.

Since the group is capital intensive and the plants and facilities have a long life span, accelerated R&DDD (research, development, demonstration, and deployment) is critically important. Thus, disclosures relating to R&DDD plans and progress are valuable to see the current and future situation and risks of organizations in the group.

Consequently, disclosures should focus on qualitative and quantitative assessments and potential impacts of the following:

- Stricter constraints on emissions and/or pricing carbon emissions and related impact on costs.
- The construction materials and real estate sectors should assess risks related to the increasing frequency and severity of acute weather events or increasing water scarcity that impact their operating environment.
- Opportunities for products (or services) that improve efficiency, reduce energy use, and support closed-loop product solutions.

Materials and Buildings Group organizations should consider providing additional industry-specific metrics.¹²⁹ Examples of potential metrics include building energy intensity by area, building water intensity (by occupants or square area), percent of fresh

Figure 11 Materials and Buildings
Materials and Building Group



water withdrawn in regions with high or extremely high baseline water stress, and area of buildings, plants, or properties located in designated flood hazard areas.

Original footnote 129; For more sector-specific information, see SASB, “Climate Risk Technical Bulletin,” April 12, 2021 and WBCSD, “Construction and Building Materials TCFD Preparer Forum,” July 1, 2020.

Source: TCFD, 2021, Annex: Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures, p.66

Companies in the chemical sector conduct a wide range of business activities, and the industry has a very complex structure overall. Manufacturing processes in the chemical industry can be divided into the following categories: basic chemicals such as ethylene and propylene produced using naphtha, etc. as raw materials; intermediate chemicals, including plastics, produced using basic chemicals as raw materials; and final chemical products, such as molded plastics, produced from intermediate chemicals. The processes of manufacturing basic chemicals generate a large amount of GHG emissions in cracking naphtha, etc., and generally emit more GHG emissions than the processes of manufacturing intermediate chemicals and final chemical products.

Given that the chemical industry emits a large amount of GHG in the manufacturing phase, as described above, efforts to reduce GHG emissions in the manufacturing processes in the industry are important. Chemical products are made mainly from fossil resources at present. Over the medium- to long-term, the industry has prospects for achieving reduced GHG emissions by working on the diversification of raw materials using biomass, etc. as raw materials.

Many chemical products are intermediate materials that can contribute to reduced GHG emissions through the use phase of final products in sectors such as automobiles and home electronics. A wide range of products in the chemical industry are produced and used for diverse applications in the use phase, contributing to reduced GHG emissions. An important step in disclosure, therefore, is to describe business opportunities by identifying those products and demonstrating their applications, the mechanisms of GHG emissions reduction (the mechanisms by which they lead to reduced emissions), and the amounts of avoided GHG emission.

I. Efforts to reduce GHG emissions at the manufacturing stage

Efforts to reduce GHG emissions from manufacturing processes

The chemical industry emits a large amount of GHG in the manufacturing phase. Companies can thus adopt the GHG emission reduction strategy of improving the efficiency of manufacturing processes and shifting to high value-added products with low GHG emissions.

The sheer variety of products handled in the chemical industry makes it difficult to assess such efforts using a single type of metric. One possible metric related to energy intensity is energy consumption per total production, revenues, and profit. Another is the use of total GHG emissions.

These metrics, however, are affected by changes in the product mix and production volume. Any disclosure, therefore, should describe the reasons for such changes.

(Disclosure examples)

- Efforts to improve energy intensity and reduce total GHG emissions (e.g., efforts to save energy through the conversion of the production system, use of waste heat in a cascaded manner, fuel switch in captive power generation)

Efforts to reduce GHG emissions in procurement

Some types of chemical products may emit more GHG emissions in the procurement phase than in the manufacturing phase. In such a case, a company should disclose its efforts to reduce GHG emissions in procurement.

(Disclosure examples)

- Targets for reduced energy intensity in logistics
- Efforts for supply chain management (establishment of a green procurement policy, etc.)

Efforts to develop and disseminate emerging technologies that reduce GHG emissions in the manufacturing phase

On a medium- to long-term basis, it is important to develop new manufacturing methods using innovative technologies that will replace conventional manufacturing methods. When a company is working on the development of advanced technologies to reduce GHG emissions in a chemical product life cycle, it should describe such efforts and the GHG emissions reduction potential in its disclosure.

(Disclosure examples)

- Efforts to develop emerging technologies (e.g., development of a membrane separation process, conversion of CO₂ to raw materials (CCU³), use of biomass as a raw material, use of natural gas, use of methane hydrate as a resource)
- Expected effect of technology development in GHG reduction

³ Carbon Capture and Utilization

II. Efforts to reduce GHG emissions in the use phase

Efforts to contribute to GHG emissions reduction through the value chain

The chemical industry manufactures a wide variety of chemical products, many of which are intermediate materials. In planning out its strategy, therefore, a company can choose to supply products that contribute to the resolution of climate change issues in the use phase.

(Disclosure examples)

- Definition of environmentally beneficial products and their contribution to sales
- Amount of avoided GHG emissions through environmentally beneficial products

Efforts to develop and disseminate emerging technologies that reduce GHG emissions in the use phase

A key step, for a company developing environmentally beneficial products (e.g., high thermal insulation materials and high-strength lightweight materials), is to provide a detailed description of its research and development. Explanations on how environmentally beneficial products reduce GHG emissions (i.e., how they bring about reduced emissions) are also useful, as they help investors better understand the products and their benefits overall.

(Disclosure examples)

- Efforts and the amount of investment in research and development of environmentally beneficial products
- Mechanism for reducing GHG emissions through environmentally beneficial products

(4) Electrical and electronics

Companies in the electrical and electronics industry can be roughly categorized into device companies and assembly companies. Device companies are those that primarily manufacture semiconductors and other electronic components that are built into electronic devices but not used on their own. Therefore, it is important for device companies to reduce GHG emissions in the manufacturing phase. Assembly companies, meanwhile, manufacture final products from various parts. As many of their products emit a large amount of GHG from energy consumption in the use phase as opposed to the manufacturing phase, it is important for them to demonstrate their contributions to climate change reduction by reducing emissions in product use. Some types of products consume relatively little energy in the use phase (e.g., cameras, audio devices). For these products, the reduction in GHG emissions is more important in the manufacturing phase.

Given the wider range of products produced in the electrical and electronics industry, both device and assembly companies should ideally identify the products or technologies that contribute to reduced GHG emissions in the use phase, describe their usage, and explain how they contribute to reduced emissions.

I. Efforts to reduce GHG emissions at the manufacturing stage

Efforts to reduce GHG emissions in manufacturing processes

If a device company, or an assembly company which primarily manufactures products with lower energy consumption in the use phase, its products emit no GHG emissions in the use phase (or emit a smaller amount of GHG emissions than in the manufacturing phase). This type of company should therefore describe its efforts to reduce emissions in the manufacturing phase.

(Disclosure example)

- Efforts to improve manufacturing process efficiency (energy intensity)

II. Efforts to reduce GHG emissions in the use phase

Efforts to reduce GHG emissions from the use of products

In the case of assembly companies that primarily manufacture products with larger energy consumption in the use phase, it is important to disclose specific efforts for reducing GHG emissions in the use phase.

In view of the ongoing improvements in electrical and electronics products year after year, it is also important to demonstrate the superior performance offered by such products, along with the progress in energy efficiency.

(Disclosure example)

- Efforts to improve the energy efficiencies of primary products
(e.g., improvement of energy efficiencies during the use of products)

Efforts to contribute to GHG emissions reduction through the value chain

The electrical and electronics industry produces a wide range of products, many of which can contribute to reduction in GHG emissions. An important step in disclosure, therefore, is to identify products or technologies that contribute to reduced GHG emissions, and disclose their contribution to reduction. In the particular case of renewable energy facilities or other products which do not emit GHG, it is important to disclose the avoided GHG emissions.

Furthermore, that if a company gives definitions for its environmentally beneficial products, it is important to describe those definitions and to disclose the sales of the products so defined (in total or per product).

(Disclosure examples)

- Introduction of products and services that contribute to reduced GHG emissions
- Amount of avoided GHG emissions through products and services

Efforts to develop and disseminate emerging technologies that reduce GHG emissions in the use phase

Another important step is to describe efforts for technological development to reduce GHG emissions in the product use phase. Specific efforts may include technological development of energy management using IoT solutions, in addition to technological development related to the energy efficiency of each product.

(Disclosure examples)

- Technological development to improve the energy efficiency of products
- Technological development of IoT solutions leading to reduced GHG emissions (energy management, etc.)

(5) Energy

The TCFD Recommendations describe risks and opportunities for the Energy Group, as shown below. This section provides supplemental guidance focused on the Energy Group.

Description of the Energy Group in the TCFD Recommendations

1. Energy Group

Energy is a critical element in the economy, serving as a primary or necessary input in most economic activities. This group comprises organizations extracting, processing, producing, and distributing fossil fuels or electric energy to other sectors of the economy. It includes, but is not limited to, industries listed in Figure 9.

While many climate-related issues impact the Energy Group, organizations in this group should consider providing disclosures related to financial implications of potential physical impacts (e.g., reliance on water in areas of high water stress, severe storm/flood mitigations) and transition impacts (e.g., policy requirements, carbon prices, new technology, changes in market demand) of climate-related risks and opportunities.

As fossil fuel and electricity providers, the organizations in this group generally have significant financial exposure around transition issues related to GHG emissions and, in many cases, are dependent on the availability of water. For example, a majority of the current electricity supply comes from non-renewable fossil fuel resources, resulting in a significant exposure to transitions around global GHG emissions—either directly through utility companies’ own energy use for production or indirectly through combustion of fossil fuels.¹²⁰ Electric utilities, therefore, face significant transition risk (i.e., the financial risk arising from the changes in asset valuations caused by the structural shift toward a low-carbon energy system). This is because the utility sector’s asset valuations are at risk from the disruptive impact of the policy, technology, and portfolio changes that will occur over the next two to three decades as policies, technology, and markets shift to a low-carbon energy system.

In addition to GHG emissions, both hydroelectric power generation and cooling for nuclear and nonnuclear power generation use large quantities of water.¹²¹ Physical risks affecting water supplies creates a potentially important exposure for this industry.

Oil, gas, and coal extraction face similar transition risks as key suppliers to electric utilities. These industries also rely on water to a significant degree.^{122 123 124}

These characteristics make the Energy Group particularly sensitive to physical, policy, or technological changes affecting fossil fuel demand, energy production and usage, emission constraints, and water availability. The regulatory and competitive landscape

Figure 9 Energy Group



that surrounds electric utilities also differs significantly between jurisdictions, thus making assessment of climate-related risks very challenging.

As a result, both the transition risks and physical risks associated with climate change may impact the operating costs and asset valuation of organizations engaged in energy activities. In particular, organizations within the Energy Group are generally capital intensive, require major financial investments in fixed assets and supply chain management, and have longer business strategy/capital allocation planning horizons relative to many other sectors—horizons that may be particularly affected by climate-related risks and opportunities. This requires careful assessment of climate-related risks and opportunities to inform decisions about future sustainability and profitability.

Transparent and decision-useful climate-related disclosures are crucial to fully understand the impact of climate change on business strategy and financial plans in energy activities. Consequently, disclosures should focus on qualitative and quantitative assessments and potential impacts of the following:

- changes in compliance and operating costs, risks, or opportunities (e.g., older, less-efficient facilities or un-exploitable fossil fuel reserves in the ground);
- exposure to regulatory changes or changing consumer and investor expectations (e.g., expansion of renewable energy in the mix of energy supply); and
- changes in investment strategies (e.g., opportunities for increased investment in renewable energy, carbon-capture technologies, and more efficient water usage).

Energy Group organizations should consider providing additional industry-specific metrics.¹²⁵ Examples of potential metrics include percent of water withdrawn in regions with high baseline water stress and amount of gross global Scope 1 emissions from (1) combustion, (2) flared hydrocarbons, (3) process emissions, (4) directly vented releases, and (5) fugitive emissions/leaks.

Original footnote 120: According to International Energy Agency (IEA) data, CO₂ emissions from fuel combustion across all energy sectors and activities totaled 33.5 Gigatons (Gt) in 2018, thereby accounting for 65 percent of total anthropogenic GHG emissions (51.9 Gt CO₂e). Electricity and heat production on its own accounted for 14Gt, representing 42 percent of all CO₂ emissions from fuel combustion and 27 percent of all anthropogenic GHG emissions. To put this into context, the next highest emitting industrial sector was transportation, which accounted for 8.3Gt (25 percent of all CO₂ emissions from fuel combustion, and 16 percent of total anthropogenic GHG emissions). IEA, CO₂ Emissions from Fuel Combustion: Highlights, 2020; PBL Netherlands Environmental Assessment Agency, Trends in Global CO₂ and Total Greenhouse Gas Emissions: 2020 Report, 2020.

Original footnote 121: van Vilet, M., et al., “Power-generation system vulnerability and adaptation to changes in climate and water resources,” 2016.

Original footnote 122: IPIECA, Water Resource Management in the Petroleum Industry, 2005.

Original footnote 123: International Council on Mining and Metals (ICMM), In Brief: Water stewardship framework, 2014.

Original footnote 124: World Resources Institute (WRI), Water-Energy Nexus: Business Risks and Rewards, Washington, DC, 2016.

Original footnote 125: For more sector-specific information, see SASB, "Climate Risk Technical Bulletin," April 12, 2021, WBCSD, "TCFD Oil and Gas Preparer Forum," July 18 2018, and WBCSD, "TCFD Electric Utilities Preparer Forum," July 16, 2019.

Source: TCFD, 2021, Annex: Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures, p. 63-64

Premises: National energy policy

Energy companies play a role in the stable supply of energy for a country. The energy industry is exposed to geopolitical risks associated with the procurement of resources, and the business activities of each company are integrated with national energy policy. The disclosure of an energy company, therefore, should ideally describe its strategy based on the relevant national energy policy.

[Principle of energy policy in Japan]

Energy is an infrastructure that supports every human activity. A precondition for the further development of Japan is the creation of an energy supply and demand structure that can achieve a stable energy supply with a lower social burden. Based on this principle, the Cabinet approved the fifth strategic energy plan under the Basic Act on Energy Policy in July 2018. The plan presents the basic direction of Japan's energy policy as making maximum efforts to achieve a low-cost energy supply through the improvement of economic efficiency on the premise of safety and with energy security as the nation's top priority, while at the same time promoting environmental sustainability (3E plus S).

Japan is dependent on imports from overseas for most of its energy sources. As a consequence, the country has difficulty securing resources by itself when a problem with the energy supply arises overseas. This is a fundamental vulnerability that cannot be eliminated simply by curbing energy consumption. Japan has thus made efforts to diversify risks by developing alternative energy sources and securing domestic energy sources.

As a country prone to natural disasters such as large-scale earthquakes (e.g., the Great East Japan Earthquake) and frequent typhoons, Japan must establish a robust supply and demand structure that ensures a stable energy supply even at a time of crisis.

Each energy source has its own strengths and weaknesses in the supply chain. No

single source can support a stable and efficient energy supply and demand structure. As such, Japan needs to diversify its energy sources rather than concentrating intensively on any one source. Japan's energy policy must be suited to the environment surrounding the country. Establishing a stable energy supply and demand structure based on the basic principle of achieving 3E plus S is essential.

The recommended disclosures

Medium- and long-term target setting and efforts to reduce GHG emissions

Energy companies in sectors such as electric power, gas, and petroleum refinery are working to set medium- and long-term targets appropriate for their businesses in addressing climate change issues. Their aim, in doing so, is to establish a supply structure that can achieve a stable, low-cost, environmentally friendly energy supply in a well-balanced manner with security as a top priority.

Electric utility companies are actively contributing to environmental measures, such as reduction of CO₂ emission intensity based on the 3E plus S principle, as well as working on disclosure of information such as composition of power sources. It is important for them to continue to disclose their efforts for reducing GHG emissions on the demand side through the promotion of introduction of renewable energy, etc.

(Disclosure examples)

- Efforts to increase the proportion of non-fossil energy sources
- Efforts to reduce CO₂ emissions through the efficiency improvement of thermal power generation

Oil companies are making efforts, such as advanced and effective utilization of oil and introduction of sustainable renewable energy. It is important for them to disclose their efforts related to the life cycle that includes the product consumption phase, such as measures for reducing CO₂ emissions in their manufacturing processes.

(Disclosure examples)

- Emissions and efforts in each process of, or through, the entire supply chain, such as energy conservation related to their manufacturing processes (oil refineries)
- Efforts to introduce biomass fuels by considering sustainability

Gas companies are contributing to environmental measures by promoting the diffusion of natural gas, a fuel with superior environmental performance. It is important for them to

disclose their efforts to reduce CO₂ emissions through the value chain, from the manufacturing to the use and consumption of city gas.

(Disclosure examples)

- Efforts to reduce CO₂ emissions intensity and energy intensity in the process of manufacturing city gas, etc.
- Efforts to contribute to energy conservation and reduce GHG emissions by promoting the diffusion and use of cogeneration systems, fuel cells, etc.

Efforts in research and development

In many countries, GHG emissions are chiefly related to energy use. It becomes vital, under such circumstances, to promote efforts to reduce GHG emissions related to energy use, both on the energy demand side and energy supply side.

An electric utility company, on the energy supply side, must therefore disclose its research and development efforts in the energy manufacturing phase, along with its efforts in various other phases such as its transmission systems and consumers.

(Disclosure example)

- Principles and efforts related to the development of technologies that contribute to lower carbon emissions, such as thermal power technology for reducing environmental impacts, addressing the introduction of a large quantity of renewable energy, and development of technologies for efficient energy utilization.

For oil and gas companies, the disclosure should focus on efforts related to research and development on the following items.

(Disclosure examples)

- Principle and efforts related to research and development on efficiency improvements in production facilities and the development of products with superior fuel-saving performance, as well as the efficiency-improvement effects achieved through such technologies [oil companies]
- Principle and efforts related to the development of technologies for further efficiency improvements and low carbonization related to gas usage, such as combustion technology and cogeneration [gas companies]
- Research and development efforts focused on technologies such as hydrogen and methanation technology for significant CO₂ reduction [gas companies]

Efforts to encourage actions to save energy and GHG emissions by customers

In addition to making supply-side efforts, a country seeking to rationalize its energy supply and demand structure needs to create an environment where customers have diverse options that allow them to work towards curbed GHG emissions based on rational decisions. It thus becomes important for energy companies to disclose information on services designed to encourage customers to take actions to save energy and GHG emissions at their own initiative.

(Disclosure examples)

- Efforts to reduce GHG emissions on the demand side by promoting the diffusion of high-efficiency electrical equipment, etc. [electric utility companies]
- Efforts related to products and services that contribute to energy-saving in the use phase of oil [oil companies]
- Efforts related to smart energy networks and energy management systems [gas companies]

Efforts for resource circulation and recycling

From the perspective of reducing environmental impacts, it is important to disclose efforts for resource recycling, waste reduction, and water consumption reduction, etc.

Efforts to contribute to reduced GHG emissions through overseas business

Energy companies are actively engaged in overseas business by leveraging technologies and know-how cultivated through domestic businesses. Therefore, it is important for them to disclose their efforts to contribute to reducing GHG emissions overseas through their overseas energy supply business and consulting business on energy conservation, etc.

(6) Food

The TCFD Recommendations describe risks and opportunities for the Agriculture, Food, and Forest Products Group, including the food sector, as shown below. This section provides supplemental guidance focusing on the food sector.

Description of the Agriculture, Food, and Forest Products Group in the TCFD Recommendations

4. Agriculture, Food and Forest Products Group

The Agriculture, Food and Forestry Products Group includes, but is not limited to, the industries listed in Figure 12.

Climate-related risks and opportunities in this group largely emanate from GHG emissions and water and waste management driven by land use, production practices, and changing land-use patterns.¹²⁹

The absolute and relative impacts of climate-related transition and physical risks will vary between producers and processors of food and fiber.

Producers, such as agriculture and forestry enterprises, will likely be impacted financially to a somewhat greater degree by GHG and water risks (including extreme weather events and shifts in precipitation patterns) than processors. Agriculture and forest producers generate significant non-point GHG emissions, primarily through land-use practices and changes to them (e.g., grazing, soil tillage practices, conservation practices, feedlot practices, deforestation, or afforestation).¹³⁰

Processors, such as food, beverage, and fiber processors (e.g., paper), will likely be impacted relatively less by direct GHG emissions (Scope 1), but more by indirect GHG emissions (Scope 3) arising from their supply and distribution chains. Processors will also have a similar emphasis on water and waste risks and opportunities as compared with producers. Beverage production and paper production, for example, depend on access to significant water resources and, in the case of beverage production, high-quality water resources. Risks and opportunities around waste include residual materials such as paper and wood waste, wastewater, and post-processing animal byproducts.

Assessing the impacts of climate-related risks and opportunities for the Agriculture, Food, and Forest Products Group involves a number of interactions and trade-offs among the climate-related aspects of land use, water, waste, carbon sequestration, biodiversity, and conservation, complicated by short-run competing goals around food security (e.g.,

Figure 12 Agriculture, Food and Forest Products Group



maintaining production sufficient to meet the rising demand for food, fiber, fodder, and biofuels).

Policies and regulations around land use and conservation requirements, for example, may constrain or preclude certain uses of land and water resources (e.g., deforestation, riparian rights, tillable land). Such policies may lead to significant asset impairment if forest or agricultural lands cannot be used to produce food or fiber.

Opportunities in the Agriculture, Food, and Forest Products Group largely fall into three categories:

- Increasing efficiency by lowering the level of carbon and water intensity per unit of output (e.g., through drought-resistant hybrids, nutrient-efficient genetically modified organisms (GMOs), feed and feed practices that reduce livestock methane emissions).
- Reducing inputs and residual waste for a given level of output (e.g., nutrient management practices, tillage practices, conservation practices, biofuels, food waste reduction).
- Developing new products and services with lower carbon and water intensity (e.g., bioplastics).

Disclosures, therefore, should focus on qualitative and quantitative information related to both the group's policy and market risks in the areas of GHG emissions and water, and its opportunities around carbon sequestration, increasing food and fiber production, and reducing waste, including:

- Efforts to reduce GHG emissions and water intensity, including such non-point GHG sources as crop nutrient processes, livestock management processes, erosion, tillage practices, watershed practices, and forest management.
- Efforts to improve sustainability through better recycling of outputs and residual waste (e.g., wood products, food waste, and animal byproducts).
- Climate-related impacts on food and fiber production (e.g., extreme weather or water events).
- Opportunities that capture shifts in business and consumer trends toward food and fiber products, processes and services that produce lower emissions and are less water-/waste intensive while maintaining adequate food security (e.g., bioplastics, GMOs, new uses for wood/animal byproducts), and forestry/livestock by-products).

Agriculture, Food, and Forest Product Group organizations should consider providing additional industry-specific metrics.¹³¹ Examples of potential metrics include total water withdrawn and total water consumed, percent of water withdrawn and consumed in regions with high or extremely high baseline water stress, emissions from biological processes, changes in carbon stocks as a result of land use, and land use changes.

Original footnote 129: According to the Intergovernmental Panel on Climate Change (IPCC), agriculture and forestry is responsible for “just under a quarter of anthropogenic GHG emissions mainly from deforestation and agricultural emissions from livestock, soil, and nutrient management. Anthropogenic forest degradation and biomass burning (forest fires and agricultural burning) also represent relevant contributions.” (IPCC. “Agriculture, Forestry and Other Land Use (AFOLU),” In: Climate Change 2014: Mitigation of Climate Change, 2014. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change). Agriculture is also a heavy user of water, primarily for irrigation.

Original footnote 130: For more information, see definitions of land use change and indirect land use change on page 1,265 of the IPCC’s Climate Change 2014: Mitigation of Climate Change.

Original footnote 131: For more sector-specific information, see SASB, “Climate Risk Technical Bulletin,” April 12, 2021 and WBCSD, “Food, Agriculture and Forest Products TCFD Preparer Forum,” April 9, 2020.

Source: TCFD, 2021, Annex: Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures, pp. 67-68

It should be noted that the food sector offers a wide range of products, and the risks and opportunities for changing demand and procuring raw materials due to climate change are not uniform across products.

Physical risks are the primary subject of disclosure for agricultural, livestock, and fishery products used as raw materials for food. Climate change has various potential impacts on raw material procurement through changes in plant and animal growth associated with rising temperatures, reduced or increased production, changes in the quality of raw materials due to pest and disease outbreaks, increased procurement costs associated with investment in adaptation, and shifts in production areas.

Attention should also be paid to instability in the supply of water necessary for food production linked to weather disasters such as droughts or floods, worsened water quality due to changes in precipitation patterns, decreased glacier melt water, the excessive use of fossil water, or regulatory trends such as restrictions of water intake. In addition, weather disasters linked to climate change, such as heavy rains, floods, or droughts, may also increase the risk of interruptions in the supply of goods due to disruptions in plant operations or distribution.

While efforts are being made to reduce GHG emissions at the manufacturing of food products, the GHG generated in raw material production, or emissions throughout the supply chain (including packaging, transportation, and delivery) should also be considered. Several other sources of GHG emissions should also be noted, such as the conversion of forests to farmland and grassland, and emissions from production of agro-livestock products such as the ruminant of livestock and composting.

In addition, efforts to reduce energy consumption, water conservation and food loss are important because they not only reduce GHG emissions but also reduce energy costs.

GHG emission reduction through reductions in food loss and the use of byproducts as feed

and fertilizer is an issue unique to the food industry. A food producer can effectively demonstrate its contribution to climate change by describing efforts to address these issues.

The business opportunities created by climate change in the food industry include the development of products to meet increased demand stemming from changes in consumer preferences linked to extreme temperatures, and increased purchasing activities that take environmental impact into account.

Efforts to stabilize raw material procurement

In the food sector, it is important to identify and assess risks such as increased procurement costs due to the impact of climate change on raw material production, or insufficient procurement, an issue that may entail problems with quality. The identification and assessment of these risks forms the basis of disclosure on measures to stabilize raw material procurement.

(Disclosure examples)

- Assessment of the impact of procurement risks (reduction of raw material yields and quality, increase in procurement costs, etc.) on business operations, and the status of countermeasures considered
- Efforts to reduce risks through the diversification and change of procurement areas
- Procurement of raw materials with third party certification in sustainable production and distribution, such as RSPO⁴, the Rainforest Alliance⁵, FSC⁶ or raw materials that have undergone in-house assessment in accordance with equivalent standards
- Initiatives to support producers in sustainable agriculture and livestock industries (Examples: dissemination of sustainable production methods, support for producers' management, etc.)

Addressing Water Risks

Ideally, a company should describe an impact assessment on business operations and the measures to be taken to address water-related risks.

As water is essential for both raw materials and cleaning in food production, a company should appropriately assess and address the risks pertaining to water supply and wastewater

⁴ Roundtable on Sustainable Palm Oil: A non-profit organization that develops and operates certification schemes for sustainable palm oil (website: <https://rspo.org/>). In the case of palm oil, the rapid expansion of oil palm plantations and inappropriate plantation management lead to massive emissions due to the deforestation of tropical rainforests or greenhouse gas emissions from waste oil in extraction facilities. Procurement of RSPO-certified raw materials can reduce or avoid these climate change risks.

⁵ Rainforest Alliance: A non-profit organization that certifies farms that are working to solve climate problems in the terrestrial environment by improving land management methods such as more sustainable agriculture, as well as conserving and restoring forests (website: <https://www.rainforest-alliance.org/>).

⁶ Forest Stewardship Council: An independent non-profit organization that aims to promote responsible forest management throughout the world and operates an international forest certification system (website: <https://fsc.org/en>).

associated with climate change.

Physical risks include meteorological disasters (typhoons, heavy rains, floods, droughts, etc.) on production and distribution⁷. Mitigation measures should therefore be considered.

(Disclosure examples)

- Assessment of the impact of water risk on business operations and the status of countermeasures considered
- Support for dissemination of sustainable agriculture and livestock farming (Examples: water-saving agriculture, etc.)
- Water resource conservation activities (Examples: forest conservation, the flooding of paddy fields, etc.)
- Efforts to reduce water withdrawal and consumption (Examples: reduction of water use per unit of production, recycling of water, etc.)
- Utilization of methane gas generated in wastewater treatment for power generation
- Evaluation of the impact of meteorological disasters (storm and flood damage risks) on projects and consideration of countermeasures (Examples: disaster response, plant relocation, reviews of distribution routes and distribution centers, and BCP measures such as power outages and water outages.)

Efforts to reduce GHG emissions

It is important for the food industry to reduce GHG emissions throughout the supply chain, from the procurement of raw materials to the production, transportation and delivery of products. To effectively reduce emissions from the production of agricultural, livestock and fishery products, and improve the efficiency of transportation and delivery, food producers must make multifaceted efforts towards cooperation with related business operators and review the use of containers and packaging.

Efforts to reduce food loss and to make use of by-products and animal and plant residues as feed and fertilizer are unique to the food industry. As such, food producers must appropriately make their efforts better understood by disclosing the GHG emission reduction mechanisms they seek to promote. Through this approach, the sector can take advantage of the trend towards ethical consumption as a business opportunity.

⁷ For example of the impacts of floods on businesses, finances, and finance pathways, see below:

WBCSD Food, Agriculture and Forest Products TCFD Preparer Forum, "Disclosure in a time of system transformation: Climate-related financial disclosure for food, agriculture and forest products companies", April 2020, P 47 (Figure 20)

(<https://docs.wbcsd.org/2020/04/WBCSD-TCFD-Food-Agriculture-and-Forest-Products%20AC-Preparer-Fourm-report.pdf>)

(Disclosure examples)

- Development of alternative materials and products (Example: reducing GHG emissions from livestock feeding through the use of plant-based meat substitutes and cultured meat)
- Efforts to reduce GHG emissions during manufacturing (Examples: reduction of energy consumption and introduction of renewable energy by expanding the installation of energy-saving equipment)
- Reducing the weight and thickness of containers and packaging, and switching to alternative materials (Examples: 3R initiatives, switch to sustainable paper containers and packaging, such as recycled or biomass-based materials or FSC-certified materials)
- Reducing GHG emissions during transportation and distribution (Examples: joint distribution, modal shift, and efforts to optimize lead times for placing and receiving orders.)
- Efforts to reduce food loss (Examples: reducing food loss in the manufacturing process, extending expiration dates by improving containers and packaging, reducing food loss throughout the supply chain by indicating the year and month on labels, refining demand forecasts using AI, etc.)
- Efforts to utilize byproducts and animal and plant residues as feed, fertilizer, etc. (Example: reduction of petroleum-derived fertilizers, etc.)

Description of business opportunities

The development of products expected to be in higher demand with the progress of climate change, especially rising temperatures, may lead to new business opportunities in the food industry in the future.

The development of environment-friendly products will also contribute to reduced GHG emissions and open up opportunities for market expansion through the spread of ethical consumption and other purchasing behaviors guided by considerations of environmental impact.

It is important to disclose such efforts to create opportunities linked to climate change.

(Disclosure examples)

- Efforts to develop products that match the needs arising from climate change (Examples: development of products to relieve thirst in response to extremely hot weather and products to help prevent heat stroke and infectious diseases, etc.)
- Promotion of ethical consumption through environment-friendly products (Examples: procurement of certified raw materials or materials that have undergone in-house assessments based on equivalent standards, support for producers, and procurement of materials selected in consideration of sustainability in containers and packaging.)

(7) Banking

The TCFD Recommendations describe risks and opportunities in the banking sector, as shown below. This section provides a supplemental guidance focused on banking.

Description of Banks in the TCFD Recommendations

1. Banks

Banks are exposed to climate-related risks and opportunities through their lending and other financial intermediary activities as well as through their own operations. As financial intermediaries, banks may assume exposure to material climate-related risks through their borrowers, customers, or counterparties. Banks that provide loans or trade the securities of companies with direct exposure to climate-related risks (e.g., fossil fuel producers, intensive fossil fuel consumers, real property owners, or agricultural/food companies) may accumulate climate-related risks via their credit and equity holdings. In particular, asset-specific credit or equity exposure to large fossil fuel producers or users could present risks that merit disclosure or discussion in a bank's financial filings. In addition, as the markets for lower-carbon and energy-efficient alternatives grow, banks may assume material exposures in their lending and investment businesses. Banks could also become subject to litigation related to their financing activities or via parties seeking damages or other legal recourse. Investors, lenders, insurance underwriters, and other stakeholders need to be able to distinguish among banks' exposures and risk profiles so that they can make informed financial decisions.

Source: TCFD, 2021, Annex: Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures, p. 25

In the banking sector, the aim of TCFD is the stabilization of the financial system in the event of the emergence of climate change risks. As financial supervisors and central banks move to integrate climate change into prudential regulation and monitoring, it is useful to enhance disclosure, particularly in terms of risk.

An important point, in this case, is to specify quantified risk of climate change together with framework for controlling risk. Based on the scenario analysis, it is desirable to clarify measures to enhance resilience against climate change by disclosing not only concrete figures such as the amount of future assumed physical risks and transition risks and the degree of concentration of carbon-related assets, but also internal governance and risk management systems related to climate change risks and policies for dealing with specific sectors.

On the other hand, with regard to opportunities, it is important to specify a medium- and long-term strategy for environmental consideration using financial functions and disclose how they support the efforts taken by their customers toward a low-carbon society.

In disclosing both risks and opportunities, it is important to share the concept of TCFD Recommendations through engagement with customers and to clearly explain the actions that can be taken in the future, in order to demonstrate a stance of advancing climate change responses with customers.

Scenario analysis

It is desirable to share the future amount of risk with stakeholders by estimating and disclosing the expected increase in credit costs under climate change scenarios. Though some studies on scenario analysis are given as examples⁸, there is no international or uniform method for analysis as of this writing. In performing an analysis, a bank must begin by deciding “in what manner”, “with which scenarios”, and “for which assets”. These assumptions that go into the analysis must be specified when the analysis is disclosed.

(Disclosure examples)

- Estimation and disclosure of total credit costs based on the probability of flooding for each climate change scenario (IPCC “RCP 2.6, RCP 8.5”, etc.)
- Estimation and disclosure of total credit costs based on changes in sales and costs in borrower sectors under the transition risk scenario (IEA “sustainable development scenario”, etc.)

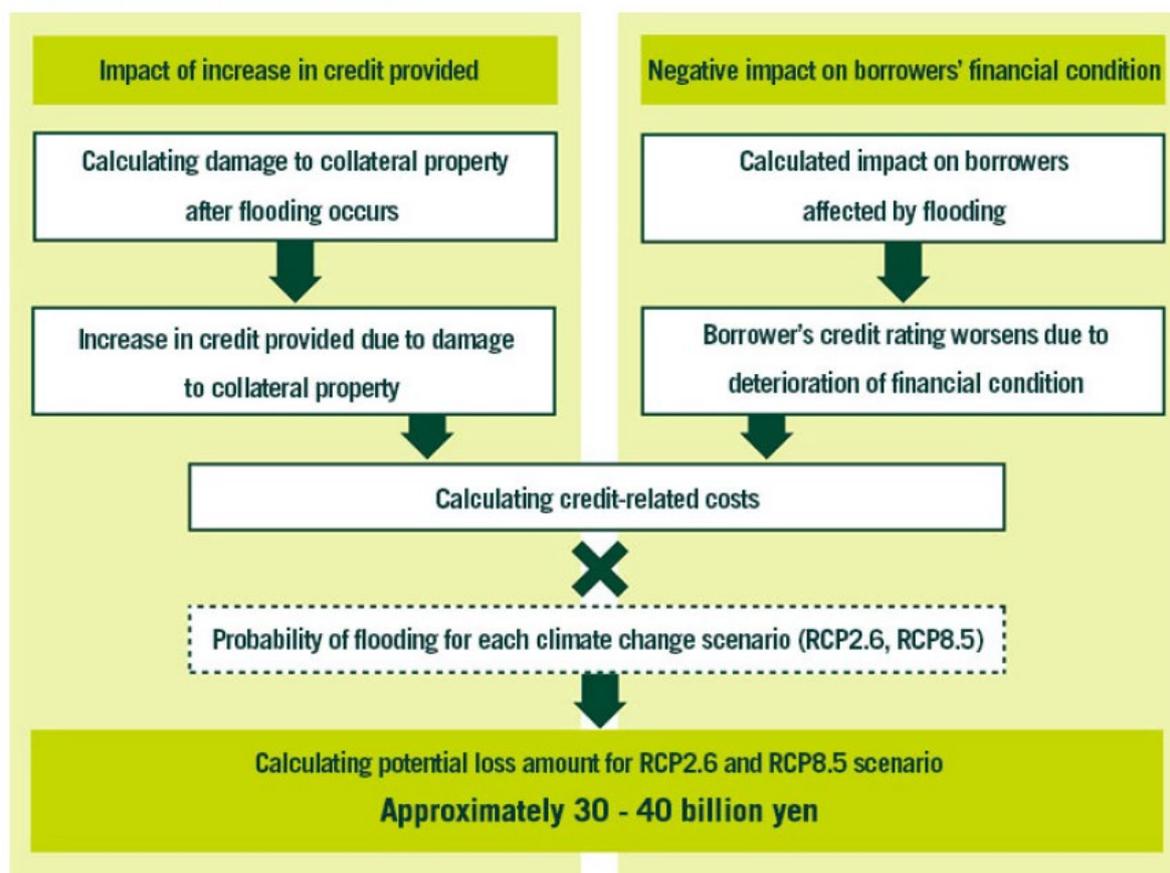
⁸ Examples of studies on scenario analysis in the banking sector include the following:

- Bank of England, 2019, Discussion Paper: The 2021 biennial exploratory scenario on the financial risks from climate change (<https://www.bankofengland.co.uk/paper/2019/biennial-exploratory-scenario-climate-change-discussion-paper>)
- Network for Greening the Financial System, 2020, Guide to climate scenario analysis for central banks and supervisors (https://www.ngfs.net/sites/default/files/medias/documents/ngfs_guide_scenario_analysis_final.pdf)

Reference: SMBC's Scenario Analysis Process and Estimated Credit Costs

<physical risk>

< Process of Analyzing Physical Risks >

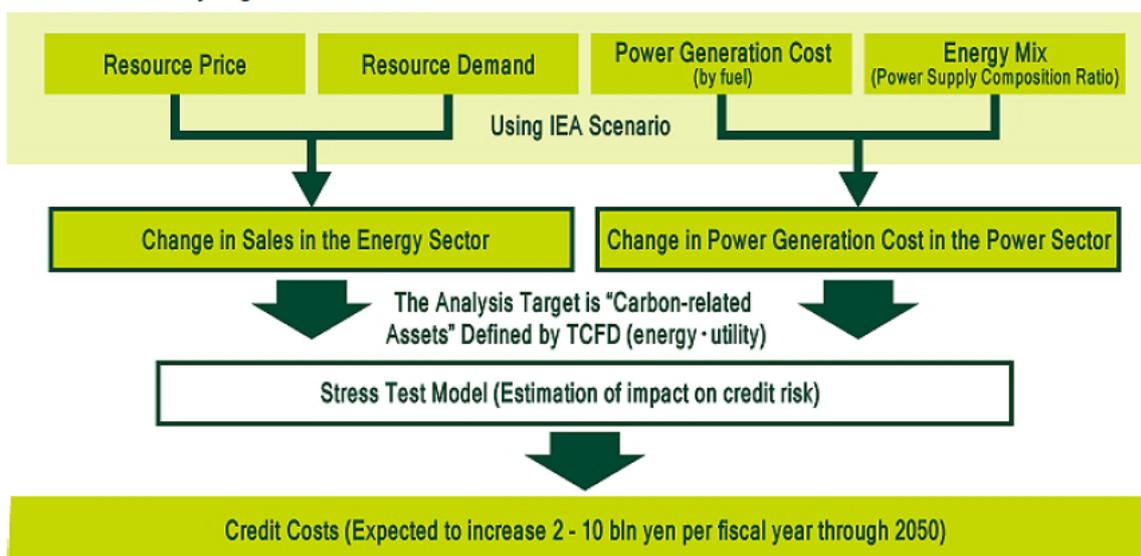


Source: Sumitomo Mitsui Financial Group, Inc. "Sustainability Report 2019" p. 55

- Risk events are identified as water disasters (floods), and the amount of loss expected to occur in the future due to water disasters is analyzed for each climate change scenario.
- Estimation of the current estimated credit costs based on (1) the amount of collateral damage in the event of a flood and (2) the financial impact on business partners (decline in sales), after identifying collateral and business partners of banks located on the water disaster hazard map prepared by the Ministry of Land, Infrastructure, Transport and Tourism.
- Calculate potential future losses by multiplying the probability of flooding in each climate change scenario (IPCC "RCP scenarios").
- The total cumulative credit cost is expected to increase by approximately 30 to 40 billion yen through 2050.

<transition risk>

< Process of Analyzing Transition Risks >



Source: Sumitomo Mitsui Financial Group, Inc. "Sustainability Report 2019" p. 56

- The effects of expected changes in oil and gas prices and demand are estimated, together with power generation costs under the IEA scenarios on credit risks in the energy and power sectors.
- The estimated credit cost under the 2°C scenario is expected to increase by approximately 2 to 10 billion yen per year up to 2050, compared to the 4°C scenario (Stated Policies Scenario).

Concentration of carbon-related asset exposures

The TCFD recommends that banks disclose "concentrations of credit exposure to carbon-related assets" that are likely to be vulnerable to climate change impacts⁹.

While carbon-related assets are defined to a degree in the TCFD Recommendations, each bank has different interpretations of detailed estimation methods, such as whether the concentration of carbon-related assets is a loan-based ratio or credit-based ratio, and how to deduct renewable-energy- and nuclear-power-related exposures of electric power companies. It should be noted that comparability cannot be warranted at present.

(Disclosure example)

- Ratio of carbon-related assets to loans (or credit amounts)

⁹ "Energy" "Utilities" in GICS (Global Industrial Classification Standard). However, water utilities, independent power producers, and renewable energy producers are excluded.

Governance and risk management systems

In order to control the future risks identified through scenario analysis and exposure to carbon-related assets, it is necessary to integrate the elements of climate change into the bank's internal governance and risk management systems, and to operate them strategically.

In doing so, it is important for a bank to clarify the involvement of its management and board of directors in climate change-related issues, and incorporate climate change risks into its risk appetite framework in the future.

(Disclosure examples)

- Reflect climate change initiatives in business strategies based on discussions at the management committee, and periodically report to the board of directors
- Report on climate change risk in a “risk committee”
- Recognize climate change as a top-priority risk and implement measures to strengthen scenario analysis and consider countermeasures at the management level

Capturing opportunities

It is important, in the theme “Strategy” to disclose the positive impact of capturing opportunities in addition to minimizing the negative impact of climate change, and to disclose the impact on medium- and long-term projects and strategies in order to contribute to the transition to a low-carbon society from the perspectives of risk management and capturing opportunities.

As regards scenario analysis disclosed under “Strategy”, it is encouraged that the banking sector to consider not only how to strengthen risk management, but also how to capture opportunities by utilizing its outcome to better understand customer needs and issues, as well as to engage with customers.

It would be useful, in this regard, to make the medium- and long-term targets clear to customers and other stakeholders, along with the roadmap for achieving those targets, and to disclose the actual progress of financing through the issuance of green bonds (providing finance for green sectors), financing for renewable energy projects, and financing for projects that contribute to climate change countermeasures such as loan products that encourage customers to address ESG and SDGs.

It should be noted that the definition of finance (whether to specialize in the environmental and climate change fields, including social fields, etc.), the types of financial services subjected to the target, and the timeline to achieve the target are left to each bank in setting its targets.

(Disclosure examples)

- Issuance of green bonds (providing funds for green sectors)
- Provision of project finance for renewable energy businesses
- Provision of loan products related to ESG and SDGs
- Medium- and long-term targets for sustainable finance

Objectives of Sector-Specific Disclosure Guidance

Sector-Specific Recommended Disclosures

Automobiles

Iron and Steel

Chemicals

Electrical and electronics

Energy

Food

Banking

Life insurance

Non-life insurance

International Shipping

(8) Life insurance

The TCFD Recommendations describe risks and opportunities in the insurance sector, as shown below. This section provides a supplemental guidance focusing on life insurance companies.

Description of insurance companies and asset owners in the TCFD Recommendations.

2. Insurance companies⁵³

For insurance companies, climate-related risks and opportunities constitute a key topic affecting the industry's core business (e.g., weather-related risk transfer business). The scientific consensus is that a continued rise in average global temperatures will have a significant effect on weather-related natural catastrophes and will account for an increasingly large share of natural catastrophe losses.⁵⁴

Users of climate-related financial disclosures are specifically interested in how insurance companies are evaluating and managing climate-related risks and opportunities in their underwriting and investment activities. Such disclosure will support users in understanding how insurance companies are incorporating climate-related risks into their strategy, risk management, underwriting processes, and investment decisions. This guidance applies to the liability (underwriting) side of insurance activities. For insurance companies' investment activities, refer to the supplemental guidance for asset owners.

Original footnote 53: Insurance companies include both insurers and re-insurers.

Original footnote 54: Intergovernmental Panel on Climate Change, Fifth Assessment Report (AR5), Cambridge University Press, 2014.

Source: TCFD, 2021, Annex: Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures, p. 31.

3. Asset Owners

Asset owners are a diverse group that include public- and private-sector pension plans, re-/insurance companies, endowments, and foundations and invest assets on their own behalf or on behalf of their beneficiaries. Asset owners invest according to a mandate or investment strategy set out by their oversight body or their beneficiaries. Asset owners have various investment horizons that influence their risk tolerance and investment strategies. Many asset owners have broadly diversified investment portfolios across investment strategies, asset classes, and regions and portfolios with thousands of underlying individual company and government exposures. Asset owners may hire asset managers to invest on their behalf.⁶⁷

Whether asset owners invest directly or through asset managers, asset owners bear the potential transition and physical risks to which their investments are exposed. Similarly, asset owners can benefit from the potential returns on the investment opportunities associated with climate change.

Asset owners sit at the top of the investment chain and, therefore, have an important role to play in influencing the organizations in which they invest to provide better climate-related financial disclosures. Disclosure of climate-related risks and opportunities by asset owners—to the extent possible given existing data and methodology constraints—allows beneficiaries and other audiences to assess the asset owner’s investment considerations and approach to climate change. This may include an assessment of the asset owner’s integration of appropriate climate-related financial information into its investment activities in various ways, for example, in setting investment strategy, making new investment decisions, and managing its existing portfolio. By encouraging climate-related financial disclosures by asset owners, beneficiaries and other stakeholders will be in a position to better understand exposures to climate-related risks and opportunities. Further, climate-related financial disclosures by asset owners may encourage better disclosures across the investment chain—from asset owners to asset managers to underlying companies—thus enabling all organizations and individuals to make better-informed investment decisions.

Asset owners have contributed to the success of the TCFD in many ways, including by voluntarily publishing their own “TCFD reports.” In these reports, asset owners have highlighted GHG emissions data from their respective portfolios and how their governance structures have developed to manage climate-related risk. Governance structures have developed to collect and analyze GHG emissions data as a proxy for climate-related risk from investee companies, either directly or via third party asset managers and data analytics specialists. The Task Force recognizes asset owners often issue reports, including ones containing climate-related information, directly to their beneficiaries or members rather than making them available publicly as would generally be the case with public companies. As a result, some of the cross-industry, climate-related metrics described in Appendix 2 may be less relevant for asset owners than for other organizations, particularly where flexibility is needed on the specific metrics and methodologies used.⁶⁸ Nevertheless, the Task Force believes the cross-industry, climate-related metrics have some applicability to asset owners because, by asking for this standardized information, asset owners encourage all organizations to publish TCFD-aligned information.

- Objectives of Sector-Specific Disclosure Guidance
- Sector-Specific Recommended Disclosures**
- Automobiles
- Iron and Steel
- Chemicals
- Electrical and electronics
- Energy
- Food
- Banking
- Life insurance**
- Non-life insurance
- International Shipping

Original footnote 67: In this role, asset managers also act as fiduciaries. Asset managers invest within the guidelines specified by the asset owner for a given mandate set out in the investment management agreement or the product specification.

Original footnote 68: The Task Force also understands asset owners may need several years to implement relevant cross-industry, climate-related metrics, particularly where assets are held through third party mandates such as pooled funds. The data and methodologies for some of these metrics, such as the impact of climate change on investment income or asset valuations, are very much in the early stages of development; and it may take time before methodologies have been developed and can be applied in practice. The Task Force also recognizes the methodological challenges of calculating GHG emissions associated with certain asset classes (e.g., sovereign bonds) and accepts research is ongoing. In determining whether a particular category of metric is relevant, asset owners should consider whether the information is used as part of the management of climate-related risks or investment decision-making processes.

Source: TCFD, 2021, Annex: Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures, p. 37

Life insurance companies have two positions: as underwriters of life insurance and as institutional investors. It thus becomes necessary, in addressing TCFD Recommendations, to pay attention to what is recommended for each position.

In the life insurance business, the impact of climate change on human life and health will be assessed, and the impact of climate change on business will be examined. While the impact on the life insurance business is not deemed to be substantial at present, the research being done on the relationships of climate change with health damage and mortality is still in its early stages. Life insurance companies thus need to consider how information is to be collected and incorporated into their business.

As institutional investors, insurance companies need to consider the impact of climate change on the companies they invest in, as well as their own information disclosure. These companies are required to better disclose the physical and transition risks and opportunities they experience in their engagement activities and to have an adequate understanding of the information disclosed.

Policies for addressing climate change and ESG investments and loans

Life insurance companies need to make continuous efforts to address climate change as companies. It thus becomes important to indicate how a company perceives the impacts of climate change, how this perception is reflected in its business activities, and what basic policies it has adopted. In this way, the communication of the company's basic position can be promoted to the company's investment and loan recipients as well as to the fund providers.

(Disclosure examples)

- Status of policy formulation for dealing with the environment and climate change
- Development of ESG investment and loan policy

Addressing Climate Change Risks in the Life Insurance Business

The impact of climate change on human life and health may affect insurance payments. It thus becomes important for life insurance companies to show how they understand the risks to human health caused by climate change, and how those findings are reflected in their business. In this way, life insurance companies are expected to demonstrate how they take account of climate change risks in their business strategies.

(Disclosure examples)

- Efforts to analyze the impact of short-term impacts on insurance payments due to factors such as changes in the frequency or scale of abnormal weather or natural disasters
- Efforts to identify risks such as increased morbidity and mortality due to medium- to long-term effects such as average temperature increases

Investment and loans focusing on the risks and opportunities of climate change

As institutional investors, life insurance companies need to view the transition to a low-carbon society as an opportunity for providing investments and loans, and to continuously monitor the status of the sustainable growth of its investment and loan recipients through engagement activities, etc. It thus becomes important to show how a company perceives the risks and opportunities of climate change in its investment and financing strategy, and how those perceptions are considered and reflected in its investment and financing. Ideally, a company should disclose items such as those shown in the following examples.

(Disclosure examples)

- Examples of investments and loans to companies, technologies, and projects that contribute to low carbon emissions (Green Finance), as well as its cumulative investments and loans, etc.
- Items to be emphasized in making decisions on investments and loans, points of view, etc.
- Engagement activities for investment and loan recipients (implementation of climate change-related dialogue)

Climate-related risk management process

As long-term institutional investors, it is important for life insurance companies to indicate how the portfolios are positioned with respect to transition risks and physical risks, and how they are managed. In other words, it is important to indicate how a company as an institutional investor evaluates and analyzes the information disclosed by investment and loan recipients. It thus becomes desirable to disclose specific matters such as those shown in the following examples.

(Disclosure examples)

- Status of preparation of investment and loan standards
- Analysis of climate change-related impacts on investments and loans (risks of loss in value of investments and loans associated with the transition to a low-carbon society, along with the responses to such risks)

[References]

For more on how life insurers are responding to climate change, see The Life Insurance Association of Japan, 2019, "Climate Change Starter's Guide: Impacts and Key Considerations for the Life Insurance Industry"

(downloadable from: [https://www.seiho.or.jp/activity/sdgs/climate/pdf/handbook\(en\).pdf](https://www.seiho.or.jp/activity/sdgs/climate/pdf/handbook(en).pdf))

(9) Non-life insurance

The TCFD Recommendations describe risks and opportunities in the insurance sector, as shown below. This section provides a supplemental guidance focusing on non-life insurance companies.

Description of insurance companies in the TCFD Recommendations

2. Insurance companies⁵³

For insurance companies, climate-related risks and opportunities constitute a key topic affecting the industry's core business (e.g., weather-related risk transfer business). The scientific consensus is that a continued rise in average global temperatures will have a significant effect on weather-related natural catastrophes and will account for an increasingly large share of natural catastrophe losses.⁵⁴

Users of climate-related financial disclosures are specifically interested in how insurance companies are evaluating and managing climate-related risks and opportunities in their underwriting and investment activities. Such disclosure will support users in understanding how insurance companies are incorporating climate-related risks into their strategy, risk management, underwriting processes, and investment decisions. This guidance applies to the liability (underwriting) side of insurance activities. For insurance companies' investment activities, refer to the supplemental guidance for asset owners.

Original footnote 53: Insurance companies include both insurers and re-insurers.

Original footnote 54: Intergovernmental Panel on Climate Change, Fifth Assessment Report (AR5), Cambridge University Press, 2014.

Source: TCFD, 2021, Annex: Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures, p. 31.

As noted in the TCFD Recommendations, the continuing rise in the global average temperature is said to have a significant impact on large-scale natural disasters. In Japan, the recent increases in heat waves and torrential rains, as well as the frequent occurrence of typhoons and other natural disasters, have raised concerns about the frequency of further large-scale natural disasters due to climate change.

The insurance to compensate for damage caused by natural disasters is a social infrastructure that plays a part in climate change countermeasures. The non-life insurance sector provides compensation to reduce the economic burden on companies and individuals that suffer damage, and is expected to continue playing that important social role. At the same time, the growing severity of natural disasters has increased concerns about the impacts of

climate change on the sustainability of the non-life insurance sector.

Climate-related risks include not only physical risks, such as increased natural disasters due to climate change, but also transition risks that affect businesses via the environmental changes brought by the transition to a decarbonized society.

For the stable provision of insurance, the non-life insurance sector has implemented comprehensive risk management (ERM, etc.) to appropriately manage its own risks, including measures against large-scale disasters. Based on the TCFD Recommendations, it is important to show how non-life insurance companies including their management, view, manage, and respond to these climate-related risks.

The non-life insurance sector also provides various services to support disaster prevention and mitigation, along with insurance products (products for Green Infrastructure, etc.) that contribute to climate change responses. These measures are taken to increase society's resilience to climate change and drive partner companies' innovation toward a decarbonized society, and are focused on areas where the non-life insurance sector can actively contribute. A company can effectively demonstrate the contribution of the non-life insurance sector to climate change responses by explaining how such measures are addressed.

Based on these considerations, the following disclosures may be considered.

Potential impacts of climate change (risk identification and assessment)

The following examples show disclosures that are expected, under the TCFD Recommendations, to indicate the climate-related physical risks and transition risks that may affect the insurance business, related services, and financial conditions in the future, as well as how the impacts are perceived. If quantitative disclosure is difficult, the information may be disclosed in a qualitative form.

(Disclosure examples)

- Impacts under the assumption that the frequency and magnitude of natural disasters changed (increased insurance claim payments, impact on underwriting profit, etc.)
- Impact of environmental changes accompanying the transition to a decarbonized society (impact on insurance premiums from the changes in the industrial structure resulting from strengthened laws and regulations and the development of new technologies)

Management of strategies and risks related to climate change

Based on the risks identified above, it is recommended to indicate the strategies and policies in place and the internal systems established to address climate-related issues and manage risks.

There may be ways to develop strategies and policies specific to climate-related issues, as

well as to include climate-related elements in strategies and policies for integrated risk management. Each company may explain its own strategies and policies based on its situation.

In addition, given that the TCFD Recommendations encourage companies to explain their responses to climate-related issues, including the roles of their boards of directors and managements, and to indicate their approaches to managing climate-related risk, it is a good way to indicate how climate change is integrated, in the case where climate change is included in integrated risk management, as well as the internal review system including the structure of the board of directors and committees and the role of management. In addition, efforts such as stress testing and scenario analysis conducted as part of climate-related risk management, and utilization of reinsurance may be presented.

(Disclosure examples)

- Strategies and policies on climate-related issues (indicate if they are implemented as part of an integrated risk management system)
- Internal review system (structure of the board of directors / committees, roles of the management, etc.)
- Climate risk management Initiatives (initiatives in integrated risk management, etc.)
- Stress testing / scenario analysis as part of climate-related risk management, use of reinsurance, etc.

Enhancing risk management and reducing risks

As risks related to climate change are changing, methods and analysis for risk assessment may be improved through in-house research and studies, and through participation in external initiatives. Efforts such as these can increase a company's resilience to climate change by enhancing risk management and risk reduction.

Non-life insurance companies have also traditionally provided risk consulting to customers through insurance contracts, carried out activities to raise stakeholder and community awareness of disaster prevention and mitigation, and engaged in various research activities in cooperation with external organizations. By disclosing efforts that help to improve the resilience of society as a whole to climate change, companies can effectively demonstrate their contributions to society.

(Disclosure examples)

- Initiatives to enhance risk assessment and stress testing / scenario analysis related to climate change (research projects and participation in international initiatives, etc.)
- Disaster prevention and mitigation initiatives (research projects and enlightenment activities, etc.)

Opportunities brought by climate change

The TCFD Recommendations call for disclosure of information not only on the risks caused by climate change, but also on the opportunities brought by climate change. Climate change may change the needs of customers for insurance, other products, and insurance-related services. Responding to these new needs also represents a new business opportunity for non-life insurance companies.

Meanwhile, new technologies with lower environmental impact are emerging toward the transition to a low-carbon society, and their emergence generates a demand for new products and services for their adoption. Furthermore, the compensation provided for new technologies is expected to make it easier for business partners to develop and promote such technologies. Compensation will thus help to spread and promote new technologies toward the transition to a low-carbon society, and will also encourage innovation by business partners.

If a company has taken measures to provide products and services that respond to these new risks and technologies, or has developed completely new products and services, or revised its existing products and services, in response to changes in the environment and customer needs, it may also present such measures in its disclosure.

(Disclosure examples)

- Provision of new products and services to respond to natural disaster risks
- Provision of products (insurance products for green infrastructure) that aim to promote climate change countermeasures
- Provision of various services to support disaster prevention and mitigation (provision of consulting services on climate-related risks to corporations, etc.)

(10) International Shipping

The TCFD Recommendations describe climate-related risks and opportunities for the Transportation group, including the shipping industry, as shown below. This section provides supplemental guidance focusing on the international shipping industry.

Description of the Transportation group in the TCFD Recommendations

2. Transportation Group

The Transportation Group includes, but is not limited to, industries listed in Figure 10.

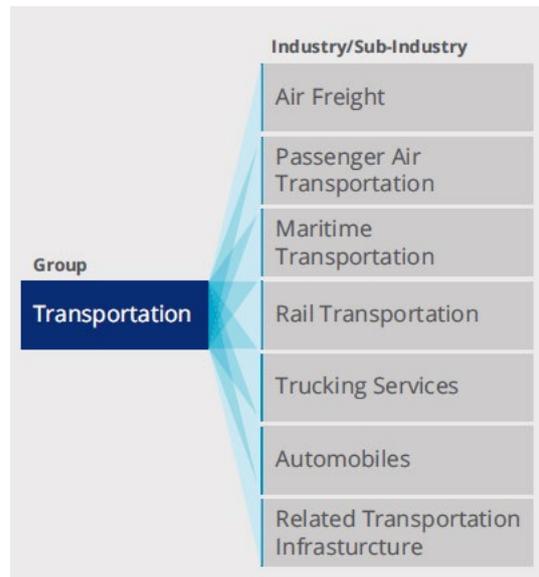
Transportation is critical to the economy and drives a significant portion of emissions and demand for energy through the production and, more important, the use phase. The industry is under increasing policy and regulatory pressure to achieve emission targets for the use phase. Increasing constraints on emissions fuel efficiency will continue to impact costs in this group, particularly around investments in innovation (new technologies and efficiencies).¹²⁶

The Transportation Group, therefore, will likely face financial challenges from two major drivers. First, policymakers are setting stricter targets for emissions and fuel efficiency from transportation carriers. Second, new technology around low-emission/fuel-efficient carriers (e.g., electric cars) is creating a shift in the competitive and investment landscape. New technological innovations and new market entrants can weaken companies' market position, resulting in lower revenues, higher costs, and narrower margins. The effects of these two drivers may be compounded by the length of product cycles for transportation products, such as cars and trucks, and especially for air and rail and marine equipment. As with the Energy Group, investments in long-lived assets (e.g., manufacturing facilities, airplanes, ships) and longer planning horizons are relevant factors that must be taken into account when considering the climate-related risks and opportunities.

Consequently, disclosures should focus on qualitative and quantitative assessments and potential impacts of the following:

- financial risks around current plant and equipment, such as potential early write-offs of equipment and R&D investments or early phasing out of current products due to policy constraints or shifts or the emergence of new technology;

Figure 10 Transportation



- investments in research and development of new technologies and potential shifts in demand for various types of transportation carriers; and
- opportunities to use new technologies to address lower-emissions standards and increased fuel-efficiency requirements, including transport vehicles (cars, ships, planes, rail) that run on a range of traditional and alternative fuels.

Transportation Group organizations should consider providing additional industry-specific metrics.¹²⁷ Examples of potential metrics include sales weighted average fleet fuel economy by region and weight/number of people transported, Energy Efficiency Design Index (EEDI) for new ships, life cycle reporting of GHG emissions of transportation products (air, ship, rail, truck, auto).

Original footnote 126: Moody's Global Credit Research, "Moody's: Auto sector faces rising credit risks due to carbon transition," September 20, 2016.

Original footnote 127: or more sector-specific information, see SASB, "Climate Risk Technical Bulletin," April 12, 2021 and WBCSD, "TCFD Auto Preparer Forum," May 26, 2021.

Source: TCFD, 2021, Annex: Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures, p.65

International shipping accounts for the majority of international trade in terms of weight and supports global logistics. While the CO₂ intensity per ton-kilometer (specific CO₂ emissions) of international shipping is lower than most transport modes, CO₂ emissions from international shipping account for about 2% of global CO₂ emissions, and emissions reductions are being required. The International Maritime Organization (IMO), an United Nations specialized agency for maritime affairs, is promoting GHG reduction in international shipping.

One of the characteristics of the shipping industry is that ships generally have a long service life of about 20 to 30 years, and it takes several years from ordering to completion. For this reason, it is important to consider CO₂ reduction measures from a medium- to long-term perspective. Other notable characteristics are a) vessels are basically custom-made, making it difficult to retrofit standard equipment, and b) the shipping industry needs to be cautious about introducing new technologies since breakdowns on the high seas must be avoided at all costs.

Shipping companies use vessels chartered by ship owners, along with vessels owned by the companies themselves. Therefore, it is necessary for the entire charter chain (owners and users) to make efforts when installing energy-saving equipment that requires additional costs.

Initiatives for medium- to long-term transition

Two major changes are expected in international shipping along the decarbonization

pathway: change in ship fuel and change in the transported freight. Regarding the former, in the long term, it is necessary to implement vessels which consume fuels that are not currently used. In addition to the introduction of LNG-fueled ships, which is considered as a medium-term measure, many options such as hydrogen, ammonia are under discussion, and shipping companies are required to adapt flexibly. LNG-fueled vessels are also effective as a measure against air pollution, and there are some pioneering cases of introducing LNG-fueled ships by using transition finance.¹⁰

In addition, freight to be transported may change significantly due to changes in demand stemming from global reduction of fossil fuel consumption, increase of alternative fuels such as hydrogen and ammonia, transportation of CO₂ for CCS¹¹, and increase in renewable energy devices and rare metals. It is desirable that efforts to address such changing demands are disclosed.

(Disclosure examples)

- Efforts to utilize ships applying new technologies such as energy efficient vessels and alternative fuel vessels in merchant fleets.
- Efforts to cooperate with shipbuilders and shipowners on the conversion to ships applying new technologies such as energy efficient vessels and alternative fuel vessels.
- Changes in freight movement (i.e., changes in freight and their countries of origin) along the pathway to carbon neutrality.
- How transition risk are analyzed and reflected in governance.

Initiatives to reduce short-term GHG emissions

In order to reduce GHGs, an international treaty (MARPOL Convention) provides for the improvement of energy intensity (EEDI¹²) for new ships (applying to ships above a certain size, to be reduced by 30% from the baseline from 2025 with more stringent targets for container ships). In addition to reducing GHG emissions, ships are also required to significantly reduce the sulfur content of their fuels from 2020. For this reason, introduction of LNG-fueled vessels is being promoted as described above.

As a short-term measure in the GHG emission reduction strategy, two systems of regulation will be imposed: EEXI regulation¹³ for technical regulation and CII rating¹⁴ for operational

¹⁰ A financial instrument designed to support GHG reduction efforts in accordance with a long-term strategy for decarbonization. Including funding to achieve steady low carbon emissions even when decarbonization technologies are not technically and economically feasible at present.

¹¹ Carbon dioxide capture and storage. CO₂ capture and storage technology, in which CO₂ emitted from power plants and chemical plants is separated from other gases, collected, stored and injected deep into the earth.

¹² Energy Efficiency Design Index (EEDI) is an index and requirement to keep CO₂ emissions related to fuel efficiency of new vessels below a certain level.

¹³ Energy Efficiency Existing Ship Index (EEXI) regulation requires to keep an index similar to EEDI below a certain level with an objective to impose equivalent fuel efficiency standard for existing ships as newly-built ships.

¹⁴ Carbon Intensity Indicator (CII) rating is a system that evaluates annual average fuel economy performance on a 5-point scale of A-E.

performance (Adopted in June 2021, effective from 2023). In particular, the EEXI regulation will establish a standard on CO₂ emission factor, and imposes restrictions on engine power output when the index is not attained. The CII rating on the other hand will have a five-level rating based on actual performance of fuel consumption.

In addition, one method of GHG emissions reduction which is characteristic of shipping is slow steaming. Slow steaming without facility renewal is effective, but slow steaming involving changing the ship shape to suit reduced speed as well as retrofitting of engines, etc. are being carried out. Cooperation with shippers and ports is important in implementing slow steaming.

Customers are requesting that CO₂ emissions be reduced throughout the supply chain, and these measures will reduce the transition risk to the shipping industry. In addition, reducing the CO₂ emissions and intensity of commercial vessels operated by the company can reduce business risks and create opportunities.

(Disclosure examples)

- CO₂ emission intensity of vessels used by the company (applicable standards and performance. AER¹⁵, EEOI¹⁶, CII ratings, etc.)
- Improvements in operation (cooperation with shippers and ports to realize these goals) such as slow steaming, reduced offshore waiting, weather routing, and improved maintenance, and technical improvements such as retrofitting energy-saving equipment.

Initiatives to Reduce Physical Risk

The industry may be impacted by both acute and chronic risk such as the increase in frequency and severity of natural disasters, changes in ocean currents, and the effects of reduced sea ice. Impacts of ports and docks due to sea level rise are also expected.

(Disclosure examples)

- Establishment of guidelines and efforts for physical risk reduction such as hull strengthening.
- A system to identify physical risks and reflect them in governance.

Business Opportunities

Social change towards decarbonization also provides a new business opportunity for the shipping industry. If shipping companies adopts the use vessels using new technologies such as high-efficiency vessels, alternative fuel vessels, owns vessels with lower CO₂ emissions than

¹⁵ Annual Efficiency Ratio (AER) is an index of operational carbon intensity calculated using the designed deadweight of the vessel.

¹⁶ Energy Efficiency Operational Indicator (EEOI) is the operational CO₂ emissions factor, based on amount of freight transported.

conventional vessels, or if their fleet actively take measures to improve operational efficiency such as slow steaming, such measures will lead to a reduction in CO₂ emissions through the value chain of freight, and disclosure of such measures may be competitively advantageous. In order to transport hydrogen and ammonia, specialized ships will be needed. In addition, demand for copper and rare metals is expected to increase as a result of electrification. It is important to accurately grasp these new changes in demand and freight movements, and to demonstrate flexibility in responding to them.

(Disclosure examples)

- Policies and outcomes for handling new freight movements such as transport of hydrogen, ammonia, and CO₂ toward carbon neutrality
- Initiatives to introduce high-efficiency vessels, alternative fuel vessels, and other vessels that use new technologies, and to work on novel method of navigation
- Organizational structure to identify risks and opportunities related to the above and reflect them in corporate governance.