

## TCFD

Climate change is a global threat to the life of humanity and the health of the planet. It will also affect Murata's business, our customers and our supply chain. The scientific assessment from the United Nations' Intergovernmental Panel on Climate Change (IPCC) released in 2021 called for urgent deep decarbonization action in this decade in order to avoid the worst climate impacts and maintain a liveable planet.

We believe businesses have an important role to play to fight climate change. We recognize that climate change presents both risks of increased

cost and disruption for our business as well as new opportunities for Murata to create value while meeting the needs of society. Therefore, in the next decade, we will aim to achieve our objective to "innovate to create a continuous cycle of social and economic value and contribute to the enrichment of society" through innovative technologies and solutions. The following outlines Murata's efforts in the four thematic areas specified in the TCFD recommendations, namely, governance, strategy, risk management, and metrics and targets.

## GOVERNANCE

Murata is strengthening its governance in the fight against climate change. The Board has overall accountability for the management of all risks and opportunities, including climate change. In addition, our President and an Executive Vice President, who are Executive Directors of the Board, chair Murata's CSR Management Committee and Climate Change Committee respectively and are ultimately accountable for the oversight of our climate change agenda.

The Climate Change Committee is responsible for governing Murata's overall strategies in response to climate change and monitoring the delivery of climate-related targets across the Murata group of businesses. The Committee, composed of people responsible for the Manufacturing Department, Research and Development Department, Environment Department, and other business units, meets at least twice a year, with additional meetings on selected topics.

The Committee examined initiatives to reduce GHG emissions at manufacturing sites, the development of light, thin, short, small, and high-efficiency products to support the achievement of CO<sub>2</sub> reduction goals by customers, the establishment of GHG reduction targets to acquire SBT certification, the introduction of renewable energy, etc.

### Subordinate Organizations of the Climate Change Committee

The Climate Initiatives Subcommittee, a subordinate organization of the Committee, is chaired by the General Manager of Murata Group's environment department and consists of senior managers of relevant departments. This subcommittee deliberates the implementation of climate-related strategies and offering a platform for collaboration and best practice sharing across the Company.

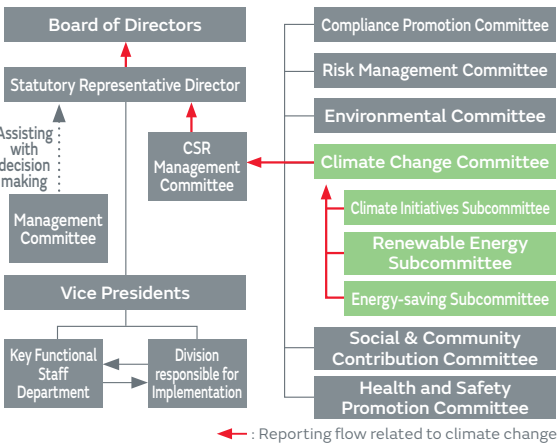
In response to its membership in RE100, a global initiative that aims to achieve a 100% introduction ratio of renewable electricity by 2050, Murata has established a Renewable Energy Subcommittee consisting of the Battery Department, Business Development Department, Environment Department, and other relevant departments, to strengthen company-wide efforts to promote the introduction of renewable energy, while also utilizing Murata's technologies. In addition, an Energy-saving

Subcommittee, consisting of members from each manufacturing department and plant, was established as a subordinate organization of the Committee. We will strengthen company-wide efforts to further develop energy-saving activities. First of all, we believe that it is important to visualize energy consumption, and will examine the carbon footprint (CFP) calculation for each product through this Subcommittee. We will then investigate further possibility of CO<sub>2</sub> reduction in our production processes, in order to link this to the measures to be taken.

### Responses in terms of business management system

In order to increase the corporate value from a long-term perspective by strengthening governance of various issues related to climate change, starting in fiscal 2021 we introduced an internal carbon pricing system. The system applies financial values to CO<sub>2</sub> reduction volumes and incorporates those values into an investment index. Specifically, we have introduced and are utilizing a shadow pricing system that encourages investments to reduce CO<sub>2</sub> emissions, and the associated business costs and risks, from a long-term perspective.

Moreover, from fiscal 2022 we have introduced and are utilizing a sustainability investment promotion system that reduces the costs related to investments aimed at solving social issues in management accounting.



## STRATEGY

The risks and opportunities brought by climate change are expected to have a significant impact on the sustainable development of our business in the medium and long term. To anticipate the potential impact and appropriately incorporate the potential effects in our strategic planning processes, we analyzed how Murata's key assets and markets would be affected.

### Our approach to climate scenario analysis





Two scenarios, with different extent of physical risks and strength of transition measures – one with high level of warming and another with strong policy interventions to limit temperature rise – were selected to assess the resilience of our assets, business strategies and climate change countermeasures. IPCC Representative Concentration Pathway (RCP)\*1 8.5 and 2.6 are used in the analysis.

We focused the assessment on the material

physical impacts of climate change to Murata's business in the year 2030 and 2050, and the risks and opportunities brought forth by evolving policy and regulatory changes as the world aspires to transition to a decarbonized society.

\*1 Representative Concentration Pathways: Greenhouse gas concentration trajectory scenarios

### List of each RCP scenario

Acronym	Scenario (forecast) type
 <b>RCP 2.6</b>	Lowest stabilization scenario (radiative forcing of 2.6 W/m² at the end of the century)Lowest emissions scenario developed with the goal of limiting future temperature increase to 2°C or less
 <b>RCP 4.5</b>	Medium stabilization scenario (radiative forcing of 4.5 W/m² at the end of the century)
 <b>RCP 6.0</b>	High stabilization scenario (radiative forcing of 6.0 W/m² at the end of the century)
 <b>RCP 8.5</b>	High reference scenario (radiative forcing of 8.5 W/m² at the end of the century)Scenario corresponding to maximum greenhouse gas emissions in 2100

Based on the Japan Center for Climate Change Actions (JCCCA) IPCC Fifth Assessment Report special page  
(<https://www.jccca.org/ipcc/ar5/rcp.html>)

### Our climate scenario analysis prerequisites (key assumption and variables)

<b>Approach</b> A mix of quantitative and qualitative methods: <ul style="list-style-type: none"><li>Quantitative modelling to assess potential direct physical climate impact on Murata's assets</li><li>Qualitative approach to transition impact analysis</li></ul>	<b>Scenarios</b> IPCC RCP 2.6 (2°C scenario) and RCP 8.5 (4°C scenario) were used as base scenarios. <ul style="list-style-type: none"><li>The physical impact of 10 climate hazards*2 to the selected portfolio of assets</li><li>The transition impacts from policy intervention in Murata's top markets</li></ul>	<b>Scope</b> <ul style="list-style-type: none"><li>The assessment covers: Direct physical impacts on 20 major manufacturing sites and business facilities</li><li>Transition impacts in Murata's top operating locations and markets (based on net sales)</li></ul>
<b>Timing</b> Given the nature of global warming effect and typical process of public policy formulation, the following time horizons were adopted: <ul style="list-style-type: none"><li>Medium-term: 2030</li><li>Long-term: 2050</li></ul>	<b>Climate models and data sets</b> <ul style="list-style-type: none"><li>Referenced an ensemble of peer-reviewed climate models recognized by IPCC and leading climate bodies, such as CMIP5 (Fifth Coupled Model Intercomparison Project)*3, GFS weather forecast model, GPM flood and precipitation data, etc.</li><li>Use of AI technology to enhance the predictive power and quality of analysis</li></ul>	<b>Physical risks</b> Examined the impact of 10 climate hazards to the selected portfolio of assets. This research focused on the direct physical impact on the assets, and we are planning to analyze the impact on the whole value chain, such as suppliers and product transportation

### Value-at-risk (VaR)

Reflects the estimated financial loss that can incur to the selected portfolio or asset in a year, with a certain probability, if all the estimated hazard events occur under the considered scenarios and period. VaR is estimated based on a macro view of the following two aspects.

- Loss from physical damage to an asset: Evaluated with reference to historical events, asset types and cost of construction for the specific locations
- Loss from business interruption: Evaluated based on macro-economic factors such as country GDP, population, land use (e.g. farming, commercial, residential, manufacturing, etc.), urbanization.

### Policy

Referenced relevant climate-related policy intentions and targets announced in Murata's top operating locations and markets, including national carbon reduction targets, Nationally Determined Contributions (NDCs) for Paris Agreement, etc. Policies are assumed to be more stringent in the 2°C scenario and less in the 4°C scenario.

\*2 Storm surge, rainfall floods, river floods, landslides, typhoons, drought, precipitation, sea-level rise, snowmelt and extreme heat

\*3 Coupled Model Intercomparison Project (CMIP5) is a collaborative framework led by World Climate Research Programme (WCRP) with the aim to foster climate model improvements and support national and international assessments of climate change impact. For more information, please see here. [www.wcrp-climate.org/wgcm-cmip5](http://www.wcrp-climate.org/wgcm-cmip5)

Understanding the plausible impacts

The business implications of these climate scenarios were assessed without considering any actions that Murata might take to mitigate or adapt to the evolving circumstances. We outlined the material impacts of these scenarios and included a high-level discussion of how climate change is positioned in our business strategy. The figures for “4°C scenario” and “2°C scenario” in the “IMPACTS TO MURATA’S BUSINESS” are currently being analyzed and reviewed based on Murata-specific information.

Physical risks		Assessed Murata's top 20 manufacturing sites and business facilities		Assets: Japan, China and South-East Asia		Transition Impact		Assessed major markets (based on net sales) and operating locations		Markets: Japan, China, the USA, European Union, South East Asia and Korea.																						
IMPACTS TO MURATA'S BUSINESS	4°C scenario			2°C scenario			Transition risks			Transition opportunities																						
	<ul style="list-style-type: none"><li>Over 80% increase in the risk of one or a group of these assets being affected by extreme climate hazards in 2050 from that in 2020</li><li>Risk exposure by types of acute and chronic physical risks:</li></ul>			<ul style="list-style-type: none"><li>Over 25% increase in the risk of one or a group of these assets being affected by extreme climate hazards in 2050 from that in 2020, a 60% point reduction in the increase of risk exposure than that in the 4°C scenario</li><li>Risk exposure by types of acute and chronic physical risks:</li></ul>			<table><tr><th>Emerging Trends</th><th>Risks</th></tr><tr><td>Countries with net-zero emissions targets account for over 70% of Murata's sales in fiscal 2021. Although the electronic components industry is not a targeted industry for heavy regulatory emissions control across the priority markets that we have assessed, policy interventions (e.g. carbon tax or carbon trading schemes) will likely increase over time</td><td>Increase in cost of our production activities</td></tr><tr><td>Most countries have set energy efficiency improvement targets</td><td>Increase in utility costs of production operation</td></tr><tr><td>Some countries intend to set product energy efficiency standards or carbon import tax</td><td>Increase in the cost of accessing these markets</td></tr></table>			Emerging Trends	Risks	Countries with net-zero emissions targets account for over 70% of Murata's sales in fiscal 2021. Although the electronic components industry is not a targeted industry for heavy regulatory emissions control across the priority markets that we have assessed, policy interventions (e.g. carbon tax or carbon trading schemes) will likely increase over time	Increase in cost of our production activities	Most countries have set energy efficiency improvement targets	Increase in utility costs of production operation	Some countries intend to set product energy efficiency standards or carbon import tax	Increase in the cost of accessing these markets	<table><tr><th>Emerging Trends</th><th>Opportunities</th></tr><tr><td>All the assessed economies have set targets for the deployment of renewable energy and electric vehicles (EV) by 2025 or 2030</td><td>These commitments would fuel a soaring demand for EVs and renewable energy, and hence for Murata's products.</td></tr><tr><td>Global sales of automobiles have declined over the past several years, but net sales for Murata's car electronics increased by 23.1% year-on-year to 336.3 billion yen in fiscal 2021</td><td>EVs, with their rising share in the global automobile market, require more electronic components than conventional cars, which will likely bring about higher demand for a number of our product lines</td></tr><tr><td>Rising public concern on climate change and policy trends of pursuing a green and smart economic transition globally</td><td>Increase the demand for our compact and energy-efficient electronic components over the medium to long term, driving revenue growth and creating opportunities for us to enter new markets</td></tr><tr><td>Current Nationally Determined Contributions (NDCs) are considered insufficient to limit the rise in global average temperature to below 2°C</td><td>Our innovative technologies and products will play an increasingly important role</td></tr><tr><td>Rising investor interest in green investment in the medium to long term</td><td>Murata's robust environmental management and carbon-efficient innovations will make it appealing to investors</td></tr></table>			Emerging Trends	Opportunities	All the assessed economies have set targets for the deployment of renewable energy and electric vehicles (EV) by 2025 or 2030	These commitments would fuel a soaring demand for EVs and renewable energy, and hence for Murata's products.	Global sales of automobiles have declined over the past several years, but net sales for Murata's car electronics increased by 23.1% year-on-year to 336.3 billion yen in fiscal 2021	EVs, with their rising share in the global automobile market, require more electronic components than conventional cars, which will likely bring about higher demand for a number of our product lines	Rising public concern on climate change and policy trends of pursuing a green and smart economic transition globally	Increase the demand for our compact and energy-efficient electronic components over the medium to long term, driving revenue growth and creating opportunities for us to enter new markets	Current Nationally Determined Contributions (NDCs) are considered insufficient to limit the rise in global average temperature to below 2°C	Our innovative technologies and products will play an increasingly important role	Rising investor interest in green investment in the medium to long term	Murata's robust environmental management and carbon-efficient innovations will make it appealing to investors
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<ul style="list-style-type: none"><li>Value at Risk (VaR): estimated to be approximately 1 billion yen.</li><li>We aim to conduct analysis based on Murata-specific information in the future, and depending on the results, VaR may increase.</li><li>Impact to our operating costs: The ramification of physical impact of climate change will likely cause increased incidences of disruption to our supply and distribution networks and higher prices of raw materials.</li></ul>			<ul style="list-style-type: none"><li>Value at Risk (VaR): estimated to be approximately a few hundred million yen.</li><li>We aim to conduct analysis based on Murata-specific information in the future, and depending on the results, VaR may increase.</li><li>Impact to our operating costs: Increased in operating costs will likely come from transition measures, such as emissions restrictions, price of carbon relating to our operation, raw materials and products</li></ul>																													
RESPONSE AND RESILIENCE OF STRATEGY	(Common for Physical and Transition risks)			Additionally, we are developing new internal systems and targets to guide emissions reduction effort.			(Physical risks)			● Positioning the mobility market as opportunity for business growth in our long-term vision “Vision 2030,” as the EV market, with high demand of electronic components, is expected to grow																						
	Company-wide emissions reduction programs, led by the Climate Change Committee, have resulted in continued reduction of our total carbon footprint since fiscal 2018 .			● Internal systems: <ul style="list-style-type: none"><li>An internal carbon pricing system and a sustainability investment promotion system were introduced to align investment decision-making with the Company's commitment to CO<sub>2</sub> emissions reduction.</li></ul>			● We aim to conduct analysis based on Murata-specific information in the future, and depending on the results, VaR may increase.			● Similarly, harnessing business opportunity related to environmental countermeasures, including working to expand earnings from our battery business, such as from battery storage technology																						
● Energy conservation:			● New targets:			● Business Continuity Plan (BCP) to minimize the impact of hazards on our operations. (►P.79 Business continuity management (BCM))			● Developing fully-solid-state batteries that can be used in safety-conscious applications, such as consumer wearables, household and power-plant sensors																							
● While we have been working to save energy by optimizing air-conditioning systems and other actions, energy-saving technologies at the design and development stage will be essential to achieve even greater energy savings. Accordingly, we established the Energy Conservation Promotion Subcommittee in fiscal 2021 and begin to examine the calculation of CFP for each product.			● Joined RE100, committing to sourcing 25% electricity from renewables by fiscal 2024, 50% by fiscal 2030, and 100% by fiscal 2050.			● Transitional risks			● Continuing to evolve the technology behind our market-leading capacitors, inductors, SAW filters, RF modules, and other products																							
● Renewable energy:			● Established Scope 1, 2, and 3 reduction targets in conformance with SBT standards. (►P.65 Strengthening Murata's response to climate change)			● Capital investment projects related to energy saving can result in a less aggressive threshold on the rate of return compared to other investment activities. The net costs of these energy-saving investments are considered to be negligible in the long run as the projects can generate saving in energy costs over time.																										
● Introduced solar power generation facilities and implemented purchase of renewable energy (RE).			● Scope 3 initiatives:																													
● In fiscal 2021, total amount of renewable energy introduced: approximately 600 million kWh equivalent, ratio of renewable energy introduced: approximately 21%, contribution to CO <sub>2</sub> reduction: approximately 330 kt-CO <sub>2</sub> .			● Refined CO <sub>2</sub> emissions in each category and coordinated with a wide variety of related departments while advancing the shift to DX to promote climate change countermeasures across the entire Murata supply chain.																													

Risk Management

CSR Management Committee regularly evaluates the materiality of a wide range of social, environmental, and economic issues through a structured process. In the most recent materiality assessment, climate change was identified as a critical risk and endorsed and monitored by the Board of Directors as an important issue that Murata should prioritize management actions. (►P.42 Process of identifying key issues (materiality), Promotion framework for key issues (materiality))

On a strategic level, the Climate Change Committee provides oversight on Murata's climate

change agenda, including the continuous monitoring of evolving climate-related risks.

On the operational level, ISO14001 is enforced in our production facilities to assess environmental risks and drive continuous improvement.

Our participation in industry associations, such as Japan Climate Leaders’ Partnership (JCLP), and global initiatives, such as RE100, can help us gather insights into emerging risks and opportunities related to climate change.

Metrics and Targets

In order to contribute to global initiatives to limit the average temperature increase to 1.5°C, Murata acquired SBT certification. In addition, as a member of RE100, we have committed to achieving 50% electricity from renewable energy by fiscal 2030 and 100% by fiscal 2050.

In our medium-term business plan through fiscal 2024 (Medium-term Direction 2024), we have set a management target of social value to reduce GHG emissions (Scope 1 + Scope 2) to 1.28 million t-CO<sub>2</sub>e, a 20% reduction from fiscal 2019, in addition to aiming to expand our business scale.

GHG Emissions (kt-CO <sub>2</sub> e*)	Fiscal 2019	Fiscal 2020	Fiscal 2021
Total emissions	5,979	5,237	5,762
Scope1	307	278	260
Scope2*5	1,302	1,157	1,140
Scope3	4,371	3,801	4,362*6

\*Figures are rounded to the nearest unit, so the breakdown and total may not match

\*4 The approach we use in measuring our emissions (Scopes 1, 2 & 3) are in line with the emissions accounting methodology defined in the GHG Protocol. Our annual emissions data have been reviewed and certified by third-party assurer to ensure consistency and reliability of the emissions data.

\*5 Scope 2 emissions calculation method:  
Location-based: Calculated using the average CO<sub>2</sub> emission coefficient for the power network in that region.  
Market-based: Calculated using the CO<sub>2</sub> emission coefficient for each power purchase agreement.

Murata's calculation method changed to the market-based method since fiscal 2019.  
\*6 From fiscal 2021, categories 8, 10, 11, and 15 have been newly added to the range of Scope 3 aggregation.