

Environment

In recent years, companies have been asked to contribute to the world's efforts in transitioning into a circular use of resources and a decarbonized society in order to address serious environmental issues in different parts of the world. In particular, with climate change, companies are facing not only closer scrutiny but also stronger demand for information disclosure. It has become a major issue for companies to disclose how they grasp and manage risks and opportunities posed by climate change. Murata has set reinforcing responses to climate change and sustainable use of resources as priority issues for the Company to manage and is continuously working towards being able to respond accurately to society's wide-ranging requirements.

TCFD measures

Murata endorsed recommendations by the TCFD^{*2} established by the FSB^{*1}. We will analyze risks and opportunities brought on by climate change and work to disclose information related to governance and strategies in accordance with the TCFD recommendations.



*1: Financial Stability Board
*2: Task Force on Climate-related Financial Disclosures

The followings outlined Murata's efforts in the four thematic areas specified in the TCFD recommendations, namely, governance, strategy, risk management, and metrics and targets.

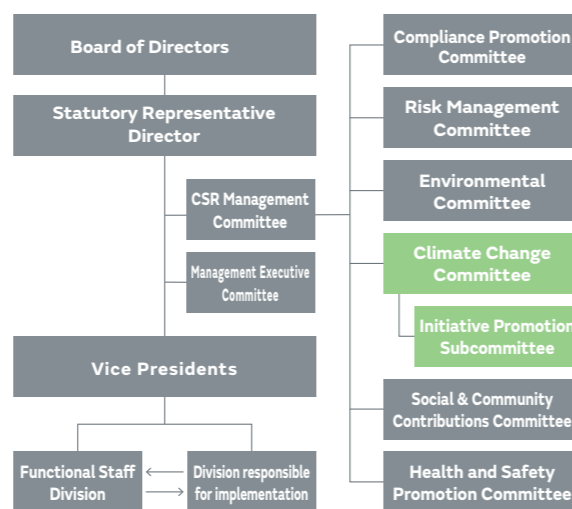
Governance

Murata has set up a Climate Change Committee, which meets at least once every six months, to bolster measures for managing risks brought on by climate change across the entire Group. The Climate Change Committee reports to the CSR Management Committee, which is chaired by the President and in turn reports to the Board of Directors. A Vice President in charge and a Director serve as chairperson and vice chairperson, respectively, of the Climate Change Committee, which comprises representatives from related divisions, including production plants, business divisions, and development divisions.

The Climate Change Committee oversees Murata's greenhouse gas ("GHG"^{*3}) emissions and develops systems, including relaxation criteria for capital expenditure on energy conservation, to ensure energy conservation measures are taken throughout the company and to promote the introduction of renewable energy. The Climate Change Committee plans to step up efforts in reducing the environmental impact of Murata's products, particularly in the design phase of production processes.

In 2019, Murata launched an Initiative Promotion Subcommittee, under the Climate Change Committee, comprising managers of relevant divisions, with an aim to reinforce responses to climate change and better serve societal needs.

*3: Greenhouse gas: gases that cause the greenhouse effect.



Strategy

We expect demand for Murata's products to continue growing as more products are computerized; communications equipment acquires more sophisticated functionality and higher speed; and vehicles acquire self-driving functions and are electrified. At the same time, the world faces grave challenges, such as climate change, depletion of resources and increasing income gaps, as highlighted in the international framework of the United Nations' Sustainable Development Goals (SDGs). Murata has identified these issues as material to our business and as a starting point for us to contribute to resolving these societal issues through our business activities.

In assessing the potential impact of climate change on Murata's business, we classify opportunities and risks by type and timeframe, and analyze them under different scenarios.

- Abnormal weather phenomena, including typhoons and torrential rains, are among the physical risks that can affect our manufacturing plants and supply chain. For example, floods and blackouts can completely halt operation of key plants, while abnormal weather can cause disruption in the supply of materials. We will need to take additional measures as abnormal weather events increase amid climate change; however, this is where Murata's technology can be utilized. For example, Murata acquired a lithium-ion battery business in 2017 and subsequently developed all-in-one energy storage batteries and high voltage direct current (HVDC) storage battery units. We believe this new solution, which uses cutting-edge technology, will aid in enhancing resilience of plants affected by blackouts or power shortages.
- The risk of rising energy costs due to factors such as the introduction of carbon tax in regions where Murata operates is a potential transition risk that should be accounted for in financial planning and capital expenditure decisions. The Climate Change Committee is robustly promoting energy-conserving measures and the introduction of renewable energy. This includes efforts to ensure the introduction of energy-conserving measures across the company and a review of the criteria for investment decisions with impact on overall energy conservation. The Climate Change Committee is also discussing a plan to introduce an internal carbon pricing system.^{*4} We believe we can reduce transition risk by continuing these activities.

- We expect demand for Murata's compact and energy-efficient electronic components to increase over the medium- to long-term amid rising attention to climate change and the tightening of related regulations. The reduction of Murata products' carbon footprint is a key agenda for the Climate Change Committee and the Initiative Promotion Subcommittee.

- We conducted analysis under RCP 2.6^{*5} climate scenario to consider our climate change strategies. The analysis revealed that we would not be able to achieve the reduction goal through energy-conservation measures alone. We thus have been introducing solar power systems at plants and purchasing renewable energy-derived power and certificates. The amount of renewable energy we used in fiscal 2019 totaled about 35 million kWh.

In February 2020, Murata committed to setting emissions reduction targets in accordance with the latest standard by the SBT initiative^{*6}. Going forward, we aim to look into other climate scenarios and assess potential impact on our business and assets under these scenarios.

*4: Carbon pricing system: a measure to attribute prices to CO₂ emissions in a company to give monetary value to reduction in CO₂ emissions and promote reduction in CO₂ emissions by the company.

*5: Representative Concentration Pathways (RCP) 2.6: a scenario developed under the goal of limiting the future rise of atmospheric temperature below 2°C by 2100.

*6: Science Based Targets (SBT) initiative: a joint international initiative by CDP, an international non-governmental organization committed to environmental issues, including climate change, United Nations Global Compact (UNGC), World Resources Institute (WRI) and World Wide Fund (WWF). It certifies CO₂ emissions reduction targets set by businesses in line with scientifically sound reduction scenarios, in order to achieve the Paris climate agreement's goal of keeping a global temperature rise below 2°C above pre-industrial levels.

Risk management

Murata recognizes the importance of managing risks associated with climate change. We believe this requires working out appropriate strategies to identify latent risk factors in a timely manner and enhance the resilience of our businesses against risks that may materialize. When evaluating Murata's exposure to climate risks, we will:

- Classify risks into physical and transition types
- Consider time horizon in the short-, medium- and long-term
- Keep watch on regulatory changes in countries and regions where we have operations

In assessing potential impact of risks, we take into consideration both the possibility of being affected and potential degree of impact. The Climate Change Committee reports outcomes of the assessment to the CSR Management Committee and works with other committees, including the Board of Directors and the Risk Management Committee, as necessary.

Currently, we collect information on social developments that may lead to risks, such as moves to tighten regulations, at regular intervals through industry groups. Going forward, we plan to launch a program for exchanging views with stakeholders, to strengthen Murata's climate change strategies and information disclosure. We believe this new program will help us improve effective assessment of climate change-related risks and the planning of strategies against them.

Metrics and targets

At Murata, we estimate the amount of GHG emissions in accordance with the Greenhouse Gas Protocol, a globally used greenhouse gas calculation standards. We obtain certification on our data from an independent verification body to ensure their reliability.

Our total GHG emissions (Scope 1+2) was 1.47 million t-CO₂, down about 0.16 million t-CO₂ year on year, in fiscal 2019.

GHG emissions (thousand t-CO ₂ /year)	Periods		
	Fiscal 2017	Fiscal 2018	Fiscal 2019
Total emissions	1,400	1,632	1,472
Scope 1 ^{*1}	251	312	307
Scope 2 ^{*2}	1,149	1,320	1,165

Our GHG emissions had steadily increased in recent years as we increased production output to keep pace with business expansion as well as M&As and new business activities, but we were able to reverse the upward trend in fiscal 2019 through efforts such as energy conservation activities and introduction of renewable energy throughout the year. Through the activities of the Climate Change Committee, we aim to achieve our reduction target of keeping emissions to 1.40 million t-CO₂ in 2021.

*1: Scope 1: direct emissions of greenhouse gases from sources owned or managed by a business operator

*2: Scope 2: Indirect emissions of greenhouse gases associated with use of electricity, steam or heat.

Responses to climate change

Progress of Responses to climate change

Murata has identified the strengthening of climate change measures as material to how we operate our business and as a starting point for us to contribute to this important issue to the wider society. The measures we have taken included introducing unique criteria to assessing capital expenditure regarding energy conservation and actively making energy-conserving capital investment. Our efforts were well-received by external stakeholders, including our rating of the CDP^{*1} climate change survey, the acquisition of a Independent certification on our GHG emissions and active information disclosure. However, our GHG emissions rose sharply in recent years as we increased our production output to keep pace with business expansion. In order to reverse the upward trend and further reduce GHG emissions, we are discussing how to set GHG emissions reduction targets in accordance with the standards of the SBT initiative and adhere to the TCFD recommendations in disclosure of related information. These efforts are led by the Climate Change Committee, which will

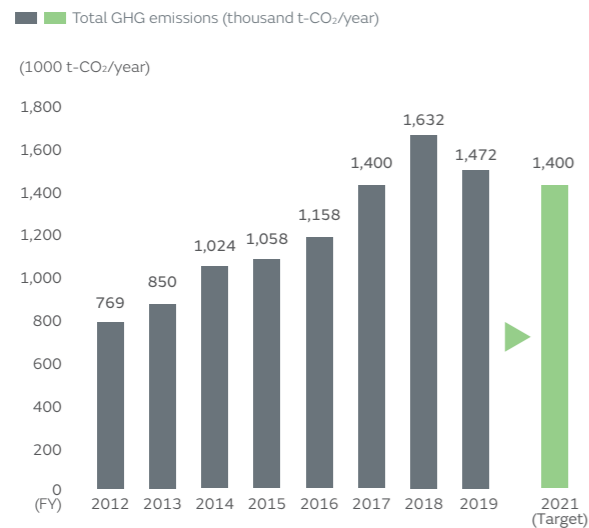
continue to augment our efforts on further reduction of GHG emissions.

We have also started efforts to optimize energy use in production by developing a new energy management system that combines proprietary sensing and IoT technologies, in addition to existing energy conservation efforts centered on capital expenditures.

In addition, we have joined the Japan Climate Leaders' Partnership (JCLP), a Japanese group actively committed to the issue of climate change, to leverage external expertise to accelerate our activities and to consider the possibility of launching a business that can contribute to global efforts to combat climate change in collaboration with other participating companies.

*1: Carbon Disclosure Project. An international nongovernmental organization (NGO) that surveys and evaluates the environmental initiatives of entities such as companies and cities and publishes the results.

Trend of total GHG emissions



Our GHG emissions had steadily increased in recent years as we increased production output to keep pace with business expansion and due to M&As and new business activities, but we were able to reverse the upward trend in fiscal 2019 through efforts such as energy-conservation activities and introduction of renewable energy throughout the year. Murata's total GHG emissions was 1.47 million t-CO₂ in fiscal 2019, down about 0.16 million t-CO₂ year on year.

We will consider a variety of measures to help ensure that we achieve the target of keeping emissions to 1.4 million t-CO₂ in 2021. These measures include not just energy conservation but also the use of renewable energy and carbon pricing systems for the entire company, including new plants acquired through M&A.

ACTIVITY TOPICS

Aiming to correctly serve the needs of society

The breadth of what businesses are required to do for climate change has expanded. Murata set up the Initiative Promotion Subcommittee, a body under the Climate Change Committee, to respond to these requirements and drive our competitive edge in the industry. The Subcommittee's role is to collect information on social trends, discuss and implement measures, as well as strengthen collaboration with

relevant departments. It regularly reports to the Climate Change Committee.

Recently, the Subcommittee has been working with relevant departments to set targets in accordance with the criteria of the SBT initiative, acquire certification to ascertain the reliability of our emissions data, and enhance information disclosure in accordance with the TCFD framework.

Independent certification of climate change measures^{*2}

Murata believes that managing GHG emissions using the right data and disclosing highly reliable data is the first step towards tackling climate change. We obtained Independent certification on our GHG emissions every year and certification on the amount of our renewable energy-derived power as Murata is actively introducing solar power.

*2: For further information on Independent certification, visit https://corporate.murata.com/en-global/csr/environment_murata/climate_change

Scope	Type of greenhouse gas	Emissions [ton-CO ₂] (fiscal 2019)
Scope1	CO ₂	171,718
	CH ₄	0
	N ₂ O	0
	HFCs	1,314
	PFCs	133,907
	SF ₆	0
	Other	0
Scope2	CO ₂ (Due to power)	1,165,203

Scope	Category	Description	Actual emissions (t-CO ₂) (fiscal 2019)
Scope3	Category 1	Purchased goods and services	3,262,165
	Category 2	Capital goods	692,734
	Category 3	Fuel- and energy-related activities (not included in Scope 1 or 2)	178,261
	Category 4	Transportation and distribution (upstream)	173,679
	Category 5	Waste generated in operations	20,397
	Category 6	Business travel	9,634
	Category 7	Employee commuting	33,336
	Category 8	Leased assets (upstream)	Outside scope
	Category 9	Transportation and distribution (downstream)	
	Category 10	Processing of sold products	
	Category 11	Use of sold products	316
	Category 12	End-of-life treatment of sold products	
	Category 13	Leased assets (downstream)	
	Category 14	Franchises	Outside scope
	Category 15	Investments	
		Other	

Introduction of renewable energy

At Murata, we are working to expand the use of renewable energy for power consumed in our business operations as part of our efforts to reinforce climate change measures. As a global company, we have actively introduced solar power in Japan, China and other locations.

In fiscal 2019, consumption of power derived from renewable energy, including electricity from solar power equipment, totaled about 35 million kWh, contributing to the avoidance of about 20,000 t-CO₂. We will continue to evaluate the feasibility of introducing renewable energy at both Japan and other countries operations, to help reduce environmental load.

As an example of our efforts to introduce renewable energy in fiscal 2019, we built one of Japan's largest parking lot-style mega solar systems on a company parking lot with a capacity for 1,200 vehicles owned by Okayama Murata Manufacturing Co., Ltd. (located in Setouchi City, Okayama Prefecture); we started generating power in March 2020. This system increases energy generation efficiency per unit of installed area of solar panels by using double-sided generation panels instead of the more common single-sided panels, enabling light to

be absorbed on the back surface in addition to direct sunlight hitting the front. It, therefore, can generate power from light reflected from parked cars and the ground surface as well. We estimate that energy generated by this system is equivalent to average annual power consumption of 600 households, reducing 1,698 tons of CO₂ emissions in a year.

In 2021, we plan to add double-sided solar panels to a parking lot area for 500-car parking lot.



Parking lot-style mega solar system at Okayama Murata Manufacturing Co., Ltd.

Use of Sustainable Resources

Resource recycling initiatives

In recent years, there has been a call for efforts on Use of Sustainable Resources regarding plastics in response to tighter control on import of waste in China and other Asian countries and environmental issues, such as marine contamination. In Japan, especially, the amount of waste that is buried in the ground, instead of being recycled, has increased

Waste management

Murata's waste management processes are based on "compliance," "control of the production of waste," and "zero emissions" as fundamental principles.

To help achieve the medium-term target for fiscal 2019 to 2021 of improving the amount of waste per production output by 7% from the fiscal 2016-2018 average, we worked in fiscal 2019 toward a single-year target of keeping the amount of waste no larger than the basic unit value in the previous fiscal year. The amount of waste increased in fiscal 2016 to fiscal 2018 due mainly to increased production output, but we were able to significantly achieve the single-year target of keeping the amount no larger than the basic unit value in the previous fiscal year, as a result of reduction measures taken in fiscal 2019, including the introduction of an in-house waste liquid processing facility and concentrating of plating waste liquid.

We are also working to put resources to effective use by, for example, reusing or recycling

Water resource management

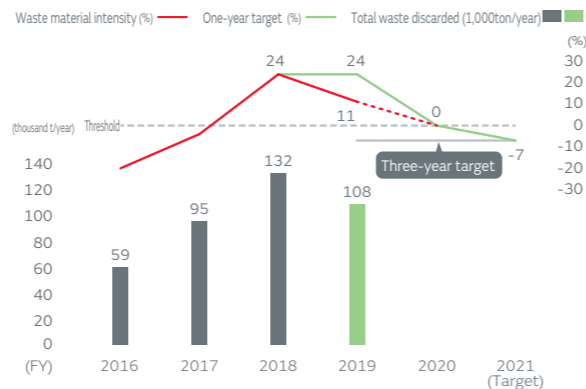
Murata is promoting effective use of water resources used in business activity. We take measures for water risk that can affect our corporate activity.

To help achieve the medium-term target for fiscal 2019 to fiscal 2021 of reducing water usage per production output by 6% from the fiscal 2016fiscal 2018 average in fiscal 2021, we worked toward the target of improving the usage by 5% from the fiscal 2016fiscal 2018 average basic unit in fiscal 2019, but the result was a 2% increase. This is attributed to a delay in the start of operation of equipment for processing wastewater to be reused in production processes, which was planned to be introduced at Toyama Murata Manufacturing Co., Ltd. in fiscal 2019. Another factor of deteriorated basic unit was that infrastructure-related water, such as cooling water used in cooling towers, represented about half the total water usage while production output dropped. This was due to deterioration in the basic unit as a result of a smaller denominator in relative terms, as water consumption did not decrease because conditions such as airconditioning, one of production conditions, remained constant whereas the production output, which is the denominator used in calculating a basic unit, decreased. In

sharply due to China's tighter control on import of waste. Under such circumstances, Murata is studying ways to recycle waste into materials with a higher quality than typical levels by regularly exchanging information with materials makers in order to maintain "zero emissions."

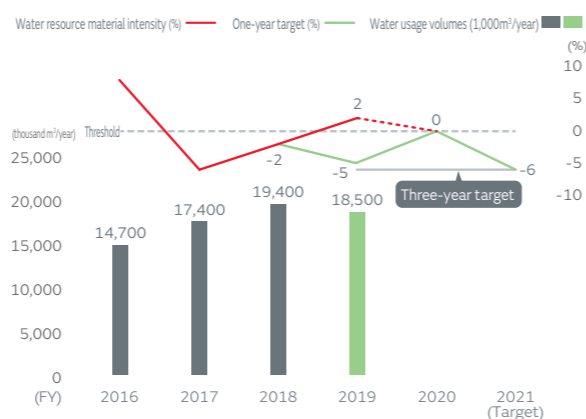
some packaging materials. We expect to be able to achieve the medium-term goal for fiscal 2019 to fiscal 2021, driven by the introduction of another in-house waste liquid processing facility and reduction in defect rates.

Changes in Total Waste Discarded and Effective Production Ratio



particular, an increase in infrastructure demand for air-conditioning use, etc. in excess of contribution to production increases, which was due partly to construction of new buildings at plants in fiscal 2019, also led to a deteriorated basic unit, as described above. We plan to achieve the medium-term target for fiscal 2019 to fiscal 2021 by reviewing measures to reduce water usage at plants in fiscal 2020.

Trend for water use and comparative unit ratio of real production



Pollution Prevention and Chemical Substance Management

Efforts to prevent pollution

In fiscal 2019, we set "Pollution Prevention" as a key issue (materiality) in relation to issues facing society.

Murata recognizes contamination by chemical substances as a material environmental risk, and has been working to prevent it. In particular, regarding equipment related to storage or intra-plant transportation of liquid chemical substances, such as fuels, organic solvents, acids, alkaline fresh liquids and waste liquids, we are implementing measures by setting four voluntary standards, to prevent accidents.

There were no major environmental accidents or violation of environmental laws and regulations in fiscal 2019.

Voluntary standards for prevention of environmental accidents and pollution (equipment-related)

- **Prohibition of underground storage tanks**
Storage tanks for liquid chemical substances and raw water tanks for wastewater processing must be installed above ground, in principle. If there is no choice but to install a tank underground, it must be double-layered.
- **Permeation barrier coatings**
Use anti-seepage coating or place stainless steel pans in places where liquid chemical substances are handled.
- **Prohibition of underground piping**
Piping for carrying liquid chemical substances and wastewater from production processes must be set up aerial.
- **Emergency containment structures**
Operational areas in which new liquids are received from tanker trucks, etc. or waste liquids are discharged will be provided with a structure that allows immediate containment of any leakage outside the area if an accident occurs.

Chemical Substance Management

In its pursuit of sustainable society, Murata strives to provide products that have low impacts on the global environment.

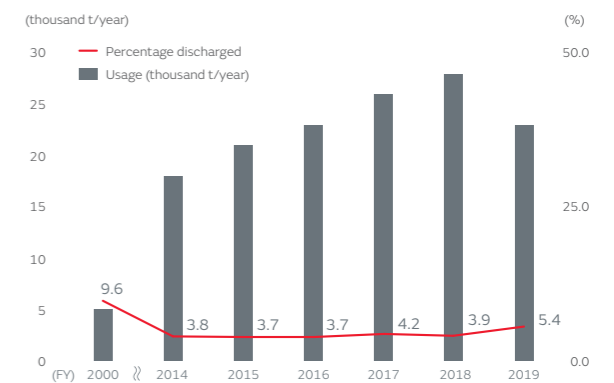
In addition to efforts to comply with laws and regulations such as the RoHS Directive and the REACH regulations, we have established voluntary standards that take account of global trends regarding environmentally hazardous substances and customer requests, and actively work to comply with reduction requirements and bans on such substances in our products under the management structure as illustrated in the right figure. Furthermore, Murata has been taking proactive actions to address any revisions in laws related to environmentally hazardous substances.

The current RoHS restricts use of ten types of chemical substances in electronic or electric equipment sold in European Union countries. Of these, restrictions on the use of four specified types of phthalic esters were added in the July 22, 2019 amendment. In July 2017, Murata banned the use of these phthalic esters in new products to be developed, in advance of the enforcement of the

Control of emissions of air polluting substances

We take voluntary measures to control discharge of volatile organic compounds (VOCs), an air pollutant. Worksites that handle large amounts of VOCs have regenerative thermal oxidizers (RTOs) installed to treat exhaust gas. Usage of VOCs has increased as our production output grew, but the voluntary measure has eliminated 95% our usage.

Trends in volume of VOC use and rate of discharge into the atmosphere (Japan)



Soil and groundwater contamination surveys and decontamination

We investigate contamination of soil and underground water found to have been caused by our past business activity as early as possible. We use the latest purification technology and take active measures, aiming to complete purification processes as early as possible.

amended RoHS Directive. To prevent contamination through contact, we also included packing materials and tools that come into contact with products in production or logistics processes in the scope of the control.

Accordingly, Murata places top priority on the safety of society, local communities and customers in reducing environmentally hazardous substances.

Management of environmentally hazardous substances at Murata

