Environment

Policy

Contributing to society has been the management philosophy for the Panasonic Group ever since its founding, and we have been taking measures against pollution since the 1970s. We announced the Environmental management basic policy in 1991, and the Environmental Statement in 1993, clarifying our approaches to address global environmental issues as a public entity of society. Since then we have been carrying out initiatives including matters on global warming prevention and resources recycling corporate-wide, aiming to attain a sustainable, safe, and secure society.

After the completion of the Green Plan 2010 which was established in 2001, the Green Plan 2018 was established in 2010 to clarify our targets for fiscal 2019 (from April 1, 2018 to March 31, 2019) as well as an action plan for all employees in order to achieve the targets. The Green Plan 2018 will continue our initiatives in five areas: CO_2 reduction, resources recycling, water, chemical substances, and biodiversity.

In 2013, we introduced a new brand slogan, "A Better Life, A Better World," aiming to realize a better life for all its customers, and is promoting environmental initiatives as an important element in achieving that goal. Based on this, the Green Plan 2018 was revised in 2013, followed by the newly-established Environmental Action Guideline.

Furthermore, in response to rising demand by the society for CO_2 reductions following the 21st session of the Conference of the Parties (COP21) of the United Nations Conference on Climate Change, and to the need to make changes to our business structure, including growth in the automotive and B2B businesses, the Plan was revised again in 2016.

Additionally, we formulated the Environment Vision 2050 in 2017 to achieve "a better life" and "a sustainable global environment," aiming for a society with clean energy and a more comfortable lifestyle. Under the Vision, through the development of products, technologies, and solutions relating to energy creation, storage, saving, and management, we will work towards creation and more efficient utilization of energy which exceeds the amount of energy used.

We announced Green Plan 2021 in 2019, following completion of Green Plan 2018, with a focus on key issues for achieving the Panasonic Environment Vision 2050, and we have been working on the issues. On January 2022, we announced Panasonic GREEN IMPACT, our long term environment vision,founded based on Panasonic Group's belief that the top priority action for the entire Group should be focused on global environment issues including climate change, which is a pressing task for the entire world.

The Panasonic GREEN IMPACT is the result of a shift from the Panasonic Environment Vision 2050, with the aim of achieving carbon neutrality together with creating impacts from actions (ACT) that reduce CO_2 emissions from Panasonic Group as well as from various sectors of the society. To achieve Panasonic GREEN IMPACT, we are working on initiatives under our newly developed GREEN IMPACT PLAN 2024.

Environmental Policy

Environmental Statement

Fully aware that humankind has a special responsibility to respect and preserve the delicate balance of nature, we at Panasonic acknowledge our obligation to maintain and nurture the ecology of this planet. Accordingly, we pledge ourselves to the prudent, sustainable use of the earth's resources and the protection of the natural environment while we strive to fulfill our corporate mission of contributing to enhanced prosperity for all.

Environmental Action Guideline

Toward achieving a sustainable society, we will strive to develop our business through the creation of environmental value. For this purpose, we will address environmental challenges through our business activities and will expand our environmental initiatives based on collaboration with stakeholders.

(1) Initiatives to address environmental challenges
- We will reduce CO_2 emissions through production activities and products/services.
- We will work to efficiently use resources by pursuing Recycling-oriented Manufacturing.
- We will conserve water resources through efficient use of water and prevention of contamination.
- We will reduce the impact of chemical substances on human health and the environment.
- We will consider and conserve biodiversity.

(2) Initiatives based on collaboration with stakeholders
- We will provide products and services that create environmental value for customers with our technical strengths.
- We will expand our environmental contributions with our partner companies.
- We will deepen communications with local communities and work as a team to address environmental challenges.

Environmental Action Plan

GREEN IMPACT PLAN 2024 (see pages 12-13)

We strive to grow and develop our business through the creation of environmental value for customers with our technical strengths while each and every employee follows the Environmental Policy to address environmental challenges. Therefore, collaboration with stakeholders including our partners is essential. We will continue to sincerely work on environmental sustainability management through further collaboration with stakeholders.

Mid-term to Long-term Environmental Vision

What we should be in the future as the Panasonic Group and solution for global environmental issues

The true mission of the Panasonic Group is to achieve both of 'material and spiritual prosperity', in other words 'an ideal society with affluence both in matter and mind'. that is pursued by our founder Konosuke Matsushita in his entire life. Roughly 90 years ago in 1932, the founder declared his ambition to create an ideal society over a span of 250 years, across ten generations. Since then, we have carried on his ambition and made our contribution through businesses to solve the social issues of the times and to work for the happiness of each customer.

At present, the biggest challenge that prevents us from achieving our mission is against global environmental issues. We must avoid the situation at any cost where our planet is no longer habitable in approx. 160 years which is the year of reaching our goal for achieving our mission, far from bringing happiness to our descendants. In order to hold back environmental pollution, depletion of finite resources, and the most serious and urgent issues of global warming as early as possible, we must achieve net zero total CO_2 emissions throughout society as a whole, as soon as possible. In our determination to play a major role in contributing to this goal and lead to solve the issues without fail, we announced "Panasonic GREEN IMPACT (PGI)", the Group's long-term environmental vision in January 2022 , and we have been accelerating our initiatives to contribute to reduction of emissions from our business activities, as well as from our customers and from society.

Panasonic GREEN IMPACT

PGI was established with the following thoughts to stop global warming. Addressing the scale of both of the Panasonic Group's 'responsibility' that is to reduce emissions from our business activities and 'opportunity' that is to contribute to avoiding emissions for society, by accumulating each of our diligent efforts (Act), we aim to achieve carbon neutrality (CN) through reducing CO_2 emissions from our business activities and from society and working in concert with society. With the aim of creating a carbon neutral society by 2050, we have developed a strategy for each of our business fields backcasted from the social reforms to be implemented by 2030. In April 2022, with a classification of PGI into ❶ OWN IMPACT, signifying fulfillment of own responsibilities, ❷ CONTRIBUTION IMPACT, referring to opportunities to contribute, and ❸ FUTURE IMPACT, along with INFLUENCE (+) that means the positive ripple effects on our customers and society, we announced our plan to create an impact by 2050 from our emissions reductions of more than 300 million tons[*2] in total for ❶, ❷ and ❸: that is approx. 1% of the global CO_2 emissions of 31.7 billion tons[*1] today. This was followed by our milestone announcement in July 2022, 'to achieve net zero emissions for all of our operating companies (Scope 1 and 2 in ❶)' and 'to create avoided CO_2 emissions of approx. 100 million tons (initiatives in ❷), together with establishment of "the GREEN IMPACT PLAN 2024", our action plan for 2022-2024.

*1 2020 energy-derived CO_2 emissions (Source: IEA)

*2 The emissions factor for the size of our contribution to reducing CO_2 is based on the 2020 emissions level.

❶ OWN IMPACT

We plan to achieve net zero emissions from all of our value chain (110 million tons[*3]), as well as a decarbonization effect on society[*4]. Net zero will be achieved for total emissions from our business activities (Scope 1, 2, and 3), including from our factories (Scopes 1 and 2) by fiscal 2031, for emissions in parts and materials production (Scope 3, Category 1), and for emissions in product use (Scope 3, Category 11). Efficient reduction of emissions can become the driving force behind our competitiveness.

*3 Fiscal 2021 actual results

*4 CO_2 emissions factor for electricity can be turned positive through advances in decarbonization at various electric power suppliers.

❷ CONTRIBUTION IMPACT

In our present business fields, we plan to contribute 100 million tons or more in avoided emissions from society and our customers. We plan to visualize avoided emissions by each product and service, for example, by promoting wider use of environmentally friendly vehicles through improvements in the performance and cost of automotive batteries, by replacing fossil fuels in towns and at homes with heat pump water heaters that use electricity, and by providing optimized solutions for inventory and transport to business flow of customers from material procurement to market supply. This visualization of emissions will be employed as a benchmark shared with society at large. Additionally, we plan to make investments in fields where contributions can be made and to boost our competitiveness, in order to grow our business and increase our contribution.

❸ FUTURE IMPACT

We plan to achieve avoided emissions of 100 million tons or more by creating new technologies and business fields.

+ INFLUENCE

Through communications related to PGI initiatives, we plan to have positive ripple effects on reforms in the energy supply and demand for the society as a whole and decarbonization through changes of demands and behaviors of customers, other business operators, as well as governments and investors. Although the direct impact on reduction cannot be calculated at present, we will move forward in this direction, being convinced that this is part of our mission to build a carbon neutral society as quickly as possible.

Environmental Action Plan "GREEN IMPACT PLAN 2024"

As milestones in reaching the 2050 targets set in "the Panasonic GREEN IMPACT", our long-term environmental vision, we set out the fiscal 2031 target linked to our groupwide business strategy, and formulated "the GREEN IMPACT PLAN 2024 (GIP 2024)", the three-year environmental action plan from fiscal 2023 to fiscal 2025, for which we are working on. Under GIP 2024, we have set out the fiscal 2025 targets for OWN IMPACT: CO_2 emissions reduction across our entire value chain (VC) (Scopes 1, 2 and 3), CONTRIBUTION IMPACT: contribution to avoided CO_2 emissions in society and the resource/circular economy (CE) as our materiality issues.

In OWN IMPACT, we plan to cut down CO_2 emissions from our entire VC of 110 million tons in fiscal 2021 to 16.34 million tons in fiscal 2025 and to 31.45 million tons in fiscal 2031 respectively with our business growth. In our plan to achieve net zero CO_2 emissions in our factories ('Zero-CO_2 factories') for all of our operating companies by fiscal 2031 under the drive to achieve net zero emissions from our business activities (Scopes 1 and 2), we are planning to achieve net zero CO_2 emissions at 37 factories by fiscal 2025.

In CONTRIBUTION IMPACT, we plan to achieve avoided emissions of 93 million tons* in fiscal 2031 and 38.3 million tons in fiscal 2025*. It must be noted that international standardization of the method to calculate 'the avoided CO_2 emissions' for which the Panasonic group is involved, is underway. If the calculation method to be standardized is different from the method our Group has adopted, we plan to explain the difference and at the same time revise our targets accordingly to achieve them.

There are three areas of resources/CE activities. One is maintaining the global waste recycling rate consistently at 99% or more, aiming at reaching zero emissions for factory wastes. The second is the amount of recycled resin used that we would double the quantity in three years to 90,000 tons over the result of the preceding medium-term plan (GP2021; 43,300 tons from fiscal 2020 to fiscal 2022). The third is the CE business model aimed at effective utilization of resources and maximization of customer that will be rolled out in a total of more than 13 businesses by fiscal 2025.

Additionally, we plan to continue working on the issues of 'biodiversity', 'water', 'chemical substances', 'local communities', and 'compliance', paying attention to the scale of social issues and empathy with our customers and society and corresponding to our business fields and regional characteristics and needs.

* Calculated with emissions factor at the time of the PGI establishment (IEA 2021)

Status of the first year of GIP 2024

CO_2 emissions for our entire value chain (VC) increased to 129.21 million tons (negative in OWN IMPACT) with increase of 21.70 million tons from 107.51 million tons in fiscal 2021.For the Scopes 1 and 2, there had been progress in both energy conservation and energy recycling, with 31 Zero-CO_2 factories and CO_2 reduction of 0.36 million tons. For the Scope 3, the reduction volume increased for product use (increase of 9.1 million tons) and other categories, thanks to expansion in the scope of business fields.

On the other hand, avoided emissions for our customers and society increased to 37.23 million tons, because of, in part, progress of new visualization of CO_2 emissions. In the area of resources/CE, the waste recycling rate was maintained at 99.1% globally, with recycled resin use at 12,400 tons. As four new CE business models were started up, total 10 CE business models are now in operations.

GREEN IMPACT PLAN 2024 (Fiscal 2025, 2031 targets and Fiscal 2023 actual results)

Item				Fiscal 2023 actual results	Fiscal 2025 targets GREEN IMPACT PLAN 2024	Fiscal 2031 targets
Material issues	CO_2 / Energy	**OWN IMPACT** Emissions reduction in our own Value Chain*2		**– 21.70 Mt (9.39 Mt)** *6	**16.34 Mt**	**31.45 Mt** *7
		Scopes 1 &2*1	Zero- CO_2 factories	Total 31 factories	Total 37 factories	
			CO_2 reductions	**0.36 Mt**	**0.26 Mt**	
		Scope 3*1 (Category 11)	CO_2 reductions in use of our products by customers	**– 9.1 Mt**	**16.08 Mt**	
		CONTRIBUTION IMPACT Avoided Emissions for society*3		**37.23 Mt**	**38.30 Mt**	**93.00 Mt**
	Resources/ CE *Circular Economy	Factory waste recycling ratio*4		99.1%	99.0%	
		Recycled resin used*5 (Fiscal 2023 to 2025 total for GIP2024 targets)		12,400 tons	Fiscal 2023 to 2025 total 90,000 ton	
		Circular economy business models and products (Total)		10 businesses	13 businesses	
Continuing challenge	Biodiversity	Reducing and restoring the impact of business activities on the ecosystem to become nature positive Procurement of sustainable raw materials, businesses that contribute to biodiversity green spaces, and products and services that contribute to biodiversity				
	Water	Reduce water consumption in business activities and products/services				
	Chemical substances	Reducing the environmental impact of chemical substance's business activities and products				
	Local communities	Promote environmental initiatives to contribute to local communities and educate the next generation				
	Compliance	Ensure compliance with environmental laws and regulations				

*1 Classification according to the GHG protocol (Accounting and Reporting Principles).

*2 Amount obtained by subtracting the amount of emissions in the relevant fiscal year from the amount of emissions in fiscal 2021.

*3 Amount calculated by subtracting the lifetime CO_2 emissions after introduction from the lifetime CO_2 emissions assuming that the Group's products and services do not exist, using the IEC 2021 value as the emission factor.

*4 Amount of resources recycled/(Amount of resources recycled + Amount of landfill).

*5 Mass of recycled materials contained in the recycled resin used in our products.

*6 Includes Scope 1,2 and Scope 3 Category 11, plus increases or decreases in Category 1 (procurement), Category 12 (disposal), and other indirect emissions. Figures in parentheses indicate the case where fiscal 2021 (starting point) is calculated with the same boundary as the fiscal 2023 target.

*7 The CO_2 emissions factor for electricity calculated with the IEA World Energy Outlook's 2° C scenario.

GIP2024: Points of change in fiscal 2023

CO_2 emissions (upper part of the figure)

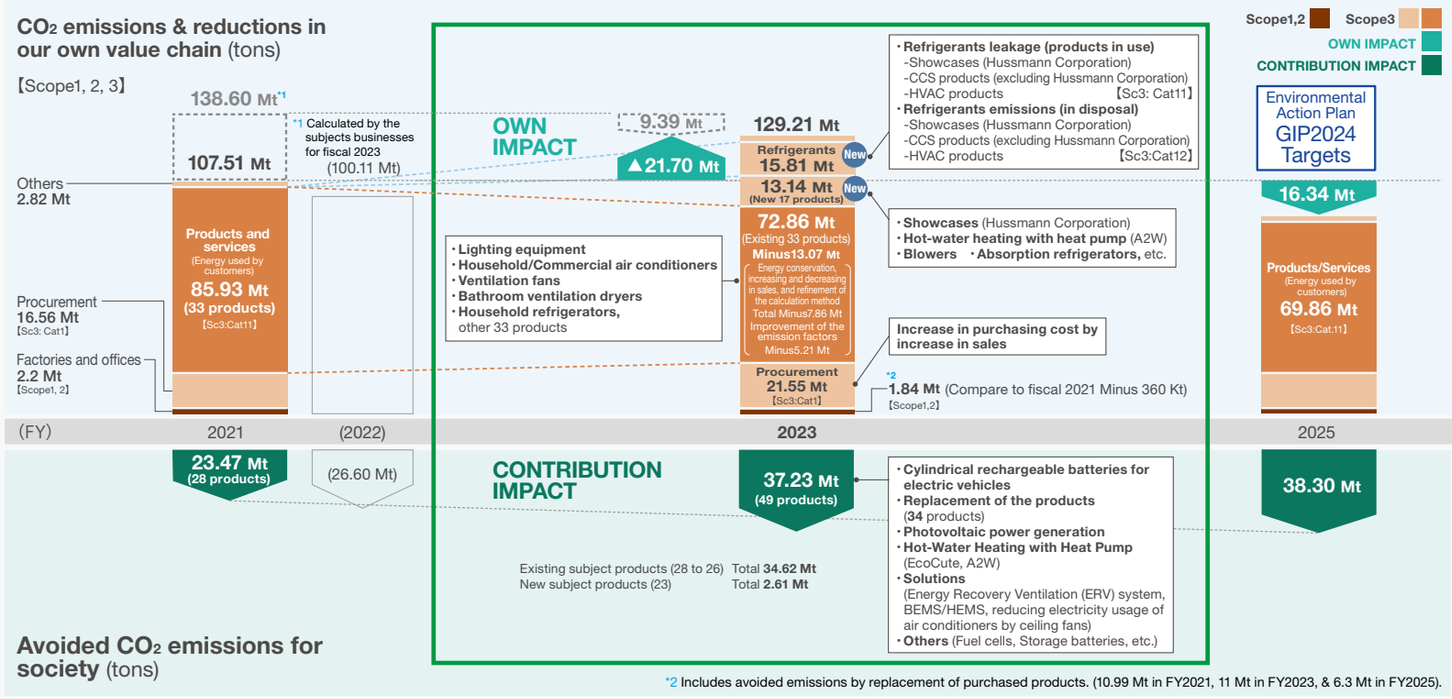
The CO_2 emissions in product use (Scope 3, Category 11) that accounts for approximately 80% of total value chain emissions, decreased from 85.93 million tons for 33 products in fiscal 2021 to 72.86 million tons (reduction of 13.07 million tons) in fiscal 2023, thanks to the improved energy efficiency of our products, increase and decrease in sales, refinement of the calculation method, and the emissions factor turning positive. On the other hand, to expand the scope of our responsibilities and contributions of the Panasonic group, we newly visualized 13.14 million tons in the CO_2 emissions from 17 more businesses. Regarding Refrigerant related equipment of HVAC Company and Cold Chain Solutions Company aiming to reduce CFC emissions of their product use by wider use of refrigerants with low environmental impact (CO_2 refrigerant/ propane) and wider-scale recovery of refrigerants disposed of by customers, we have added estimated refrigerant-related emissions after their visualization (total of 15.81 million tons). Together with an increase in procurement amount (increase of 5 million tons), the CO_2 emissions of 107.51 million tons in fiscal 2021 rose to 129.21 million tons in 2023, i.e. an increase of 21.70 million tons (negative in OWN IMPACT). However, if the new emissions boundary for fiscal 2023 is applied to the fiscal 2021, the volume indicates an improvement of 9.39 million tons from the point of the new emissions boundary. We will continue to actively work to improve accuracy by reviewing the boundary and method of calculation for Scope 3.

Avoided CO_2 emissions (lower part of the figure)

For avoided emissions ( ) to society and customers, the number of visualization of the subject business has increased from 28 businesses in fiscal 2021 to 49 in fiscal 2023. Total reached 37.23 million tons is approaching the fiscal 2025 target of 38.3 million tons. Contributions have hugely increased from 26 businesses that have been visualized up to now (28 as of fiscal 2021). At the same time, new 23 more businesses have been visualized (total 2.61 million tons) and their PDCA cycle based activities have begun.

The Panasonic GREEN IMPACT(PGI) serves as a benchmark for achieving carbon neutrality through the accumulation of each diligent effort (ACT) together with society, by addressing both our responsibility and opportunity in the urgent need to stop global warming. Since 'CO₂ emissions' and 'avoided CO_2 emissions' differ in its concept and objectives, our responsibility (CO_2 emissions) cannot be canceled out by contribution to customers (avoided CO_2 emissions). We believe that firstly we should understand their relationship is inextricable as they linked to each other and, then, should accelerate respective initiatives. In particular, as for 'the avoided CO_2 emissions', the flexibility of conditions for its calculation is high, and it has not been internationally standardized as of now. Although there are so many practical issues that need to be addressed before 'the avoided CO_2 emissions' can serve as a social benchmark, we plan to report on the progress of the PGI as a whole, employing 'the avoided CO_2 emissions' as an indicator to show the acceleration in reform and growth, by enhancing our competitiveness in electrification, energy conservation, energy conversion, resources recycling, etc., and contributing to the early achievement of the decarbonization scenarios.

GREEN IMPACT PLAN2024 (GIP2024) Points of change in fiscal 2023



Avoided CO_2 Emissions

The CONTRIBUTION/FUTURE IMPACT of Panasonic GREEN IMPACT, commonly referred to as the avoided emissions, is an indicator of the value of the amount of CO_2 emissions contributed to the reduction of CO_2 emissions by customers and society by introducing our group products and services, compared to the amount not introduced (baseline). In fiscal 2023, CONTRIBUTION IMPACT totaled 37.23 million tons in 49 businesses covering products and services sold in the same year. Most of this is in the living business, which includes air conditioners and lightings, and the energy business, which includes EV rechargeable batteries, accounting for about 50% of Group sales. Our group's main business is to provide electrified products and services (electrical and electronic equipment) by converting to electric appliances that are more efficient in energy use than those that use fossil fuels, we are able to reduce CO_2 emissions. The widespread use of electric appliances will increase demand for electricity, but by continuously increasing the efficiency of energy use in appliances and spaces, and by controlling and optimizing demand through energy storage and energy management, we will reduce the load on grid power in each region and promote renewable energy.

On the other hand, although there is no internationally uniform standard for the avoided emissions (as of August 2023), our company has participated in WBCSD*1, IEC*1, and the GX League*1, and has worked with like-minded government departments and companies to promote dialogue on the need for the avoided emissions. In March 2023, the WBCSD and the GX League released guidance and guidelines on the avoided emissions*2, and we are working on a calculation based on these guidelines in conjunction with discussions at the IEC*3, which aims to achieve international standardization. The baseline (comparison target) is the period of use (durable life, etc.) of our group products and services compared to the market average condition expected for each business, and the annual electricity consumption in terms of design and calculated rationally under conditions judged to be objectively reasonable after discussions within the Panasonic Group. The basic structure of the calculation formula is as follows: activity volume (sales volume, etc.) × annual reduction per activity volume (difference in energy consumption compared to baseline, etc.) × duration (lifespan, etc.) × CO_2 emission factor. This calculation method and the data on which it is based have been verified by a third party, and this is our group's first disclosure in this report.

The concept and purpose of use of these two indicators are very different. The emissions cannot be offset by "avoided emissions (reduction contribution to customers)". The emissions reduction is the company's responsibility. Our mid-term to long-term reduction targets are certified as SBTs 1.5 degree targets*4 in May 2023. Panasonic group aims to realize a decarbonized society early by accelerating the PDCA cycle of both responsibility and contribution.

*1 World Business Council for Sustainable Development (WBCSD), International Electrotechnical Commission (IEC), GX League is a forum for cooperation between a group of companies, the government and academic institutions in order to meet greenhouse gas reduction targets and increase industrial competitiveness by using Japan's goal of carbon neutrality by 2050 as an opportunity for economic growth.
*2 "Avoided Emissions Guidance" by WBCSD, "Basic Guidelines for Disclosure and Evaluation of Opportunities for Climate Change" by GX League
*3 IEC63372 ("Avoided CO_2 emissions" international standard to be issued in 2024.)
*4 Companies play their part in combating climate change by setting GHG emissions reduction targets that are aligned with reduction pathways for limiting global temperature rise to 1.5°C or well-below 2°C compared to pre-industrial temperatures. These targets are termed science-based targets (SBTs).

For further examples of our avoided emissions products that contribute to CO_2 reduction for consumers and society, see the following website.

WEB https://holdings.panasonic/global/corporate/sustainability/environment/vision/product.html

CONTRIBUTION IMPACT

[Unit: ton] Calculation example : See the following pages for further examples.

Category	Top 20 businesses in FY 2023
Electrification **9.70** million in FY 2021 ↓ **4 businesses 17.79 million**	**Cylindrical Rechargeable Batteries for EVs** Calculation example
	Hot-Water and Heating Systems with Heat Pump (A2W) Calculation example
	Electric-assist Bikes
	Hot-Water Systems with Heat Pump (EcoCute) Calculation example
	Total **4** businesses: **17.79** million
Replacements Calculation example (Home appliance) **10.99** million in FY 2021 ↓ **34 businesses 11.00 million**	**Household Air Conditioners**
	LED Lightings
	Household Refrigerators
	Electric Showers / Electric Water Heaters
	Commercial Air Conditioners
	Washing and Drying machines
	Projectors
	LCD TVs
	CO_2 Freezers
	Dryers
	Total top **10** businesses: **10.29** million
Solution **4 businesses 2.42 million**	**Heat Exchange System** Calculation example
	Ceiling Fans
	BEMS*1 / HEMS*2
	Total top **3** businesses: **2.31** million
Others Calculation example **7 businesses 6.01 million** (Vacuum Insulated Glasses) (Home Delivery Communication Boxes)	**Photovoltaic Power Generation Systems**
	Fuel Cells
	Creation and Storage Collaboration System (Storage batteries)
	Total top **3** businesses: **5.96** million
Total all 49 products and services: ★37.23 million	

*1 Building Energy Management System
*2 Home Energy Management System

Electrification

Hot-Water and Heating Systems with Heat Pump (EcoCute, A2W[*1]) *1 A2W: Air to Water

Product life stages subject to avoided CO_2 emissions

Raw materials > Manufacturing > Transportation > **Use** > Disposal/Recycle

Sales regions: **Japan for EcoCute, and Europe for A2W**

■Overview

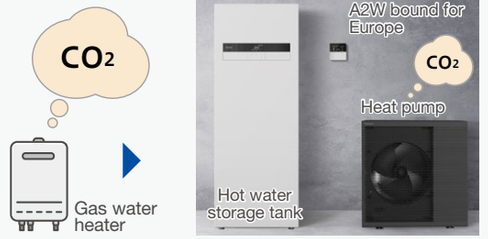
A heat pump is equipped with electrification technology that captures heat energy from the ambient air and transfers it to heat water or air utilizing the characteristic that temperature changes when gas is compressed or expanded. With the technology, the equipment with heat pump is 2.4 to 4.3 times more energy-efficient compared to the equipment uses heat energy from fossil fuel combustion.[*2] Furthermore, on the premise that the ratio of renewable energy use in each energy sources will increase year by year as the electrified equipment with heat pump is spread, whereas CO_2 is always emitted from gas equipment in combustion of city gas, we will contribute to accelerate the transition to a decarbonized society.

*2 Our own calculation based on information in METI's 'Top Runner Program'.

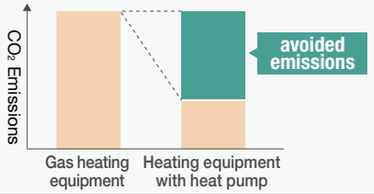
WEB https://www.enecho.meti.go.jp/category/saving_and_new/saving/enterprise/equipment/

■Avoided CO_2 emissions mechanism

Compared to the average hot-water and heating systems with gas combustion type that are water heaters widely available in markets, our heating equipment with heat pump with equivalent capacity emit less CO_2 from the electricity used throughout their lifetimes, therefore, the difference of CO_2 emissions becomes avoided emissions.



Average CO_2 emissions from water & air heating energy by one gas heating equipment and one heating equipment with heat pump (A2W)



■Calculation formula of avoided emissions

Amount of activities | Avoided emissions for a given amount of activities | CO_2 emissions-related values and factors | Period

[Amount of activities] (Units)
The number of units that replaced existing gas heating equipment in the total annual sales volume[*3]

$$\times \left(\text{Annual city gas consumption per gas heating equipment } (m^3) \times \text{City gas } CO_2 \text{ emission factor } (kg\ CO_2/m^3) - \text{Annual power consumption per unit of the heating equipment with heat pump } (kWh) \times \text{Electric power } CO_2 \text{ emission factor per sales region } (kg\ CO_2/kWh) \right) \times \text{Period}$$

*3 Japan: Approximately 70% of sales are heating equipment with heat pump replacing gas heating equipment. (Source: Industrial association data). Europe: 100% of sales are heating equipment with heat pump replacing gas water heaters. (We deemed that the replacement of existing A2Ws can be ignored as the sales started in 2008.)

Annual avoided emissions by one heating equipment with heat pump replacing a gas heating equipment.

- **Electric power** CO_2 emission factor: Japan - **0.487** kg/kWh, and Europe - **0.277** kg/kWh (Source: IEA 2021)
- **City gas** CO_2 emission factor: **2.240** kg/m^3 (Source: Document by Ministry of the Environment)

■Baseline (Subject to comparison)

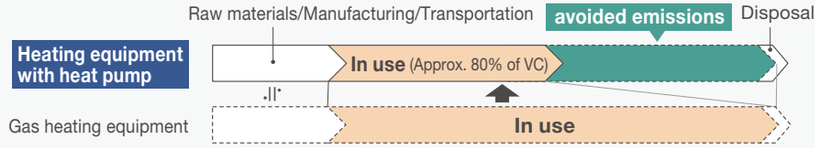
CO_2 emissions from gas combustion to capture heat energy required for heating the same amount of water or air. Conventional gas by gas combustion is predominantly used in Europe where there are many cold climate areas. (Transformation of an A2W to its electrification is possible by using gas pipe used for the existing gas heating equipment.)

■Coverage of quantification (Way of thinking and its rationalization)

When the heating equipment with heat pump is in use. We deemed that CFP[*4] of the equipment when it is in use can be ignored because both of a heating equipment with heat pump and a gas heating equipment show a relatively greater CFP when they are use.[*5]

*4 CFP (Carbon Footprint of Products): CO_2 emissions converted from GHG emissions throughout the entire product life cycle—from raw material procurement to disposal and recycling of a product and service (per one unit).

*5 79.9% for 'in use' of CO_2 emissions in the value chain (VC) of the Panasonic heating equipment with heat pump. (FY2020 Panasonic actual result)



*4 **CFP** (Carbon Footprint of Products): CO_2 emissions converted from GHG emissions throughout the entire product life cycle—from raw material procurement to disposal and recycling of a product and service (per one unit).

■Amount of activities

EcoCute: The number calculated by the following equation: the annual sales volume in Japan x 70%[*6] which is the replacement ratio of gas heating equipment with heating equipment with heat pump. (Unit)

*6 Data from a Japanese industrial association. The calculation excludes the number of replacements of an end-of-life EcoCute with a new unit.

A2W: The number of annual sales of A2W in Europe (Unit)[*7]

*7 We deemed that replacement ratio of old A2Ws with new ones can be ignored as the sales started in 2013.

■Avoided CO_2 emissions per unit of amount of activities (Basic unit)

Regarding the annual energy consumption used for the same amount for heating water or air, which was converted to CO_2 emissions, difference between those of heating equipment with heat pump and gas heating equipment.

■Period (Flow method: Include entire lifetime CO_2 emissions of the product in its first sales year)

- The holding years for repair parts
- CO_2 emissions reduction effect continues during that period.

Electrification

Cylindrical rechargeable batteries for electric vehicles (EV)

Product life stages subject to avoided CO_2 emissions

Raw materials > Manufacturing > Transportation > **Use** > Disposal/Recycle

Sales regions: **North America**

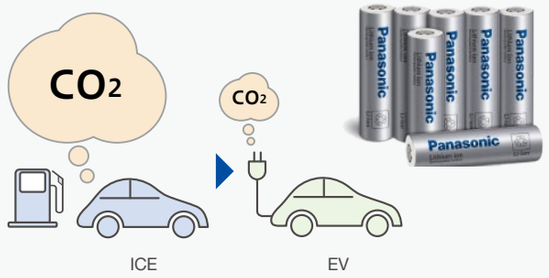
■Overview

Transition of use from internal combustion engine vehicles (ICEVs) to electric vehicles (EVs) is expected to bring decarbonization of transportation sectors in the world as EVs do not directly emit CO_2 , in addition to their better energy efficiency*1. EVs, which does not use internal combustion engine, use a motor driven by electricity supplied from a rechargeable battery. Hence, it is recognized that the rechargeable battery that is equivalent to the fuel tank of an ICEV is one of the most important components in an EV.

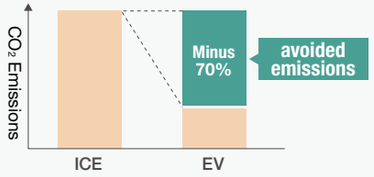
*1 Energy efficiency: The percentage of consumed energy that reaches to the wheels;
EV: **87–91**% ICEV: **16–25**%.
Source: Yale Climate Connections. August,2022 "Electrifying transportation reduces emissions and saves massive amounts of energy"

■Avoided CO_2 emissions mechanism

In the case that an EV and an ICE drives the same distance, the difference between the fuel consumption of an ICEV converted into CO_2 emission and the amount of electricity charged and discharged in an EV converted into CO_2 emission because of the high energy efficiency of the EV is avoided emissions.



Average CO_2 emissions from an ICEV and an EV
(U.S.) (EVs use the power grid)



■Calculation formula of avoided emissions

Amount of activities | Avoided emissions for a given amount of activities | CO_2 emissions-related values and factors | Period

[Amount of activities] (Units)
The CO_2 emissions converted from the number of EVs of the battery capacity sold per year

$$\times \left(\underbrace{\text{CO}_2\text{ emissions per 1 km by an ICEV}}_{(\text{kg CO}_2/\text{km})} - \underbrace{\text{CO}_2\text{ emissions per 1 km by an EV}}_{(\text{kg CO}_2/\text{km})} \right) \times \text{Lifetime mileage}$$

Annual avoided emissions by one EV replacing an ICEV

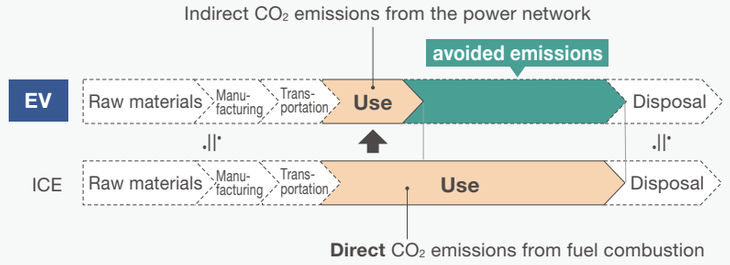
* Average annual mileage respectively in Japan, U.S. and Europe x 10 years

■Baseline (Subject to comparison)

CO_2 emissions from driving an ICEV

■Coverage of quantification (Way of thinking and its rationalization)

- Difference in CO_2 emissions between from ICEV and EV while driving.
- This case refers only to EV driving. CFP of the battery*2 is calculated separately.



*2 **CFP** (Carbon Footprint of Products): CO_2 emissions converted from GHG emissions throughout the entire product life cycle—from raw material procurement to disposal and recycling of a product and service (per one unit).

■Amount of activities

CO_2 emissions converted from the number of EVs for the capacity of cylindrical rechargeable batteries for EVs sold per year. (unit)

■Avoided CO_2 emissions per unit of amount of activities (Basic unit)

Difference in CO_2 emissions between from an ICEV and an EV while driving 1km.

■Period (Flow method: Include entire lifetime CO_2 emissions of the product in its first sales year)

- Lifetime mileage of an EV (to indicate reduction effects of driving EVs)
- Lifetime mileage of an EV
  = Average annual mileage respectively in Japan, U.S. and Europe x Vehicle life (10 years)

■Avoided CO_2 emissions in fiscal 2023: 14.17 million tons

Replacements

Energy-saving effects from replaced home appliances

Product life stages subject to avoided CO_2 emissions

Raw materials > Manufacturing > Transportation > **Use** > Disposal/Recycle

Sales regions: **Japan, China, North America, Central and South America, Europe, Southeast Asia, Middle east, etc.**

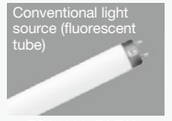
■Overview

Improving efficiency of energy consumed by a large number of home appliances now widely used throughout society will reduce the load of local grid power for the use of appliances, lower the hurdle to transform to use renewable energy as their energy source. This facilitates transition to decarbonization society from demand sides. One of the characteristics of home appliances with high durability is that their dominant stage of CO_2 emissions (CFP[*1]) in the life cycle is from energy use through the whole period in which product are used by customers and in society. This accounts for 80 to 90% of large home appliances such as lighting and refrigerators. Replacing the product used enough of the life with a new product that has equivalent function and performance in use together with improved energy efficiency will cause effect of reducing CO_2 emissions both from users and power suppliers.

■Avoided CO_2 emissions mechanism

Regarding the home appliance whose life is passed and replaced with a new product with equivalent functions, the difference between CO_2 emissions equivalent to the energy saved in the product's lifetime use before and after its replacement is avoided emissions.

Example of lighting equipment

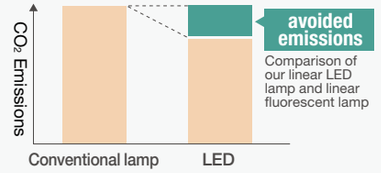


FSA42001F VPN9

Approx. 60% less energy consumed by a new product with higher brightness compared to those of conventional fluorescent lamps.

Integrated LED Base Light 'iD Series'
General facilities General-purpose model (Energy-saving light bar)
Direct mount XLX450DHNU LE9 Daylight white (5000 K)
https://www2.panasonic.biz/jp/lighting/facilities/baselight/id/general.html

[Example] Average lifetime CO_2 emissions from consumed power before and after single unit replacement



■Calculation formula of avoided emissions

Amount of activities | Avoided emissions for a given amount of activities | CO_2 emissions-related values and factors | Period

[Amount of activities] (Number of units)
The number of units sold per year[*2]

× (Annual power consumption of the product before replacement (kWh) − Annual power consumption of the product after replacement (kWh))

× CO_2 emission factor for electricity per sales region (kg CO_2 /kWh)

× Period (7 to 10 years depending on the product)

= Annual avoided emissions from energy-saving effect by one replaced product

[*2] 'Before replacement' refers to the average penetration status of existing products that can be replaced with a new product with equivalent functions and performance at the time of the sale, per region. The amount of activities was broken down according to each situation and then totaled.

CO_2 emission factors for electricity
(Source: IEA2021)
Unit: kg/kWh

Regions	Factors
Japan	0.487
Europe	0.277
North America	0.383
China	0.623
India	0.723
Asia and Pacific	0.386
Latin America	0.252
Middle East & Africa	0.616

■Baseline (Subject to comparison)

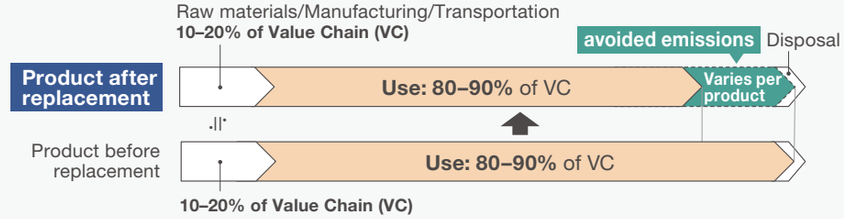
CO_2 emissions converted from lifetime power consumption of the average product in markets at the penetration rate of the product with functions and performance equivalent to the new product per sales region[*3].

[*3] Example: LED penetration rate per country, and the like.

■Coverage of quantification (Way of thinking and its rationalization)

When LED is in use. The average CFP of home appliances are dominant[*4] 'in use'. We deemed that we can ignore the impact from the CO_2 emissions difference between those from the products before and after the replacement.

[*4] 'in use' accounts for approx. 80 to 90% of CO_2 emissions in the home appliances value chain.



■Amount of activities

The number of annual sales depending on the status (penetration rate, etc.) per sales region for the new product.

■Avoided CO_2 emissions per unit of amount of activities (Basic unit)

Difference between CO_2 emissions converted from lifetime power consumption[*5] between those from the products before and after replacement in each sales region.

[*5] Example: Rated power in design x annual 'time in use' etc.

■Period (Flow method: Include entire lifetime CO_2 emissions of the product in its first sales year)

- This was set by product, which can maintain holding a spare parts (7–10 years), optimum operational period for basic performance etc.
- CO_2 emissions reduction effect continues during the period.
- We deemed that 7 to 10 years for holding spare parts is a conservative estimate as the life of home appliances can be extended with appropriate use and maintenance.
- With the extended product life, further CO_2 emissions reduction effects are also expected because of efficient utilization of resources

[*1] **CFP** (Carbon Footprint of Products): CO_2 emissions converted from GHG emissions throughout the entire product life cycle—from raw material procurement to disposal and recycling of a product and service (per one unit).

Solution

Heat Exchange System

Product life stages subject to avoided CO_2 emissions

Raw materials > Manufacturing > Transportation > **Use** > Disposal/Recycle

Sales regions: **Japan, China, North America, and Europe**

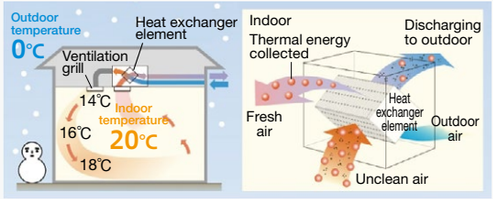
■Overview

To achieve decarbonization in the consumer and business sectors, it is important to reduce environmental impact from air conditioning at living spaces in houses and offices. The heat exchange system reduces heat loss from the interior of buildings and provide comfort maintaining appropriate air quality at the same time. The heat exchange system exchanges heat of indoor and outdoor with a heat exchange element during ventilation and either heat or cool the air before being taken into the building, which reduces air conditioning load. Moreover, the system is equipped with air purifier that is a high performance system. Therefore, the exchange heat system is used in wide areas in residential, commercial, and office buildings, where high air tightness is required including Japan, the U.S., Europe, and China.

■Avoided CO_2 emissions mechanism

CO_2 emissions converted from the reduced amount of power or fuel consumption by adopting this heat exchange system in room spaces under the same conditions compared to those from average ventilation method for ventilation in the market.

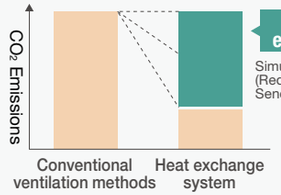
How the heat exchange system works (winter)



* Efficiency varies according to model.

WEB https://sumai.panasonic.jp/air/kanki/kodatekicho/

CO_2 emissions converted from energy consumption with adjusted heat loss from ventilation



Simulation by Panasonic (Reduction rate in Tokyo, Sendai, and Sapporo)

WEB https://sumai.panasonic.jp/air/kanki/kabekakefan/

■Calculation formula of avoided emissions

Amount of activities | Avoided emissions for a given amount of activities | CO_2 emissions-related values and factors | Period

[Amount of activities]
Annual system installation volume (The number of heat exchange systems)

× (**Annual energy consumed by air conditioning in a residential house with conventional ventilation methods (volume of thermal loss)** (kWh or liters) × **CO_2 emission factors by electricity or fuel type in each sales region** (kg CO_2 /m^3)

− **Annual energy consumed by air conditioning in a residential house with a heat exchange system (volume of thermal loss)** (kWh or liters) × **CO_2 emission factors by electricity or fuel type in each sales region** (kg CO_2 /kWh or liters))

= **Annual avoided emissions by installed one heat exchange system** × **Period**

- CO_2 emission factor for **electricity**: **0.487** kg/kWh in Japan, **0.623** kg/kWh in China, **0.383** kg/kWh in North America, and **0.277** kg/kWh in Europe (Source: IEA 2021)
- CO_2 emission factor for **kerosene**: **2.49** kg/liter (Source: Data from Ministry of the Environment)

■Baseline (Subject to comparison)

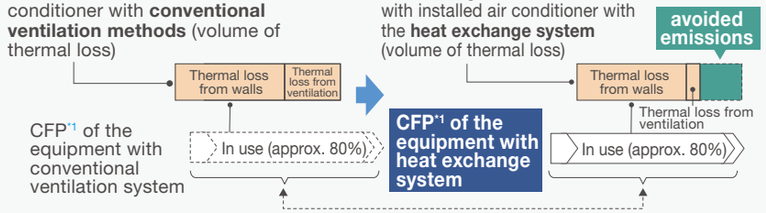
CO_2 emissions converted from power and fuel consumption per each sales region from the use of air conditioners in a residential house where the current average ventilation systems in the market is installed.

■Coverage of quantification (Way of thinking and its rationalization)

Difference 'in use' . 'in use' account for the dominant (approx. 80%) of the CFP[*1] of ventilators,, and effects from other than 'in use' are equivalent with other ventilators. Hence, we deemed that their CFPs when not 'in use' can be ignored.

CO_2 emissions equivalent to energy consumed by air conditioning in a residential house with installed air conditioner with **conventional ventilation methods** (volume of thermal loss)

CO_2 emissions equivalent to energy consumed by air conditioning in a residential house with installed air conditioner with the **heat exchange system** (volume of thermal loss)



Both systems ventilate same amount of air using a fan (i.e. CFPs[*1] are equivalent)

*1 **CFP** (Carbon Footprint of Products): CO_2 emissions converted from GHG emissions throughout the entire product life cycle—from raw material procurement to disposal and recycling of a product and service (per one unit).

■Amount of activities

The number of annual sales of heat exchange units, which is the core function of the system.

■Avoided CO_2 emissions per unit of amount of activities (Basic unit)

We calculated the average air conditioning load from an average ventilation method in the living space of a residential house in Japan using our simulation for each sales region.
We then determined the difference in the volume of energy consumed by system operation for air conditioning in living spaces between the conventional ventilation method and the energy exchanged method, and multiplied it by the CO_2 emission factors for electricity or fuel[*2] by each sales region.

*2 Kerosene was used as the fuel.

■Period (Flow method: Include entire lifetime CO_2 emissions of the product in its first sales year)

- Design life of the heat exchange system
- CO_2 emissions reduction effect continues during the period.

Others

Vacuum Insulated Glass

Product life stages subject to avoided CO_2 emissions

Raw materials > Manufacturing > Transportation > **Use** > Disposal/Recycle

Sales regions: **Japan**

■Overview

One effective means of achieving decarbonization in the consumer and business sectors is through reducing the air conditioning load at spaces in residential houses and offices by maintaining stable room temperatures through improvement of building insulation. According to our estimation, heat loss through the windows in all heat loss in an average detached house in Japan accounts for 30 to 40%. Our vacuum insulated glass (VIG) achieves high insulation while at the same time maintaining its thinness, that can be adopted for existing openings (windows) in buildings as they are. Therefore, VIG has a potential to offer high applicability to a wide range of room spaces in different types of both new and older buildings.

■Avoided CO_2 emissions mechanism

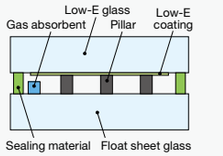
VIG shows significantly higher thermal insulation compared to those of single-pane glass and Low-E multi-pane glass.[*1] CO_2 emissions converted from the reduced amount of power of electricity required for operation of air conditioning equipment by installation of the VIG for glass material of buildings.

*1 The overall heat transfer coefficient, or U-value

1/4 of multi-pane glass

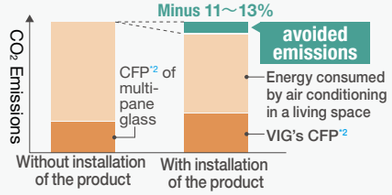
VIG: 0.7 w/ m²·k

Multi-pane glass: 2.9 w/ m²·k



Vacuum insulated glass structure

Comparison of CO_2 emissions from energy consumed by air conditioning in a residential house with/without VIG windows, taking account of the glass's CFP.[*2]



■Calculation formula of avoided emissions

Amount of activities | Avoided emissions for a given amount of activities | CO_2 emissions-related values and factors | Period

[Amount of activities] (m²)
Amount of VIG sold per year

× (Power consumed by air conditioning in a residential house with single-pane or Low-E multi-pane glass[*3] per year (kWh/ m²) − Power consumed by air conditioning in a residential house with VIG[*3] per year (kWh/ m²))

× CO_2 emission factor for electricity (kg CO_2 /kWh) × Period (Design life)

CO_2 emission factor for electricity Japan **0.487** kg/kWh (Source: IEA 2021)

Annual avoided emissions achieved by installation of 1 m² of VIG

*3 Calculated based on our simulation using data from the Architectural Institute of Japan.
*4 Calculated based on data from the Flat Glass Manufacturers Association of Japan, by Panasonic.

− (VIG's CFP*2, *4 (kg CO_2 / m²) − Single-pane or Low-E multi-pane glass's CFP*2,*4 (kg CO_2 kWh/ m²))

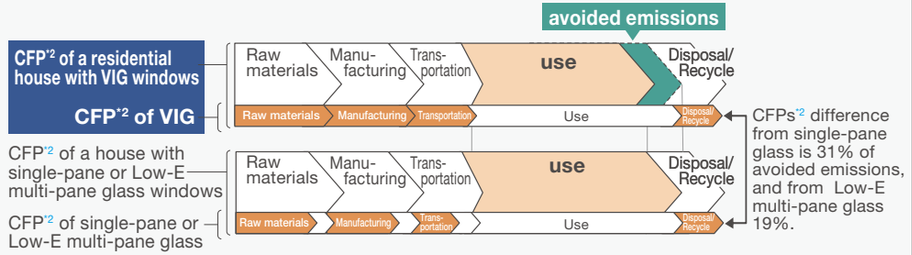
■Baseline (Subject to comparison)

CO_2 emissions converted from electricity consumed by air conditioning operations in the entire space of a residential house in Japan.

For the installation of VIG, it is set that VIG replaces single-pane glass when reforming a house, and replaces Low-E multi-pane glass when building a new house.

■Coverage of quantification (Way of thinking and its rationalization)

- In use: CO_2 emissions derived from electricity consumed by air conditioning in an entire residential house.
- Glass's CFP[*2]: VIG's CFP[*2] is greater than that of single-pane or Low-E multi-pane glass, however, there are no CO_2 emission from the glass in use.
  The difference between the CFPs[*2] from VIG and single-pane glass is 31% of avoided emissions, and the difference between VIG and Low-E multi-pane glass is 19% of avoided emissions. These differences were subtracted from the avoided emissions, instead of ignoring them.



■Amount of activities

Amount of VIG sold per year (m²)

■Avoided CO_2 emissions per unit of amount of activities (Basic unit)

- In use: Differences in electricity consumed by air conditioning in residential houses per different type of glass.
  * Annual power consumption was calculated by us, using a simulation of a two-story wooden house with a floor space of 120 m² based on standard weather data from the Architectural Institute of Japan using air conditioning heat load computing software.
- CFPs[*2] for glass: Calculated by ourselves, per type of glass based on data from the Flat Glass Manufacturers Association of Japan.

■Period (Flow method: Include entire lifetime CO_2 emissions of the product in its first sales year)

- Design life of VIG.
- CO_2 emissions reduction effect continues during the period.
- We deemed that the CO_2 emissions effects over the design life of VIG are conservative estimates as the glass could be used as long as the life of a residential house in Japan, which is generally longer than the glass life.

*2 **CFP** (Carbon Footprint of Products): CO_2 emissions converted from GHG emissions throughout the entire product life cycle—from raw material procurement to disposal and recycling of a product and service (per one unit).

Others

Home Delivery Communication Box

Product life stages subject to avoided CO_2 emissions

Raw materials > Manufacturing > Transportation > **Use** > Disposal/Recycle

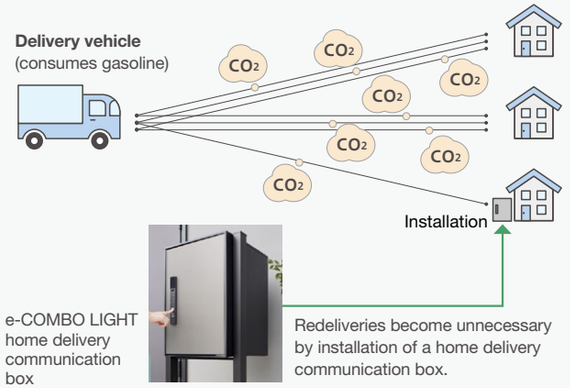
Sales regions: **Japan**

■Overview

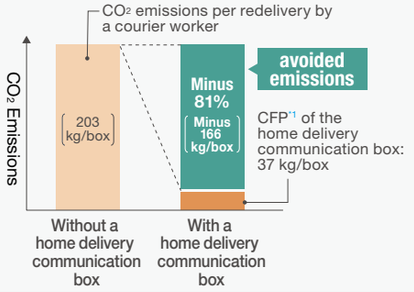
In the household business sector in Japan, because of increase in e-commerce trading and increase in the time when none is at home along with changes in lifestyle, load for distribution on couriers is on increase as the number of redelivery of goods increases. Installation of a home delivery communication box at home can avoid redelivery of goods, lowers the burden for the parcel receivers, and decreases the working hours of couriers workers. At the same time, it reduces CO_2 emissions from energy consumption such as fuel for deliveries, which contributes to reduction of load in local distribution networks and decarbonization.

■Avoided CO_2 emissions mechanism

Reduction of CO_2 emissions from energy consumption (combustion of fossil fuel such as gasoline) required for courier workers to redeliver goods, by avoiding redeliveries.



CO_2 emissions with and without one home delivery communication box
(CO_2 emissions from a vehicle on redelivery by the courier worker and CFP[*1] of the home delivery communication box)



■Calculation formula of avoided emissions

Amount of activities | Avoided emissions for a given amount of activities | CO_2 emissions-related values and factors | Period

[Amount of activities] (Units)
The number of home delivery communication boxes sold per year.

Avoided emissions per vehicle per redelivery (0.46 kg/redelivery) × **Annual number of redeliveries** (29.5 times/year) × **Period** (Design life of the product)

* Verified data by Ministry of Land, Infrastructure, Transport and Tourism (MLIT)

* Verified data by Panasonic

− **CFP[*1] of a home delivery communication box** (37.0 kg/box)

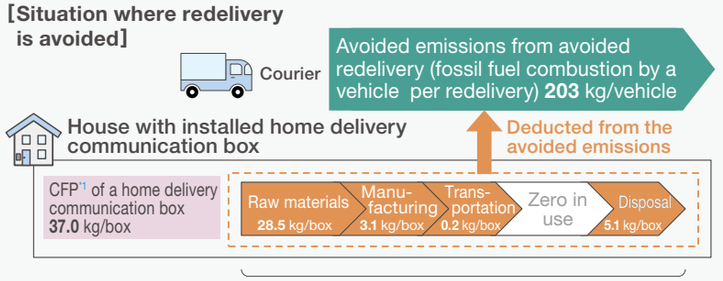
* Estimated by Panasonic

■Baseline (Subject to comparison)

CO_2 emissions converted from the average energy consumption from redelivery of goods by courier workers, in the case that the receivers of the goods did not receive the goods at the first delivery as they were not at home where a home delivery communication box is not installed.

■Coverage of quantification (Way of thinking and its rationalization)

When the box is in use (avoided emissions from avoided redelivery by installation of a home delivery communication box). Although the box emits no CO_2 when it is in use, the CFP[*1] of the box itself is 20% of entire avoided emissions (by our estimation). However, this was not included in the avoided emissions as it is an additional effect.



The CO_2 emissions occur additionally (Approx. **20**% of the avoided emissions)

■Amount of activities

The number of home delivery communication boxes sold per year

■Avoided CO_2 emissions per unit of amount of activities (Basic unit)

- Avoided emissions per redelivery: **0.46** kg (Source: Verified data by MLIT)
- The number of redeliveries: **29.5** times/year
  (Source: Verified data by Panasonic; actual measurement results obtained from 103 households in Awara City, Fukui Prefecture over 4 months)

■Period (Flow method: Include entire lifetime CO_2 emissions of the product in its first sales year)

- Design life of a home delivery communication box.
- CO_2 emissions reduction effect continues during the period.
- We deemed that the design life of the home delivery communication box is a conservative estimate for CO_2 emission effects as the box's life can be extended further with appropriate use and maintenance.

*1 **CFP** (Carbon Footprint of Products): CO_2 emissions converted from GHG emissions throughout the entire product life cycle—from raw material procurement to disposal and recycling of a product and service (per one unit).

Initiatives for Avoided CO_2 Emissions

Under the GHG Protocol, it is possible to calculate CO_2 emissions from our business activities; however, it does not take into account the contribution to society through our business (opportunities, i.e. business chance) as of now. On the other hand, although there is a concept of avoided emissions, as of now, the avoided emissions is not well recognized by society and no uniformed standard for the avoided emissions has been established. Therefore, it is a must to prepare an environment where the corporation's contribution to decarbonization is appropriately evaluated to further encourage corporate efforts (technological development and innovation) and thereby accelerate such activities to achieve carbon neutrality.

Our environmental vision, Panasonic GREEN IMPACT (PGI), sets out the CO_2 emissions reduction targets not only for our company but also for society as a whole. It is important for companies and financial institutions who share the same goals to work together to spread significance of the avoided emissions as 'a standard measurement' to evaluate the corporation's contribution to decarbonization efforts and increase recognition of the avoided emissions. Therefore, we are currently implementing the following activities regarding the avoided emissions towards its global standardization, increase of its recognition and making the avoided emissions well known.

Standardization

International Electrotechnical Commission (IEC)

In March 2023, activities of standardization of a new IEC standard started with Japan's proposal. The activities includes calculation of the avoided emissions from new technologies, such as AI, IoT, and a digital twin; providing requirements for calculation methods; and establishment of requirements for communications and information disclosure. The members have been working on the finalized standard to be published in 2024 as "IEC63372: Quantification and communication of GHG emissions and emission reductions/ avoided emissions from electric and electronic products, services and systems - Principles, methodologies, and guidance". The Panasonic Group members has been involved in the above activities since their initial stage.

World Business Council for Sustainable Development (WBCSD)

WBCSD is a global organization with members of some 200 forward thinking companies who aim at sustainable development; the members are collaborating each other to contribute to transformation to sustainable society. Endorsing the principles of WBCSD, Panasonic Holdings Corporation (PHD) became a member of WBCSD in 2022 to accelerate the Panasonic Group's PGI activities. We participated in creating 'the Guidance on Avoided Emissions' which was published in March 2023. Now, we are working to revise the guidance.

Panasonic Holdings Joins WBCSD (World Business Council for Sustainable Development)
https://news.panasonic.com/global/press/en221007-2

GX League*

Six leading companies in the GX League, including PHD, along with 73 league members, participated in the GX Business Working Group (hereafter, GXBWG) for 'rulemaking to create markets' that is one of activities of GX league. GXBWG announced 'the Guidance on Avoided Emissions' in March 2023 to establish an appropriate system to evaluate CO_2 emissions and the like by the products and services Japan's companies provide to markets towards achieving global carbon neutrality. In 2023, GX League published 'the Guidance on Avoided Emissions'.

* GX stands for 'Green Transformation'. In February 2022, the Industrial Science and Technology Policy and Environment Bureau of the Ministry of Economy, Trade and Industry (METI) announced the GX League Basic Concept. GX League was launched as an apparatus where the company groups who are proactively working for GX with players in industry, government, academia and financial institutions who challenge towards GX as a whole to discuss transformation of a whole society, economic and environmental system and implement activities to create new markets.

Establishment of the GX League Business Working Group and Appointment of PHD as a Leader – Building a Framework and Promoting Evaluation and Disclosure on Climate-Related Opportunities
https://news.panasonic.com/jp/topics/204865

Promotion of avoided emissions in international events

Global Green Transformation Conference

In the Global Green Transformation Conference 2022 (GGX 2022) held by Japan's METI in October 2022, we advocated the significance of the avoided emissions to appropriately evaluate companies' contribution to decarbonization and increase its global recognition.

Introduce a new corporate evaluation framework based on the contribution to decarbonization – GGX 2022
https://news.panasonic.com/jp/stories/13109

International Capital Market Association (ICMA)

'The annual Sustainable Bond Conference 2022' was held in November 2022, jointly hosted by the International Capital Market Association (ICMA) and the Japan Securities Dealers Association (JSDA). At this conference, based on the management policy to solve social issues through business activities, the Panasonic Group announced it would further increase its avoided emissions through the business, considering finding solutions for global environmental issues as urgent matters with the highest priority. Taking batteries for electric vehicles as an

example, we emphasized the significance of being valued for increase of avoided emissions because of the spread of eco-conscious vehicles (opportunity), not only from the viewpoint of controlling of increasing CO_2 emissions that would increase along with increase of production volume (=risks).

■ 2022 United Nations Climate Change Conference (COP27)

In November 2022, in a seminar at COP 27 with a theme of the avoided emission, the Panasonic Group gave presentation on the background and purpose of PGI, as well as the significance of the avoided emissions and related issues. With the other panelists, discussions were made on how to establish a standardized measurement method for the avoided emissions not to be considered 'Green Wash' i.e. a company superficially presents its environmentally responsible public image, while securing transparency and reliability Then, the discussion went on how companies would be evaluated in an opportunity for companies evaluation.

■ Consumer Electronics Show (CES) 2023

In the CES 2023 press conference held in January 2023, we explained that we were working on standardization of calculation methods of the avoided emissions through our participation in WBCSD and IEC, and called for joining to support the standardization.

WEB **Panasonic Group to showcase technologies and products that contribute to reducing CO_2 emissions and resolving environmental challenges at CES 2023**
https://news.panasonic.com/global/press/en230105-4

Environmental Governance

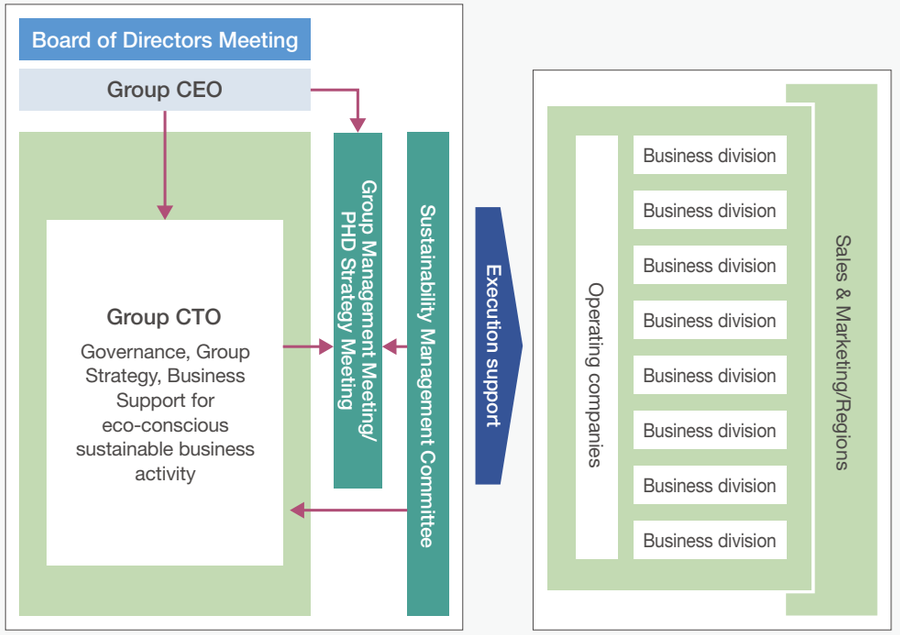
Promoting Group-wide Environmental Sustainability Management Centering on PDCA

Striving for the creation of a sustainable society, we are following our initiative under the Group Chief Technology Officer (CTO) (Tatsuo Ogawa Executive Officer, as of April 2022) and working to fulfill our corporate social responsibility through eco-conscious business activities as well as resolve environmental issues such as climate change, resources, water, etc. through our products and services. The Panasonic Group formulates its annual environmental management policy in accordance with the Group's management policy, "Panasonic GREEN IMPACT"—our long-term environmental vision announced in fiscal 2023, our Environmental Action Guidelines and the GREEN IMPACT PLAN 2024—our environmental action plan. Our environmental policy is shared annually across the entire organization through the policy presentation led by the Group CTO, who is delegated authority by the Group CEO. Operating companies and business divisions establish their own environmental policies and targets based on the Group management policy and "Panasonic GREEN IMPACT", and plan and promote their activities accordingly. The progress and results of activities for the key environmental targets we pledged to society to achieve under the Environmental Action Plan, GREEN PLAN 2024 are examined and determined on the directions, issues, and particularly key measures in the Group Management Meeting where top management such as the Group CEO and presidents of the operating companies participate. Matters of special importance are deliberated on by the Board of Directors Meeting.

Panasonic GREEN IMPACT, our Group's long-term environmental vision as stated above, was put through this process and was released in April 2022. In promoting our environmental sustainability management activities in Panasonic Group, we have built a structure to promote implementation of such activities collaborating other departments in the entire Group through determination by the Sustainability Management Committee (established in December 2021) led by the Group CEO. For activities organized by theme, we have set up committees specifically for dissemination of our environmental policy and targets to all members of the Group without fail, deliberation on how to respond to issues, and chemical substances management used in our products. We started our Sustainable Management Promotion Consortium activities in September 2020 as opportunities for volunteers to resolve sustainability issues and integrating business growth, which are underway, building consultative reporting ties with the Sustainability Management Committee as mentioned above. (approx. 650 participants)

In principle, results of activities relevant to environmental targets are gathered and assessed on a monthly basis as environmental performance data, to identify the achievements, and additional measures are taken as needed. Feedback of annual performance data is given internally and disclosed externally after review, onsite audits, and independent assurance by a third-party. Moreover, reviews and feedback from stakeholders are utilized in subsequent measures to ensure further continuous improvement.

Promotion System of Environmental Sustainability Management in Fiscal 2023



* See page 5 for more details on Promotion System of Sustainability Management

Environmental Management Systems

Implementation of Environmental Sustainability Management Based on Environmental Management Systems (EMSs)

As the foundation of environmental sustainability management, Panasonic Group set up EMS at all of our manufacturing sites across the world in fiscal 1999, and has continued to have the respective sites ISO14001 certified since then.

Moreover, in order to further strengthen the environment management world-wide, we set up EMS also at all of our nonmanufacturing sites; in principle, the respective sites also have obtained ISO 14001 certification. In October 2011, we published the Environmental Management System Establishment Guidelines that summarizes the EMS concepts for different business forms such as manufacturing, sales and services, and head office administration, aiming to build the EMS in accordance with the Basic Rules for Environmental Affairs on a global scale. Based on the Guidelines, we are implementing Environmental Sustainability Management to achieve the targets set in the Green Impact Plan 2024.

Panasonic Automotive System Co., Ltd., Panasonic Industry Co., Ltd. and Panasonic Energy Co., Ltd. provide seminars for their members to learn the basics of the EMS, and training for auditors to work at different levels, such as internal and chief auditors. Because of the COVID-19 pandemic, training programs that took a group-based format in the past have held remotely since fiscal 2021. The remote training scheme has enabled employees who could not find sufficient time to attend the program to participate actively, resulting in highly effective training. Internal audits held by operating companies have been also conducting remotely, both preventing COVID-19 infection and improving site management.

Acquired status of the ISO 14001 Certification (as of March 31, 2023)

Region	Number of certifications obtained*1		Total
	Manufacturing	Non-manufacturing	
Japan	19	10	29
North America & Latin America	14	0	14
Europe & CIS	7	1	8
Southeast Asia, & Oceania	39	8	47
China & Northeast Asia	43	1	44
India, South Asia, Middle East & Africa	6	1	7
Total	128	21	149

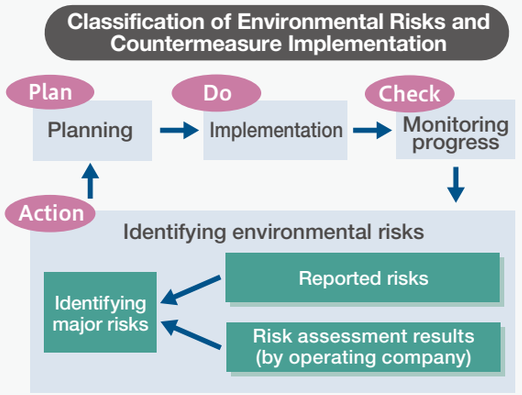
*1 The above number includes the one for integrated certification. The number of acquired status varies every year depending on the situation such as reorganization or closure of BDs, or promotion to acquire integrated certification.

PDF **Obtaining of ISO 14001 Certification**
https://holdings.panasonic/jp/corporate/sustainability/pdf/eco_isolist2022.pdf

Environmental Risk Management

Group-wide Systems to Manage Environmental Risks

As a tool to continuously reduce environmental risks, Panasonic Group has established an Environmental Risk Management System specific to each operating company. In accordance with the basic risk management policy for all Panasonic group operating companies (see pages 130-131), we promote (1) identification of environmental risks and group-wide risk management each year, and (2) ensuring quick responses to reported environmental risks.



To identify environmental risks and implement the management system, environmental risks are identified for each operating company and for each region in the world each year. From these risks, environmental risks on a Panasonic group-wide level are selected. The risks that show a high level of frequency or seriously impact business management are designated as major risks and prioritized in planning and executing risk reducing measures. These measures are implemented for each major risk, and progress is monitored and followed up on a quarterly basis in the PDCA cycle.

When an environmental risk is found, the relevant operating company, related job functions, and local companies collaborate to promptly implement emergency measures and recurrence prevention measures adapted to the risk level. Also, the management flow in case of risk discovery is standardized to prevent the occurrence of secondary risks as a result of confusion.

Environmental Compliance Management at Factories

Panasonic Group manages environmental systems in full compliance with laws and regulations. We regularly measure emissions of gas, wastewater, noise, odor, etc., and introduce preventative measures for cases that may lead to serious violations. Furthermore, key human resources are developed for information sharing among the operating companies/business divisions, environment-related job functions, and local companies, to ensure exhaustive compliance with legislation related to factory environment management in respective countries where our manufacturing sites are located. Specifically, activities to share information as well as specialized training are conducted for factory management officers in charge of the management of chemical substances, waste, wastewater, and exhaust gas, either by country or by region in Japan, Europe, China, and Southeast Asia. Field surveys on laws and regulations using checklists were conducted on a global scale to confirm comprehensive implementation of environmental compliance, and we also conducted verification of the effectiveness of various measures.

As a result of these measures, there were 3 violations of environment-related regulations across the world in fiscal 2023. In response to the violation, we promptly reported the violation to the authority, and at the same time, implemented measures against the causes to fulfill the criteria. We continue our efforts for thorough legal compliance and the prevention of any recurrence.

Case of Violations of Laws and Ordinances (e.g. excess of the standard legal level) in Fiscal 2023

Region	Environmental pollution					Other	Total
	Air	Water quality	Noise	Odor	Waste	Permission / Approval	
Global (including Japan)	2	0	0	0	0	1	3
(Japan)	(0)	(0)	(0)	(0)	(0)	(0)	(0)

Compliance with Environmental Regulations Relating to Products

We manage compliance with regulations relating to our products through a quality management system. Compliance with regulations is ensured with our Products Assessment System, a mechanism which incorporates environmental performance targets such as customer demands for environmental performance, the energy efficiency labeling program, and third-party certification systems, as well as evaluation of compliance with regulations on chemical substance management, energy efficiency, 3R, and recycling, to (1) set up overview for achieving targets at the product planning stage, (2) define concrete targets at the design planning stage and confirm compliance at the design stage, (3) conduct interim assessment at the design completion stage, and (4) conduct final assessment at the mass production decision-making stage. In compliance with the RoHS regulations on 10 hazardous chemical substances, regular acceptance inspections are being conducted for purchased parts and goods and our suppliers are audited under our environmental quality assurance system. These are designed in cooperation with our suppliers to improve the management of chemical substances in our products. Unfortunately, there were once again violations of the regulation regarding restricted substances in our products in fiscal 2023. We will take further action to ensure that our compliance management is comprehensive to prevent any recurrence.

Measures Against Soil and Groundwater Contamination and Air Pollution

In the latter half of the 1980s, soil and groundwater contamination due to chlorinated organic solvents was detected at some Panasonic group sites. In response, we have conducted anti-contamination activities across the Group. Specifically in 1991 we created the Manual for Preventing Contamination of Soil and Groundwater and began conducting necessary surveys and measures. In 1995 we discontinued the use of chlorinated organic solvents, and in 1999 created Guidelines on the Prevention of Environmental Pollution to ensure there would be no recurrence of similar problems at our sites. In fiscal 2003 we began enhancing our surveys and measures to comply with relevant laws and regulations, including the Soil Contamination Countermeasures Act, which was enforced in Japan in 2003, and in fiscal 2004 started implementing measures to place all our bases across the globe under management supervision with regard to soil and groundwater. Specifically, we conduct onsite inspections and interviews at the bases, in addition to surveying their use of volatile organic compounds (VOCs) and heavy metals. Furthermore, we implement surface soil surveys within the premises. For the sites where contamination was detected beyond the regulatory pollution standards, we conduct detailed borehole surveys to identify the boundaries of the contaminated areas and take remedial measures.

As a result of these efforts, we were able to place all our bases under management supervision in 2008. Furthermore, in fiscal 2011, the management supervision scheme was purpose-specifically reorganized and reinforced to establish a new management supervision scheme. With the highest priority given to preventing dispersion of pollution beyond our premises, this new scheme is implemented across all operating sites to further improve the level of measures against contamination.

Soil and Groundwater Risk Management Policy

Conditions subject to management supervision	Procedure
Pollution dispersion prevention beyond Panasonic premises	1. Conduct historical surveys 2. Determine and install monitoring wells at the premises' borders 3. Analyze groundwater at the borders 4. Check possibility of pollution from external sources 5. Report to management department 6. Determine the external pollution dispersion prevention methods 7. Install the external pollution dispersion prevention methods 8. Install assessment wells 9. Begin assessments (monitoring)
Thorough pollution source elimination	10. Conduct brief status check 11-1. Horizontal direction detailed analysis 11-2. Vertical direction detailed analysis 12. Determine the magnitude of pollution 13. Discuss the areas and methods of purification 14. Conduct purification and install pollution dispersion prevention measures 15. Monitor pollution source (groundwater) after purification 16. Report purification completion to management department

Soil and Groundwater Pollution Surveys and Remedial Measures for Fiscal 2023

Region	Number of sites that completed remedial measures	Number of sites currently taking remedial measures
Global (including Japan)	1	42
Japan	(1)	(37)

In addition to the above, Panasonic Group is implement measures for air pollution.

The efforts made in factories are as matters of course, we are working as a company to comply with the Act Concerning Special Measures for Total Emission Reduction of Nitrogen Oxides and Particulate Matter from Automobiles in Specified Areas (Act No. 70 of 1992), which regulates nitrogen oxides and particulate matter emitted from company cars owned and/or managed by Panasonic Group. The company cars owned and/or managed by Panasonic Group business sites in Japan are centrally managed on the group-wide vehicle management system. Annually required reports are submitted through the vehicle management system. Also each business site undertakes thorough regular vehicle checkup and fuel economy management on these cars, as well as taking the initiative in reducing air pollution, such as by advising employees on eco-driving techniques and hosting related workshops, and promoting introducing hybrid cars.

Initiatives for PCB Pollution

Our initiatives for PCB pollution are introduced on the following website.

WEB https://www.panasonic.com/global/corporate/sustainability/eco/governance/risk.html

Response to TCFD

Panasonic Group endorsed the TCFD recommendations*1 in May 2019. As Panasonic Group recognizes risks and opportunities concerning climate change as a critical management issue, we identify our business risks and opportunities and verify business resilience and strategy by thoroughly analyzing the scenarios, considering the TCFD's recommendation. We also disclose information on thematic areas recommended by TCFD, i.e. 'governance', 'strategy', 'risk management', and 'indices and targets', assuming future engagement with investors, etc.

*1 TCFD: an abbreviation of Task Force on Climate-related Financial Disclosures. The task force was set up by the Financial Stability Board (FSB) in response to a request by the G20 Finance Ministers and Central Bank Governors. TCFD published its recommendations in 2017.

Governance

Panasonic Group system to promote group-wide environmental sustainability management is headed by board of directors, so that information on group-wide environmental sustainability management from all of the operating companies are reported to the board of directors.

Also, the progress and results of activities for the key environmental targets we promised to society to achieve under the GREEN IMPACT PLAN 2024 (GIP2024) are examined and determined on the directions, issues, and particularly key measures in the Group Management Meeting where Group CEO, presidents of operating companies, and senior managers participate. Matters of special importance are deliberated on by the Board of Directors Meeting.

Our long-term environmental vision "Panasonic GREEN IMPACT (PGI)", was put through this process and was released in April 2022. In promoting our environmental sustainability management, we have built a system with which all operating companies and business sites members effectively collaborate and promote group-wide activities through determination by the Sustainability Management Committee (established in December 2021) led by the Group CEO. For activities organized by theme, there are specific committees for disseminating our environmental policy and targets to all members in the Group, for deliberating on how to respond to issues, and for managing the chemical substances used in our products.
See page 23 for more details.

Strategy

We analyzed impacts on certain items of Panasonic Group Businesses that are likely to affect climate change, based on our assessment of the risks and opportunities in Panasonic Group business operations. The results were used to develop a social scenario for the year 2030, focusing on matters with the greatest impact. We then used the scenario as the basis for examining strategies, and verified the business resilience in our strategy.
See pages 30-33 for more details.

Panasonic GREEN IMPACT (PGI) is our transition plan to low-carbon economy as a Panasonic group. To support this transition, we have set up short-term targets in our Green Impact Plan (GIP) 2024. We have also set out following medium-term targets.

- Make our total CO_2 emissions (Scope 1 and Scope 2) net-zero by 2030.
- Reduce CO_2 emissions from use of our products that Panasonic Group sold by 30% compared with the 2019 level by the year 2030.

We would like to introduce specific examples as our contribution to energy reduction and energy transformation in society.

The first is an example of our energy reduction activities for product use in Scope 3; that is, action on lighting equipment that emit large volumes of CO_2. In addition to the conventional lighting that is designed to "light up a plane" such as a floor or desktop, by using an index for 'feeling of brightness in space' and knowhows of "optical control technology" and "spatial presentation with proper lighting at a right place" that are developed based on our accumulated research results on comfortability, we will achieve energy reductions of up to 30% without compromising comfort.

The next is an example of our contribution to energy transformation in society through electrification. To speed up energy transformation in society, the demand side must itself push for electrification by replacing fossil fuel-fired equipment with electric devices. For instance, the heat pump water heater is capable of warming up water by using a heat pump to collect heat from the air efficiently, minimizing the electric power consumption. The heat pump can be used not only in new houses, but also in existing houses that use oil or gas-fired boilers without replacing the pipework. Electrification increases opportunities to make effective use of electric power derived from renewable energy sources. In addition to that frequency of utilizing opportunity to use energy derived from renewable energy sources increases thanks to the electrification, storing unstable supply of renewable energy as the warm water enables energy time shift and mitigates the load on the power grid, thus contributing to wider use of renewable energy resources.

PDF **Panasonic's Sustainable Management (Group CEO Briefing, January 2022)**
https://holdings.panasonic/global/corporate/investors/pdf/20220106_sustainability_e.pdf
See pages 41-44 for initiatives for Scope 1 and Scope 2.

Risk Management

As a tool to continuously reduce environmental risks, Panasonic Group is working to establish operating company-specific Environmental Risk Management Systems, in accordance with the basic risk management policy for all Group companies (see pages 130-131). The management policy includes (1) identification of environmental risks and group-wide risk management each year, and (2) ensuring quick responses to reported environmental risks. In addition, The Panasonic Group is promoting risk management based on the same process at Panasonic Holdings Co., Ltd. (PHD) and operating company. The PHD Enterprise Risk Management Committee conducts deliberations from the perspective of the Group's management and business strategies and social responsibilities, and decides the Group's significant risks.
In FY2024, strategic risks in Panasonic Group's significant risks such as climate change, environmental regulations and development of circular economy, and operational risks such as earthquakes, tsunami, flood and landslides have been addressed.
See page 25 for more details.

Metrics and Targets

The Panasonic Group has set its medium- to long-term target for reducing greenhouse gas emissions, was accredited SBT*2 2.0°C in October 2017. Furthermore, in May 2023, our new greenhouse gas emissions reduction target was accredited as SBT 1.5°C.

*2 SBT: an abbreviation of Science Based Target. It is a target to reduce GHG emissions in consistent with scientific knowledge toward the goals to limit the increase of global temperature to less than 2.0°C above pre-industrial levels.

GHG emissions reduction targets (SBT 1.5°C accreditation)

	Targets	Progress rate
Emissions from Panasonic Group business activities (Scope 1 and 2)	Reduce 90% by 2030 (compared to FY2019)	23%
Emissions from use of Panasonic Group products (Scope 3)	Reduce 30% by 2030 (compared to FY2019)	—*3

*3 Progress rate not calculated due to increase in emissions because of expansion of products subject to calculation (see page 13)

Moreover, regarding indices related to climate change, we are discussing to set targets for following each item.

• Transition risk

In response to a rise in the awareness of environmental issues, we are particularly focusing on the risks associated with the introduction and expansion of environmental regulations and policies in the international community. The rise in energy procurement costs, forced purchase of emission credits, increase in manufacturing costs because of switching to use materials with lower environmental impact, and commoditization of low-carbon products, resulting from the introduction of carbon pricing, such as a carbon tax and the Emission Trading System, are all may adversely affect our Group's business operations and performance. In addition, any delay in taking action to take measures against these environmental issues may lead to a loss of business opportunities to expand in the European and other markets as well as a loss of business opportunities as a result of trade halts. Furthermore, our drive to use tax deductions, subsidies and other methods to gain business opportunities under regulatory systems for energy security assurance and climate change measures in these countries may adversely affect our Group's business since we will not be able to receive fruitful results as we expected.

• Physical risk

Each operating company assesses and monitors natural disaster risks, as well as their emergency responses to those risks. Each operating company also established financial assessment standards on the scale of the impact of the potential risks, rating the risk as high when the impact is more than 10 billion yen and as medium or low according to the impact risk.

• Climate-related business opportunities

As the target set under our PGI announced in April 2022, we will strive to reduce CO_2 emissions, with a aim of by 2050, achieving reduction impact of more than 300 million tons that is 'approx. 1%' of the total CO_2 emissions discharged all over the world as of now, through group business activities.

In addition to our business operations in automotive battery business for environmentally friendly vehicles, aiming to reduce huge amount of CO_2 emissions and activities to reduce CO_2 emissions by the air quality and air conditioning business in Europe, in 2022 we started up an experimental facility under 'our RE100 solution' that had been designed to supply 100% of the power needed for a fuel cell manufacturing plant with renewable energy from hydrogen and photovoltaic power generation,*4, aiming at locally producing energy and consuming the energy locally.

• Capital allocation

Panasonic Group plans to invest 600 billion yen for the three years from 2022 to 2024 under

our medium- and long-term business strategies, mainly in automotive battery business that is in our priority investment areas.. Following the investment in automotive battery business, we have air quality and air conditioning business and supply chain management software business that we invest in our priority investment areas.

Our automotive battery business will play a central role for PGI by developing a supply chain with lower environmental impact and increasing avoided emission by such business growth As for our air quality and air conditioning business, we plan to expand the business in the European market where measures against climate change have been implemented, by focusing on air-to-water systems that will contribute to reducing CO_2 emissions. As for our supply chain management software business, we will contribute to reducing the environmental impact by eliminating waste and delays in the supply chain.

PDF **Panasonic Group Strategy Briefing by Group CEO (May 18, 2023)**
https://holdings.panasonic/global/corporate/investors/pdf/20230518_groupstrategy_e.pdf

• Internal carbon pricing

Panasonic Group introduced internal carbon pricing in March 2022 for capital investment, with a setting the price of CO_2 emissions at 6,000 yen per ton.*5 We plan to increase the installation of energy-saving facilities and renewable energy-fueled equipment, including photovoltaic power generation, while maintaining economic rationality that is consistent in the future, by considering the impact of future carbon taxation and the like. As for further expansion in the scope of our activities and price setting, we will determine in line with our business decisions.

• Remuneration

Since April 2022, we have adopted a new performance evaluation system for executive remuneration of directors and executive officers of the holding company and of the presidents of the operating companies. The evaluation items for performance-based remuneration include those related to sustainability viewpoint such as environmental contributions. One of the examples of the contribution to our environmental performance index is reduction of CO_2 emissions in our own value chain.

*4 See WEB https://news.panasonic.com/global/press/en220427-1

*5 Subject to change because of market conditions

Strategic Resilience through Scenario Analysis

To verify the strategic resilience of our business, Panasonic Group initially analyzed their impacts of climate change risks and conducted a scenario analysis based on the result of the impact analysis.

In the course of the impact analysis, we listed every possible impact on our business from climate change or measures against climate change, and then identified the risks and opportunities brought by such impacts by Panasonic Group's major businesses. The following table lists risks and opportunities by business, and integrated results of the different impacts of climate change (Table 1).

Table 1 Extracted Risks and Opportunities

			Risks	Opportunities
Transitional risks	Policies/laws and regulations	Acceleration of carbon pricing	- Energy procurement costs increase. - Competition from low-carbon businesses intensifies toward carbon neutrality.	- Energy procurement costs stabilize because of increased demand for renewable energy. - Businesses related to fuel cells, energy-saving products, solution services, and energy management expand.
		Accelerated shift to electric vehicles	- As more firms enter the automotive business, competition intensifies. - Increased demand for automotive batteries intensifies material procurement competition. - Higher cost of automotive batteries production reduces car business profitability and pressurize costs of components.	- Electric vehicle-related markets expand.
	Reputation	Increased environmental awareness among consumers	- Insufficient environmental efforts and promotion lead to unsupported by consumers. - Value shift from purchasing to leasing decreases sales.	- Recognition as a sustainable company and of sustainable products attracts more customers. - Businesses related to low-carbon products, eco materials, and energy management expand.
		Increased risk to reputation	- Insufficient efforts in decarbonization reduce business opportunities.	- Recognition of environmental technologies and products increases business opportunities.
	Technologies	Expansion of renewable energy usage	- Investment in facilities with renewable energy increases.	- Highly efficient solar cells open new markets.
		Expansion of carbon-free power generation	- Production energy procurement costs increase. - Regional disparity of carbon-free power generation lead to review the strategies of production sites.	- CO_2 emissions reduction throughout product lifecycles encourages shift to electric vehicles leading to related market expansion.
		Spread of ZEH/ ZEB	- Low-carbon products in housing equipment become mere commodities.	- Increased opportunities to provide energy management & total solution services through housing equipment and home appliances. - Demand for heat insulation materials increases.
		Replacement with low-carbon products	- Increases development costs of lightweight and robust materials for competitive low-carbon products.	- Increases demand for materials that contribute to reduction of energy consumption.
		Streamlining of supply chain	- Expanded capital investment puts stress on balance sheet.	- Demand for energy management systems increase. - Lowered prices from reduced production costs increase sales.
	Markets	Response to depletion of resources	- Delay in recycling and reuse technologies increases costs. - Resource recycling does not suit consumers' tastes.	- Business models change to circular economy- based models. - Demand for recycled resources increases.
Physical risks	Chronic	Constant temperature rise	- Poor health of employees reduces productivity. - High energy consumption from excess usage of air conditioners puts off consumers.	- Businesses related to healthcare, air conditioning and ventilation, energy management, housing, and cold chain expand.
	Acute	Physical risk management related to climate change	- Suspension of operations at our factories. - Negative impact on supply chain.	- Demand for needs of resilient infrastructure increases. - Fuel cell business with resilience expands. - Disaster-resilient manufacturing by managing risks with BCPs.

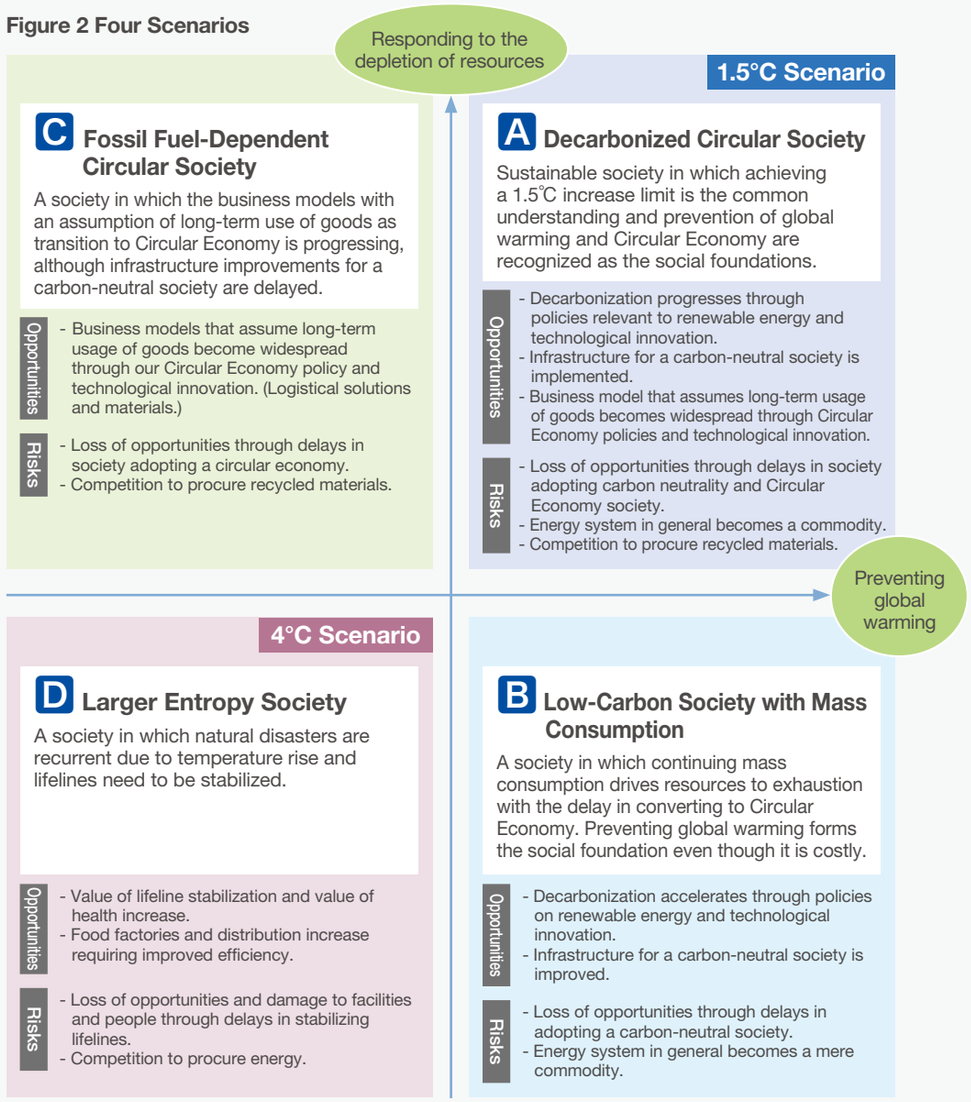
The following figure shows the impact analysis results of climate change risks (Figure 1) regarding the results of analyzed factors based on the identified risks and opportunities and analyzed impact on our businesses.

Figure 1 Impact Analysis of Climate Change Risks

Risk categories related to climate change		Strong	Impact on our businesses	Extremely strong
Transitional risks	Markets			● Response to depletion of resources
	Policies/laws and regulations		• Acceleration of carbon pricing	• Progressive shift to electric vehicles → ● Prevention of global warming
	Technologies	• Expansion of carbon-free power generation	• Expansion of renewable energy usage • Replacement with low-carbon products • Streamlining of supply chain	• Spread of ZEH/ZEB
	Reputation		• Rise of environmental awareness among consumers • Increase of reputational risks	
Physical risks	Acute		• Physical risk management related to climate change	
	Chronic	• Constant temperature rise		

We extracted "response to depletion of resources" and "prevention of global warming" from the climate change viewpoint and identified their materiality as factors that have an extremely high impact on our business. Setting these two factors as the axes of a matrix, we created four scenarios toward 2030 in the following quadrants (Figure 2). We defined a society in which global warming is prevented and response to depletion of resources is taken as 'the 1.5°C scenario', and a society in which global warming is advanced and resources are depleted as 'the 4°C scenario'.

Figure 2 Four Scenarios



The society named as a A Decarbonized Circular Society is equivalent to the 1.5°C scenario. If A continues to deplete resources, society becomes a B Low-Carbon Society with Mass Consumption. If A increases global warming, society becomes a C Fossil Fuel-Dependent Circular Society. Scenario D a Larger Entropy Society is equivalent to the 4°C scenario.

Fuller descriptions of each set of social conditions are given below.

A Decarbonized Circular Society

● **Impact on industries**

Concurrent progress of legislation and technological innovation related to preventing global warming and creating a circular economy help to form a related infrastructure for a carbon-neutral society and Circular Economy. This encourages investment in decarbonization in automotive and real estate industries, and advances the shift to business models that assume long-term use of goods in industries involved in the supply chain. It is also expected that not only products but also the construction of sustainable towns designed for carbon neutrality and Circular Economy will attract investment.

● **Changes in customer value**

Consumers: Eco-consciousness, cost reduction, ethical, on-demand usage, etc.

Corporations: Eco-consciousness, cost reduction (energy saving, asset-light approach, better fuel efficiency, etc.), effect and efficiency enhancement (maximization of customer value, i.e. better experience value, etc.).

B Low-Carbon Society with Mass Consumption

● **Impact on industries**

Progress of carbon-related legislation (NEV/ZEV laws and ZEH/ZEB subsidy policies, etc.) and technological innovation (reduced cost of renewable energy and storage batteries, etc.) encourages standardization for decarbonization in the automotive and real estate industries and attracts investment. This helps the shift to electrification and a renewable energy infrastructure. Adoption of renewable energy and hydrogen also expands.

● **Changes in customer value**

Consumers: Eco-consciousness, cost reduction (energy saving, better fuel efficiency, etc.).

Corporations: Eco-consciousness, energy saving and better fuel efficiency (downsizing, weight-reduction, high density and capacity, high efficiency, etc.).

C Fossil Fuel-Dependent Circular Society

● **Impact on industries**

Progress in technological innovation of waste plastic and for a circular economy (data linkage, material recycling, etc.) and their related legislation eliminate waste in the supply chain and encourage a shift to a circular economy. Corporations involved in the supply chain (manufacturers, distributors, etc.) change their business models from sales and consumption-based models to those that assume long-term usage of goods, including leasing, sharing, and repair. Products made of recycled resources become mainstream backed up by the formation of waste collection networks and material recycling systems.

● **Changes in customer value**

Consumers: Eco-consciousness, ethical, on-demand usage, etc.

Corporations: Effect and efficiency enhancement (maximization of customer value, i.e. better experience value, etc.), cost reduction (energy saving, asset-light approach, etc.).

D Larger Entropy Society

● **Impact on industries**

Changes in rainfall amounts and patterns make it difficult to control the yield and quality of agricultural products. This encourages a shift to demand and supply matching consumption, which eliminates waste in distribution. Deterioration of living and working environment and increases in illness due to constant temperature rises expand demand for companies related to indoor environments and health (building, home appliances, healthcare, etc.). In response to the increase in natural disasters, investment in infrastructure resilience to maintain the supply chain will increase.

● **Changes in customer value**

Consumers: Lifeline stabilization and resilience enhancement, health.

Corporations: Productivity enhancement, demand and supply matching, supply chain resilience.

We can address the risks and opportunities corresponding to the above scenarios through any of our seven main operating companies shown below.

1. Panasonic Corporation
   (Home appliance business, Air quality and air conditioning business, Food distribution business, Smart Energy System business, Electrical facility materials business)
2. Panasonic Automotive Systems Co., Ltd.
3. Panasonic Connect Co., Ltd.
4. Panasonic Energy Co., Ltd.
5. Panasonic Industry Co., Ltd.
6. Panasonic Entertainment & Communication Co., Ltd.
7. Panasonic Housing Solutions Co., Ltd.

For each type of society, we have formulated strategies for our seven operating companies from the viewpoint of climate change. Some of the strategies are listed below, with the applicable society type indicated by the corresponding scenario from A to D.

1. Panasonic Corporation

1-1 Heating, Ventilation, Air Conditioning (HVAC) System Business

• Provide the optimum and highest air and water quality values with low environmental impact, not found in conventional air conditioning, with a combination of our unique air and water technologies.	A B C D
• Create unprecedented value with water and air heating systems with heat pump (A2W), chillers, and combination of air quality and air conditioning in the air conditioning business of water circulation type to contribute to improvement for decarbonization and air quality values.	A B C D

1-2 Overseas Electrical Construction Materials Business

• Provide a sustainable and safe and secure facility infrastructure based on our wiring fixtures to contribute to electrification and disaster-resilient society with zero environmental impact in the world.	A B C D

1-3 Energy Solutions Business (Hydrogen Related Businesses)

• Achieve local production for local consumption of energy by developing a decentralized energy package business utilizing hydrogen	A B D

1-4 Home Appliances Business in Japan

• Build a circular value chain with customers through products and services.	A B C
• Achieve extension of the product life cycle and improve customer engagement looking ahead of circular economy.	A C

2. Panasonic Automotive System Co., Ltd.

• Contribute to electrification of vehicles through power chargers with high output using power electronics technology and devices that improve vehicle's weight saving and rate of electricity consumption.	A B C D
• Promote to make own products more energy efficient and further expand the range of products that use recycled resin materials.	A B C
• In our sites that achieved net zero CO_2 emissions, we are further reducing energy usage through energy-saving activities and increasing the ratio of non-external dependency on renewable energy supply.	A B

3. Panasonic Connect Co., Ltd.

• Reduce waste energy and waste goods by supply chain orchestration, including streamlining corporate customers' logistics and responsive tuning of demand and supply.	A B
• Offer solutions to improve energy efficiency and automation at corporate customers.	A B

4. Panasonic Industry Co., Ltd.

• Supply products that contribute to vehicle electrification and improved power economy.	A B
• Reduce environmental impact through provision of products that contribute to product/equipment downsizing, light weight, low energy loss, and longer product life.	A B C
• Achieve zero CO_2 emissions by increasing adoption of energy-saving schemes and renewable energy use in manufacturing activities.	A B

5. Panasonic Energy Co., Ltd.

• Increase avoided CO_2 emissions, by increasing the number of electric vehicle users through improving the competitiveness of our automotive batteries and enhancing our production capacity, and promoting electrification of power equipment such as construction machine through modularization and systematization of batteries for industrial use.	A B C
• Reduce CO_2 emissions through achieving carbon neutrality in factories and material development and establishment of supply chain for a low carbon footprint.	A B C

6. Panasonic Entertainment and Communication Co., Ltd.

• Promote energy-saving per product category by introducing devices with high energy efficiency, improving their control methods, and the like.	A B
• Promote circular economy through acceleration for using recycled resin, adoption of eco packaging, refurbishing businesses, and the like.	A C

7. Panasonic Housing Solutions Co., Ltd.

• Reduce CO_2 emissions in our value chain by thorough implementation of energy-saving initiatives and electricity generation, and at the same time, enhance product ranges that contribute to CO_2 emissions reduction in society.	A B
• Increase use of recycled materials, plant-derived materials, and the like for resource circulation.	A C

The scenario analysis found that we could always focus on one or more of our businesses in each of the four scenarios. In other words, the analysis successfully verified the resilience of our business strategies. The analysis also helped us understand that we can contribute to building a sustainable society through our businesses. We continue our efforts to build the 1.5℃ world, represented by our society A.

Our Businesses' Contribution to Carbon Neutrality

(From FY2023 business results)

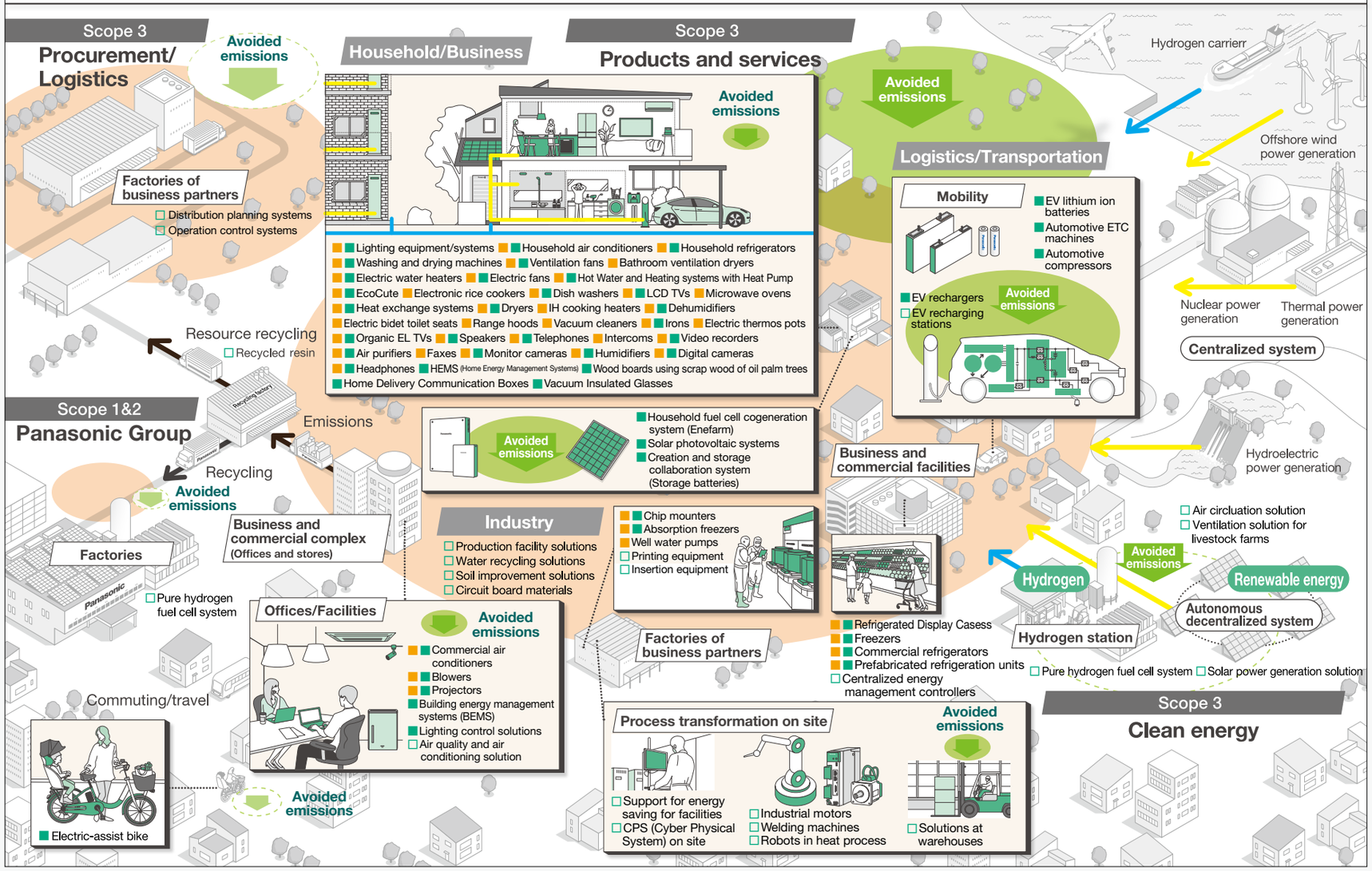
Amount of GHG emissions
Reduced amount (Estimates indicated by ◌)

Products with emissions
Products with avoided CO_2 emissions
The products with avoided CO_2 emissions that are not included in the total

Flow of electricity
Flow of hydrogen
Flow of emitted recyclables

* The size of circle indicates size of GHG emissions amount.
* The amount of GHG emissions and reduced amount were calculated from the energy usage amount.

Scope 1 Panasonic Group's direct emissions of GHGs (Fuel combustion and industrial processes). Scope 2 Panasonic Group's indirect emissions from using electricity, heat, and steam provided by third parties.
Scope 3 Other indirect emissions, excluding Scope 1 and Scope 2 (emissions from third parties involved in Panasonic Group's business activities).



* The number of businesses with emissions or avoided emissions does not match with the number stated in "the GREEN IMPACT PLAN 2024" on pages 13-14 because of sub categorization for calculation in businesses such as those for heat exchange systems, electric fans, microwave ovens, and display cases.
As the extracted business fields are the fields whose positive and negative impact on climate change are obvious, names and their coverage may differ from those in the business segments used in the TCFD-related reports.

Environmental Information Systems

Integrated Management of Corporate Environmental Information

In order to implement the PDCA cycle for environmental sustainability management, it is essential to collect a significant amount of data, such as amounts of used energy, waste, valuables, discharged and transferred chemical substances, and used water, etc. at each business site in a prompt and accurate manner.

Panasonic Group has built and introduced an environmental performance system, the Eco System (Factory), to globally collect and manage environmental data from all of own business sites. With this system, monthly CO_2 emissions are managed in particular, allowing checking the progress of initiatives and identifying issues. The system plays an important role in achieving the reduction of CO_2 emissions by sharing the information and taking measures.

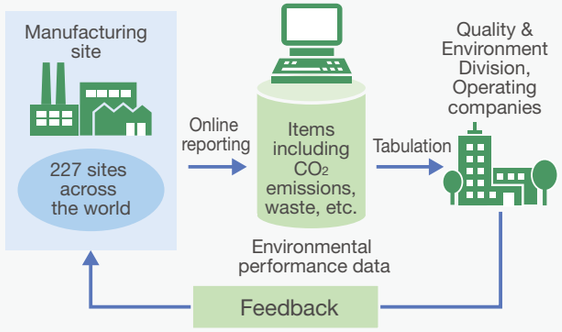
The Eco System (Factory) is also functioning as a scheme for sharing information on the status of compliance among sites across the world. In the event of complaints from local community residents or when a specific value exceeds ordinance regulated levels, as soon as the person in charge at the business site inputs the data on the system, information of the data is instantaneously e-mailed to relevant persons at the operating companies and the Quality & Environment Division of Panasonic Operational Excellence Co., Ltd. Thereby, the system enables rapid information-sharing and appropriate actions.

As for products, legislation relating to chemical substances in products is becoming more stringent, and communication and disclosure of chemical information in the EU supply chain are mandatory under the REACH Regulations. Panasonic Group has developed own management system for chemical substances in products based on industry-standard information handling methods in order to respond to a wide range of regulations and requirements.

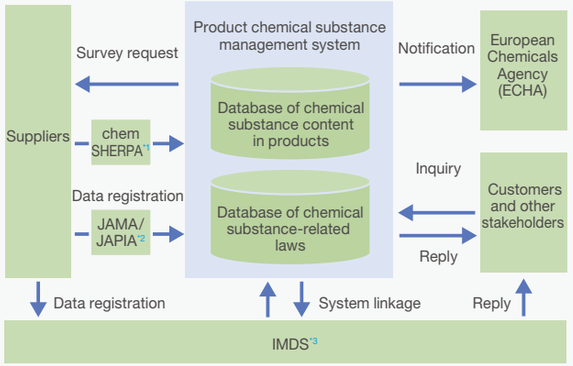
In January 2017, we renewed the system to adopt chemSHERPA,[*1] the new format for information handling of chemical substances in products led by the Ministry of Economy, Trade and Industry (METI). With the expansion of Panasonic Group's automotive business, we also adopted the JAMA/JAPIA sheet,[*2] the standard material data format for the Japanese automotive industry, in order to respond to increasingly complex and diverse regulations covering chemical substances used in products. In addition, to strengthen the response to laws and regulations on chemical substances in products relevant to our automotive businesses, in October 2020 we enhanced the function to operate in conjunction with IMDS[*3], the standard system for the global automobile industry.

Furthermore, under the EU Waste Framework Directive, the requirements for information disclosure on substances of very high concern (SVHC[*4]) to waste disposal companies and consumers have been enhanced, and registration of SVHCs with the SCIP[*5] database of the European Chemicals Agency (ECHA) has become compulsory (starting on January 5, 2021). For handling registration with the SCIP database, we have strengthened the system-based coordination of information and started registration via the system.

Mechanism of the Eco System (Factory)



Mechanism of the Product chemical substance management system



*1 New chemical information format led by METI and recommended by the Joint Article Management Promotion-Consortium (JAMP).
*2 A standardized survey datasheet for contained chemical compounds in Japan's automotive industry.
*3 International Material Data System: Material data system for the automobile industry that are operated on a global scale.
*4 Substances of Very High Concern
*5 Substances of Concern In articles as such or in complex objects (Products)

Overview of Environmental Impact and Environmental Accounting

Overview of Environmental Impact from Business Operation

In order to mainly manufacture and market electrical and electronic products, Panasonic Group consumes petroleum and electricity as energy sources and resources as raw materials of parts and components. As a result, we emit CO_2 and wastes into the environment.

Production: 227 manufacturing sites and 72 non-manufacturing sites

Logistics: Logistics stage of procurement, production, marketing and waste by partner companies and Panasonic.

Product use: Lifetime power consumption (a) of major products*9 with large amounts of energy use and CO_2 emissions (b) associated therewith.

a = Annual power consumption of a model sold*10 x Sales quantity x product life*11

b = Annual power consumption of a model sold*10 x Sales quantity x product life*11 x CO_2 emission factor*12

Recycling: Recycling of products means to use by oneself or to make into a state available for sale or free of charge the components and materialsof a separated product.

*1 Figures from photovoltaic, wind, and biomass sources including the amount of renewable energy adopted to manufacturing and non-manufacturing sites of own group . Heat pumps not included.

*2 Target substances include all substances in the Panasonic Group Chemical Substances Management Rank Guidelines (For Factories).

*3 The factors related to fuels are based on "the Guidelines for Calculation of Greenhouse Gas Emissions (version 4.7)" published by the Japanese Ministry of the Environment.
The latest figures from the "CO_2 Emissions from Fuel Combustion" 2021 issued by the International Energy Agency (IEA) is used for the CO_2 emission factors for electricity purchased from different countries use.

*4 Release amount: Includes emissions to air, public water areas, and soil.
Transfer amount: Includes transfer as waste and discharge into the sewage system. Recycling that is free of charge or recycling where we pay a fee for treatment under the Waste Management and Public Cleaning Law is included in "Transfer." (Different from the transferred amount reported under the PRTR Law.)

*5 Intra-region outside Japan not included.

*6 Figures for Japan.

*7 Air conditioners, TVs, refrigerators/freezers, and washing machines/clothes dryers

*8 As for personal computers, PC 3R Promotion Association collects and recycles PCs under the joint scheme with member companies.

*9 Household air conditioners, commercial air conditioners, lighting equipments and lamps, household refrigerators, commercial refrigerators, LCD TVs, washing and drying machines, fully-automatic washing machines, dish washer and dryers, IH cooking heaters, EcoCute, bathroom ventilation dryers, humidifiers, dehumidifiers, air purifiers, ventilation fans, electric fans, electronic rice cookers, microwave ovens, electric bidet toilet seats, irons, hair dryers, electric showers, electric water heaters, under-rug heaters, vacuum cleaners, electric water boilers, range hoods, projectors, mounting machines, etc.

*10 For each product category, the model that was sold in the largest quantity in the region was selected.

*11 Number of years during which spare parts for the product are available (defined by the Panasonic Group).

*12 Regional CO_2 emission factors (kg-CO_2/kWh) used: 0.487 (Japan); 0.277 (Europe); 0.383 (North America); 0.623 (China & Northeast Asia); 0.723 (India & South Asia); 0.386 (Southeast Asia & Oceania); 0.252 (Latin America); and 0.616 (Middle East & Africa).

*13 Hussmann Parent Inc. and its consolidated subsidiaries not included.

Overview of Environmental Impact from Business Operation

INPUT	Suppliers	OUTPUT
Energy: ★4.7 TWh Purchased electricity 3.23 TWh including renewable energy ★0.47 TWh*1 Installation of renewable energy facilities in our own sites ★0.06 TWh Town gas 71.0million m³ LNG 8.8kt LPG 5.6kt Heavy oil 6.9Ml Light oil 2.0Ml Kerosene 1.8Ml Volatile oil 0.1Ml Steam 434TJ Hot water 49TJ		CO_2: 1.63 Mt*3 GHGs other than CO_2 from energy use (CO_2-equivalent): 183 kt*13
Resources Recycled resin:12.4 kt Recycled iron: 87 kt	Production	Total wastes including revenue-generating waste: 282 kt Landfill: 2.3 kt
Water: 15.27 million m³		Water discharged: 11.78 million m³
Chemical substances: 234.7 kt*2*13		Release and transfer of chemical substances: 3.767 kt*4*13
Energy: 1.50 MWh*5 Biodiesel fuel: 9.89 kl*5	Logistics	CO_2: global 887 kt domestic ★123 kt
Electricity: 184.7 TWh	Product use	CO_2: 95.03 Mt
Collected products: 162 kt*5*7*8 CRT TVs: 5 kt Plasma/LCD TVs: 11 kt Air conditioners: 36 kt Refrigerators/freezers: 62 kt Washing machines/clothes dryers: 48 kt	Recycling	Recycled products: 123 kt*5*7 Metals: 89 kt Glass: 2 kt Other: 32 kt Generated waste: 39 kt*5

GHGs from the Whole Supply Chain (by Scope)

We calculate our GHG emissions across the supply chain for Scopes 1, 2, and 3, respectively, according to the GHG Protocol and the guidelines provided by the Ministry of the Environment.

The overall emissions across Scopes 1 to 3 in fiscal 2023 increased by 29.1 million tons compared to fiscal 2022. The major causes were increase in the purchase figure used as the amount of activity in Category 1; inclusion of CFCs that may leak from products at the time of usage or disposal (Categories 11 and 12); and commencement of data collection and disclosure for Categories 10 and 15.
We continue to disclose our emission data for transparency.

*14 Direct emissions from facilities owned and controlled by the Panasonic Group (e.g., emissions from use of town gas or heavy fuel oil).
*15 Emissions from production of energy consumed at facilities owned and controlled by the Panasonic Group.
*16 Other indirect emissions, excluding Scope 1 and Scope 2.
*17 Figures for Japan
*18 Including Scope 1 and Scope 2 from FY2023
*19 9,024 (kt) are due to the influence of CFC
*20 6,788 (kt) are due to the influence of CFC

Category		Emissions (kt)	
		FY2022	FY2023
Scope 1*14		338	406
Scope 2*15		1,723	1,433
Scope 3*16	1. Purchased goods and services	14,114	21,543
	2. Capital goods	694	880
	3. Fuel- and energy-related activities	229	212
	4. Upstream transportation and distribution	953	887
	5. Waste generated in operations	2	0.1
	6. Business travel	16*17	32
	7. Employee commuting	20*17	111
	8. Upstream leased assets	19*17	–*18
	9. Downstream transportation and distribution	18*17	61
	10. Processing of sold products	–	153
	11. Use of sold products	81,493	★95,029*19
	12. End-of-life treatment of sold products	496	7,537*20
	13. Downstream leased assets	–	–
	14. Franchises	–	–
	15. Investments	–	928
	total	98,050	127,371
	Scope 1-3 total	**100,110**	**129,209**

Numerical values in units of (t) are introduced on the following website.
WEB https://holdings.panasonic/global/corporate/sustainability/environment/governance/data.html#scope

Environmental Accounting

Panasonic Group globally collects data on its environmental conservation costs and economic benefits obtained through its environmental activities in relation to generated/controlled environmental impact. This data is internally utilized as basic information for our continuing environmental sustainability management.

Environmental Accounting for Fiscal 2023

Environmental conservation in factories	
Investments*21	6,590 million yen
Expenses*21*22	155 million yen
Economic benefit	1,655 million yen

*21 Includes all investments relating to environmental conservation. The difference or appropriate portions (divided proportionally) are not calculated.
*22 Expenses include a cost of capital investment depreciation. For example, if latest energy-saving facilities were installed, the value includes depreciation for the first year but not for the second year and later.

Environmental Conservation Benefits for Fiscal 2023 (in physical terms)

Categories	Emission reduction	Reference indicator: environmental impact	
		Fiscal 2022	Fiscal 2023
CO_2 emissions from production activities	320 kt	1.95 Mt	1.63 Mt
Human Environmental Impact	▲15 kcount	416 kcount	431 kcount
Landfill of waste	0.6 kt	2.9 kt	2.3 kt
Water consumption	1.97 million m^3	17.24 million m^3	15.27 million m^3

Fiscal 2022 data on the reduced amount of electricity and effect of reduced electricity costs through our energy-saving products are as shown in the chart below.

Economic Effects for Customers for Fiscal 2023

Electricity cost reduction from product usage (global)	
Reduced amount of electricity*23	30.9 TWh
Reduced electricity costs*24	783.5 billion yen

*23 Calculated under the same conditions as when determining the size of contribution in reducing CO_2 emissions through energy-saving products (see page 12).
*24 Electricity costs were set for each region based on IEA Statistics.

Panasonic Group published a new vision "Panasonic GREEN IMPACT" in January 2022, with the intention to realize the vision linking with our business activities. Therefore, approximately 470 billion yen for the group-wide total R&D expenses in fiscal 2023 will be invested mostly for promoting "Panasonic GREEN IMPACT".

Eco-conscious Products and Factories

Initiatives for Eco-conscious Products (Green Products)

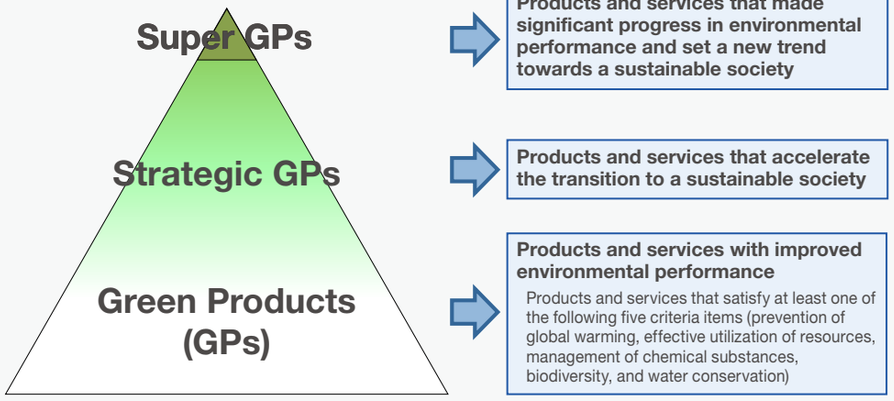
Based on the product assessment system where the environmental impacts of products and services area assessed from the planning and the design stages, Panasonic Group defines own products and services that achieved high environmental performance as Green Products (GPs).

In the GP accreditation criteria, we assess the performance of our products in terms of prevention of global warming, effective utilization of resources, and management of chemical substances by comparing them not only with our own products but also with competitors' products. Since fiscal 2012, we have conducted various activities to further enhance our accreditation criteria by adding biodiversity and water conservation to existing items. This has in turn enabled the creation of a wider range of GPs. The products and services which have been developed from the conventional superb Green Products*1 starting from fiscal 2014, and which can accelerate the transition to a sustainable society, are newly defined as Strategic GPs.

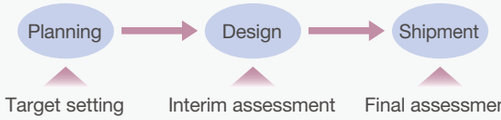
Among these products, those that particularly create new trends are certified as Super GPs.

*1 Products and services that showed superb environmental performance to products in the same category in the industry.

Green Product Structure



Products Assessment System



Product Environmental Assessment		
Items for assessment		Assessment criteria
(1) Products	Prevention of global warming	CO_2 emissions and energy saving
	Effective utilization of resources	Resource saving, light weight/downsizing, number of reused parts, durability, amount of recycled resources used, structure of easiness for removing batteries, structure to recovery/recycling, etc.
	Water and biodiversity conservation	Water saving, consideration for biodiversity
	Comparison with competitors' products	
(2) Production process (of relevant products)	Prevention of global warming	CO_2 emissions and energy saving
	Effective utilization of resources	Resource saving, mass of packaging materials to be wasted, amount of resources used, amount of waste from factories, etc.
(3) Packaging	Effective utilization of resources	Resource saving, light weight/downsizing, amount of foamed plastic used, amount of recycled resources used, etc.
(4) Instruction manual	Effective utilization of resources	Resource saving, light weight/downsizing, amount of recycled resources used
(1) (2) (3) (4)	Management of chemical substances	Panasonic Group Chemical Substances Management Rank Guidelines (for products and factories)
LCA*2		Global warming
Information management		Green procurement, information provision across the supply chain, etc.

Laws/regulations and criteria, guidelines, and environmental action plan of Panasonic Group

*2 Life Cycle Assessment: Method of quantitatively assessing the environmental impact of products at each life cycle stage.

We conduct Life Cycle Assessment (LCA) in which the environmental impact of the product is analyzed and assessed in each stage of the product life cycle, i.e. materials, manufacturing, transportation, use, and disposal. LCA is a concrete means to reduce environmental impact.

We also conduct carbon footprint (CFP) assessment that is a quantitative analysis and an assessment using conversion of GHG to CO_2 emitted in each stage of the product life cycle upon request from our customers, with a aim to lead to prevent global warming.

Initiatives for Eco-conscious Factories (Green Factories)

Panasonic Group We are leading Green Factories (GF) activities in its efforts to cut down the environmental load caused by manufacturing. On the assumption of compliance of laws and regulations in each factory, concretely we formulate a plan to reduce environmental loads in manufacturing activities, such as amounts of CO_2 emission, generated wastes and valuables, water consumption, and discharged and transferred chemical substances, conduct Progress management for total reduction amount with basic unit of discharged amount and the like, and improve the activities. Thereby, we intend to achieve reduction of environmental loads and increase of our business at the same time. In fiscal 2011, we started the GF assessment system[*3] aiming to further improve GF activities by visualizing the progress status in each factory.

In addition, Panasonic Group shares information on global activities for reducing environmental loads, relevant laws and regulations, and social trends through the Manufacturing Environmental Information Sharing Group. In Europe, Southeast Asia, China, and Latin America, we hold information exchanges and competitions on best practices by region to reduce environmental impact (presentation of awards for best practices and roll-out of good examples to other regions). By doing so, we promote GF activities suited to the issues in each region to expand and accelerate the activities.

As measures to strengthen the group-wide foundation aiming at improving the structures with energy efficiency, we have developed a BA (Before/After) chart search system to share and spread knowhow across the world on the Internet. With the system, each factory can register and share their best practices concerning managing CO_2, waste, chemical substances, water, etc.

In addition to the above, in response to environmental regulations, as a new activity to further ensure regulatory compliance in our sites, particularly those in China and Southeast Asia where we have numerous productions sites, we conduct a Cross-Company Mutual Environmental Audit that is carried out by our factories located in the same region, crossing the operating company's boundary. During pandemic, we were able to reduce risks and improve interactive skills without stopping our activities, combining online meetings considering COVID-19 infectious status in various region. We aim to further enhance the environmental activities by accelerating to carry out the mutual audits worldwide, and encouraging mutual learning among members through ensuring compliance with relevant laws and regulations, as well as utilizing expertise accumulated in our Group companies.

Cross-company compliance assessment (CCCA)

*3 The GF assessment system enables factories to evaluate themselves on a five-point scale across 19 environmental activity items, classified into six basic groups: emissions reduction; environmental performance enhancement; reduction activities; risk reduction; human resource development; and management. Factories then compare their self-assessment results with the results from other factories to obtain a relative assessment to identify issues to be addressed and determine corrective measures. The system was improved in fiscal 2014, in the way that items to assess could be added to the standard 19 items as required by each operating company. For example, a Company may implement tasks concerning compliance with environmental laws and compliance management to strengthen risk management in its factories. Then, in the assessment questionnaire, they can set questions with their own standard values stricter than the legal requirements, for example, for their ventilation systems or other facilities that control air and water quality.

Reducing CO_2 Emissions in Factories

Reducing the Amount of the Energy Used and CO_2 Emissions in Business Activities

To achieve Panasonic GREEN IMPACT, Panasonic Group has been working on toward making zero-CO_2 factories[*1] by promoting our efforts internally and externally to realize net zero CO_2 emissions at own sites in all our operating companies by 2030.[*2]

For this medium term, we established the GREEN IMPACT PLAN 2024. As our efforts for OWN IMPACT Scope 1 and 2, we have increased the number of zero-CO_2 factories to 37, aiming to reduce 260,000 tons of CO_2 emissions. In the Zero-CO_2 Factory Promotion Taskforce we started up in September 2021. The taskforce aims to create and provide group-wide measures to accelerate the creation of zero-CO_2 factories. The Taskforce consists of the Energy Saving Working Group (WG) that promotes a range of energy-saving measures, the Renewable Energy Utilization WG that assess the usage expansion of renewable energy in each site, and the Renewable Energy Procurement WG that promotes the procurement of renewable energy. With the participation of related sectors, our manufacturing, procurement, and environment specialists work together to support the united efforts of all operating companies. Following to the last year, we held online study sessions two times for group members, and total of 720 members participated in the sessions. We also hold study session by region outside Japan.

We also participate in the Keidanren Carbon Neutrality Action Plan, a voluntary action plan to alleviate global warming promoted by the entire electric and electronics industry. The industry set a target of an "average 1% improvement in energy intensity in factories and large offices per year towards 2030" and we are now working steadily to save more energy in factories and offices.

*1 The Panasonic Group's zero-CO_2 factories means realization of net zero CO_2 emissions from factory production across the world. This will be attained by promoting our conventional energy saving activities (e.g. using LED lighting), advanced energy saving technologies, such as Factory Energy Management System (FEMS), productivity improvement, and innovative manufacturing. Other means include a combination of the following efforts: promoting renewable energy usage, such as by adopting photovoltaic power systems, energy storage modules, and hydrogen fuel cells; procuring 100% renewable energy-sourced electricity; and obtaining environmental values. The Panasonic Group publishes, both internally and externally, our accelerating efforts towards reaching our goal of net zero CO_2 emissions in all the operating companies' sites by 2030.

*2 Panasonic's direction: To become a top runner in the fields of "environment" and "high usability in business."

WEB https://news.panasonic.com/global/stories/2021/90376.html

Increasing the number of zero-CO_2 factories

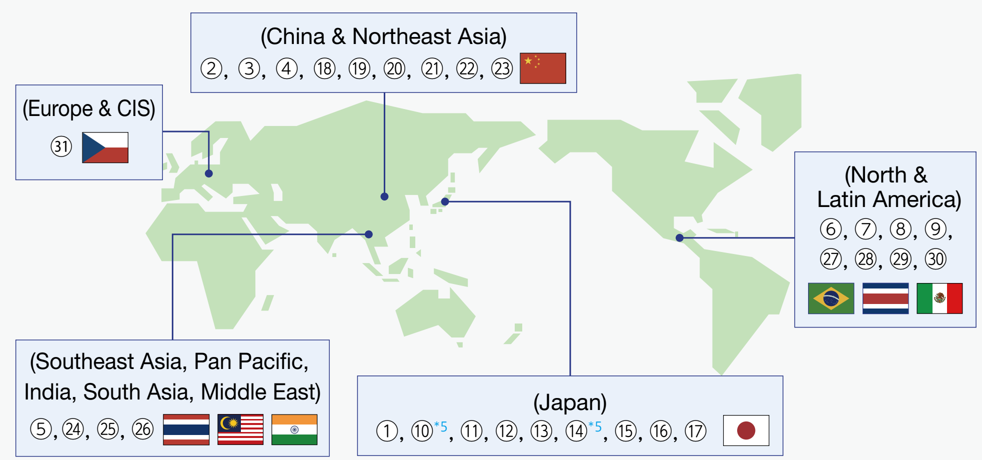
Since establishing the group's first zero-CO_2 factory in fiscal 2019, the Panasonic Group achieved conversion of nine factories across five regions[*3] to zero-CO_2 factories by fiscal 2022. Since fiscal 2022, it has been in a phase to increase the number of zero-CO_2 factories. In fiscal 2023, eight more factories in Japan achieved zero CO_2 emissions; along with six in the China and Northeast Asia region; three in the Southeast Asia, Pacific, India, South Asia, Middle East, and Africa regions; four in the North America and Latin America regions; and one in Europe and CIS. This makes a total of 31 factories[*4] achieving net zero CO_2 emissions to date. We are steadily progressing towards the GIP2024 target of 37 zero-CO_2 factories.

One achievement example in fiscal 2023 is Panasonic Electronic Devices (Jiangmen) Co., Ltd. (PEDJM) in China. The company installed a 3.94 MW photovoltaic system in fiscal 2022 followed by a range of energy-saving facilities in fiscal 2023, including a highly efficient air conditioning system and inverter water circulation pumps. Also in Asia, Panasonic Energy India Co., Ltd. (PECIN) installed a 350 kW photovoltaic system, adding to continued their energy-saving activities such as an air leakage detection campaign, and optimal control of production facilities. At the both sites, net zero CO_2 emissions have been substantially achieved by procuring I-REC certificates and utilizing credit to offset CO_2 emissions from fossil fuels, and the like.


Photovoltaic power generation systems at PEDJM


Photovoltaic power generation systems at PECIN

Zero-CO_2 Factories across the Globe



*3 Five regions are: Japan; China & Northeast Asia; Southeast Asia, Pan Pacific, India, South Asia, Middle East; North & Latin America; Europe & CIS.
*4 ★As of now, 31 factories have realized zero-CO_2 factories.
Up to fiscal 2022:① Panasonic Eco Technology Center, ② Panasonic Energy (Wuxi) Co., Ltd., ③ SANYO Energy (Suzhou) Co., Ltd., ④ Panasonic Manufacturing (Beijing) Co., Ltd., ⑤ Panasonic Energy (Thailand) Co., Ltd., ⑥⑦⑧ Panasonic Brazil (three factories; San Jose, Manaus and Extrema), ⑨ Panasonic Centroamericana S.A.
Fiscal 2023: ⑩ Panasonic Center Tokyo, ⑪ Panasonic Automotive Systems Co., Ltd. Matsumoto Region, ⑫ Panasonic Automotive Systems Co., Ltd. Tsuruga Region, ⑬ Panasonic Automotive Systems Co., Ltd. Shirakawa Region, ⑭ Panasonic Automotive Systems Co., Ltd. Yokohama Building, ⑮ Panasonic Energy Co., Ltd. SUMOTO Factory, ⑯ Panasonic Energy Higashiura Co., Ltd., ⑰ Panasonic Energy Nandan Co., Ltd., ⑱ Panasonic Electronic Devices (Jiangmen) Co., Ltd., ⑲ Panasonic Industrial Devices (Tianjin) Co., Ltd., ⑳ Panasonic Industrial Devices Materials (Guangzhou) Co., Ltd., ㉑ Panasonic Industrial Devices SUNX Suzhou Co., Ltd., ㉒ Panasonic Automotive Systems (Dalian) Co., Ltd., ㉓ Panasonic Automotive Systems (Suzhou) Co., Ltd., ㉔ Panasonic Automotive Systems Asia Pacific (Thailand) Co., Ltd., ㉕ Panasonic Automotive Systems Malaysia Sdn. Bhd., ㉖ Panasonic Energy India Co., Ltd., ㉗ Panasonic Automotive Systems Monterrey Mexico S.A.de C.V., ㉘ Panasonic Automotive Systems de Mexico S.A. de C.V., ㉙ Panasonic Automotive Systems Reynosa Mexico S.A.de C.V., ㉚ Panasonic Energy Mexico S.A. de C.V., ㉛Panasonic Automotive Systems Czech, s.r.o.
*5 Non-manufacturing sites

Activities for Increasing the Amount of Renewable Energy Use

To increase the amount of renewable energy in our business use, Panasonic Group has been actively promoting installation of renewable energy facilities in our own sites and renewable energy procurement from external suppliers.

The amount of renewable energy adopted at our sites*6 in fiscal 2023 marked 55 GWh. Installation of renewable energy facilities has been actively encouraged in our own sites across the world in a way to suite to the regional characteristics. Particularly, photovoltaic power generation systems are recommended for installation wherever possible. The major achievement in fiscal 2023 was installation of photovoltaic power generation systems in Japan.

We installed a photovoltaic power generation system at Youkaichi site of Laundry Systems and Vacuum Cleaner Business Division (LVBD), Panasonic Living Appliances and Solutions Company under a Power Purchase Agreement. The system installed this time, comprises 2,658 photovoltaic panels in total that generate 997 kW, and equipped with a 22.4 kW storage battery that enables efficient usage of power.


Photovoltaic power generation system at Youkaichi site, LVBD, Panasonic Living Appliances and Solutions Company

For further examples of our renewable energy usage, see the following website:
WEB https://holdings.panasonic/global/corporate/sustainability/environment/carbon-neutral/site.html

Procurement of renewable energy from external sources has been also promoted across the globe. In Japan, at our own site, we are an electricity user, and at the same time, an electricity retailer (registration number: A0136). Since 2005, we have been supplying power to our own sites, factories, and offices. Utilizing our knowhows and experience of electricity procurement and trading that we have accumulated to date, we procure 100% renewable electricity generated from wind, etc., as well as electricity with environmental value such as those with non-fossil fuel certificates and credits to offset CO_2 emissions from fossil fuel. This effort contributed to converting factories in Japan, China, and Southeast Asia to zero-CO_2 factories. Furthermore, the photovoltaic power station with approx. 18,000 kW capacity for use at our own sites that we determined to develop in fiscal 2022 started its operations in February 2023. We estimate that we will be able to reduce 19,000 tons of CO_2 emissions per year with the system. As described above, we continue to contribute to expanding use of electricity from new renewable energy sources. We also started selling to Panasonic Group employees in Japan, electricity derived from practically 100% renewable energy in fiscal 2021.
WEB https://news.panasonic.com/jp/topics/204036.html

In August 2019, Panasonic Group joined "RE100"*7, an international initiative that brings together companies committed to sourcing 100% renewable electricity for their global business operations. We aim to switch all the electricity used in our sites across the world to that sourced from 100% renewable energy by 2050. Progress in fiscal 2023 was 15.6%.

*6 The amount from photovoltaic energy, wind power, and so on are included. The amount from heat pumps is excluded.
*7 Press release on August 30, 2019.
Panasonic Joins RE100 Aiming for Business Operations with 100% Renewable Energy
WEB https://news.panasonic.com/global/press/data/2019/08/en190830-2/en190830-2.html

Activities for reducing energy use and CO_2 emissions

To ensure implementation of reduction of the amount of energy used and CO_2 emissions, it is important to visualize trend of the energy consumption of each facility in factory and the effects of the measures for specific emissions reduction. To date, we are working on CO_2 reduction by adopting more than 40,000 measurement equipment systems and Factory Energy Management System (FEMS) at all of our global manufacturing sites, promoting METAGEJI (Meter and Gauge)*8, which visualizes and analyzes energy consumption. An example of factory energy-saving support service is on the following website.
WEB https://www.panasonic.com/global/corporate/sustainability/eco/co2/service.html

Panasonic Corporation is conducting a demonstration experiment of the RE100 solution[*9] using pure hydrogen fuel cells in Kusatsu Factory, Shiga. Since February 2022, Panasonic Energy (Wuxi) Co., Ltd. (PECW) in China, has been conducting a demonstration experiment of pure hydrogen fuel cells that supply electricity and heat. PECW achieved net zero CO_2 emissions in fiscal 2022 through promoting energy-saving, adopting photovoltaic panels, and procuring renewable energy. The pure hydrogen fuel cells to be used for a demonstration experiment this time are three types: firstly, starting with 30 kW small-scale power generation using six connected 5kw highly efficient pure hydrogen fuel (PHF) cells; secondly, 300 kW medium-scale power generation PHF cells for the mid- to long-term experiment; and thirdly, 1 MW large-scale generation PHF cells for commercialization. The pure hydrogen fuel cells are able to supply both electricity and heat, and create cooling air in summer by supplying hot water to a lithium bromide freezer. The demonstration experiment this time is to achieve zero CO_2 emissions from energy saving and energy creation without procuring external renewable energy.

Green house where a fuel cell system is controlled.


Pure hydrogen fuel cells installed at PECW

Flow implementation using low-temperature solders.

Panasonic Corporation adapted a flow implementation using a low-temperature solder to the mass production of our household products[*10] as a world first.[*11] Lead-free solders that were developed considering toxicity of lead are most commonly used now; however, there is an issue that their melting points becomes high. On the other hand, as for low-temperature solders whose meting points are lower than 184°C, it is difficult to put such solders into practical use because of their low intensity and durability. With a collaboration with materials manufacturers, we have now optimized the chemical composition of the low-temperature solder. As a result, we developed a Sn (tin) and Bi (bismuth) solder alloy (Sn-58Bi) that is suitable to the flow implementation, and a flux dedicated to use for Sn-58B1, then applied the implementation flow using the low-temperature solder for mass production of our household products as a world-first. As the melting point of Sn-58Bi is 90°C lower than those of conventional lead-free solders, the power consumption during the implementation process is reduced by approx. 30% (Scope 2). Furthermore, by using Sn-58Bi whose basic unit of CO_2 emissions is low, the amount of CO_2 emissions is drastically reduced (Scope 3). Therefore, replacing the current solders with Sn-58Bi contributes to CO_2 emissions reduction.

The Panasonic Group will continue to accelerate necessary activities to achieve Panasonic GREEN IMPACT, e.g. proactively developing and adopting environmentally low-impact materials and methods.

*8 METAGEJI is a coined word created by the Panasonic Group which refers to visualizing energy consumption and implementing measurable reduction measures by adopting measurement instruments, such as meters and gauges.
*9 Press Release (May 24, 2022)
WEB https://news.panasonic.com/global/press/en210524-2
*10 Based on our research as of August 3, 2022.
*11 Press Release (August 3, 2022)
WEB https://news.panasonic.com/jp/press/jn220803-2

Activities at Factories

Under a company-wide energy-saving project started by Panasonic Automotive Systems (PAS) Co., Ltd., PAS has raised energy-saving awareness among its members and thoroughly implements measures to eliminate waste. Specifically, energy saving activities with visualized energy use by each site are posted on a PAS portal website where all employees can view. In addition, information on energy saving that are easy to put into practice in workplaces and the like is regularly posted on the website. At all of PAS factories, members are working together to reduce energy loss as a whole PAS through measures such as optimization of ventilation including management of positive pressure in clean rooms and at manufacturing process areas, review of operational conditions such as for furnaces and improvement of insulation, and review of cooling systems. Furthermore, as a result of adopting renewable energy, such as by installing photovoltaic power generation systems at each site, in January 2023, all global 14 sites[*12] achieved net-zero CO_2 emissions[*13], including six in Japan and eight outside Japan

*12 All of the global 14 sites managed by Panasonic Automotive
*13 Press Release (January 27, 2023)
WEB https://news.panasonic.com/global/press/en230127-2

Collaborative measures sui China's carbon peak and carbon neutrality road map

The Chinese government announced its carbon neutrality long-term policy with the prospect of the country's carbon peak. There is a movement that the Chinese government tries to strengthen the current Emissions Trading Scheme (ETS) particularly through early enforcement of "Interim Regulations on the Management of Carbon Emissions Trading", improvement of accuracy of CO_2 emissions data, and expansion of the scope of the subject and methods of trades. As the Panasonic Group has a number of business sites within China, it is necessary to

clarify our country-specific environmental issues and their contribution values. To address any identified issues, we will proactively build collaborative measures optimized for China utilizing our accumulated expertise of CO_2 emissions reduction in production processes. Although the Panasonic Group is not in the eight sectors covered by China's ETS, we will continue to monitor and understand the above-mentioned social trends as early as possible, and seek for various better methods for emission control such as increase of renewable energy use and conversion to zero CO_2 factories from the viewpoint of establishing collaborative measures with local stakeholders

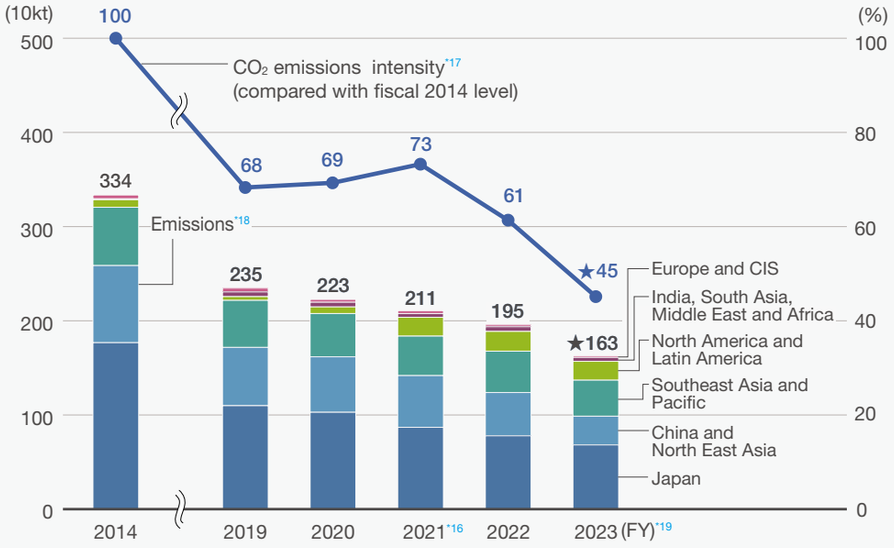
Fiscal 2023 Results

These efforts in fiscal 2023 resulted in 4.7 TWh[*14] of the energy used in business activities, and the amount of CO_2 emissions was 1.63 Mt. The fiscal 2023 investment to reduce the amount of energy used and CO_2 emissions by the efforts was 5.5 billion yen.[*15]

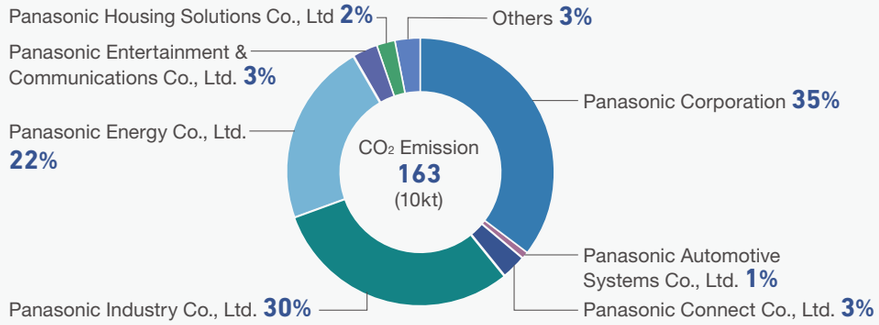
*14 In fiscal 2021, the unit used to measure the energy consumed in business activities was changed from TJ to TWh. The consumed power is measured in kWh and the consumed fuel is measured using its calorific value and then converted to electrical power units at 3.6MJ/kWh. These two values are then totaled.

*15 The total amount includes all investments concerning reduction of the amount of the energy used and CO_2 emissions. Note that differences or proportions of the investment are not calculated.

CO_2 Emission in Business Activities and CO_2 Emission (by region) Per Basic Unit



CO_2 Emission in Business Activities (by operating company)



*16 Includes emissions of Panasonic Corporation of North America after FY2021

*17 We calculated the improvement rate of the 'CO₂ emissions intensity' versus that of fiscal 2014', which was obtained by dividing CO_2 emissions by the sales volume of all Group companies.

*18 The CO_2 emission relevant to fuels was obtained by calculating with the factors stated in the "Guidelines for Calculation of Greenhouse Gas Emissions" published by Japan's Ministry of Environment. The factors for purchased electricity by country per fiscal year defined in "CO_2 emissions from fuel consumption" by International Energy Agency (IEA). The FY2014 factors in the Book 2017 were used for FY2014. The FY2018-2021 factors in the Book 2019 were used for FY2018-2021. The IEA Emissions factors 2021 were used for FY2022 and the IEA Emissions factors 2022 were used for FY2023.

*19 Includes non-manufacturing sites after FY2023

*20 In the case that net zero CO_2 emissions is achieved in the middle of the FY, the CO_2 emissions results before the FY will remain.

Breakdown of Total GHG Emissions (CO_2-equivalent) in Business Activities (by category)[*21]

[Unit: kt]

			FY2021	FY2022	FY2023
Scope 2 Energy sources			1,862	1,723	★1,433
Scope 1	CO_2 from energy sources		246	232	★224
	CO_2 from non-energy		82	106	★183
	(non-Energy Sources)	*CO_2*	*1*	*1*	*1*
		HFC	*73*	*101*	*180*
		SF_6	*3*	*3*	*2*
		NF_3 and others	*5*	*2*	*1*
Carbon offset by credit				-12	-26
Total			2,189	2,048	1,812

*21 The emissions of GHG other than CO_2 from energy sources by Hussmann Parent Inc. and its consolidated subsidiaries, Panasonic Corporation of North America, and non-manufacturing sites are not included.

Resources

Promotion of Circular Economy

Alongside changes in customer lifestyles, there is now a growing global trend for customers to use only specific functions of a product, rather than using or owning the whole product. In Europe, building a circular economy for sustainable economic growth has become a major economic strategy, in a move away from continuous resource consumption. This trend is spreading around the world along with the change in customers' sense of values. Amid this development, the Panasonic Group is introducing the idea of circular economy and moving forward in efforts to promote effective utilization of resources and maximization of customer value.

The circular economy activities we promote have two aspects: 1) creation of circular economy businesses, and 2) evolution of recycling-oriented manufacturing.

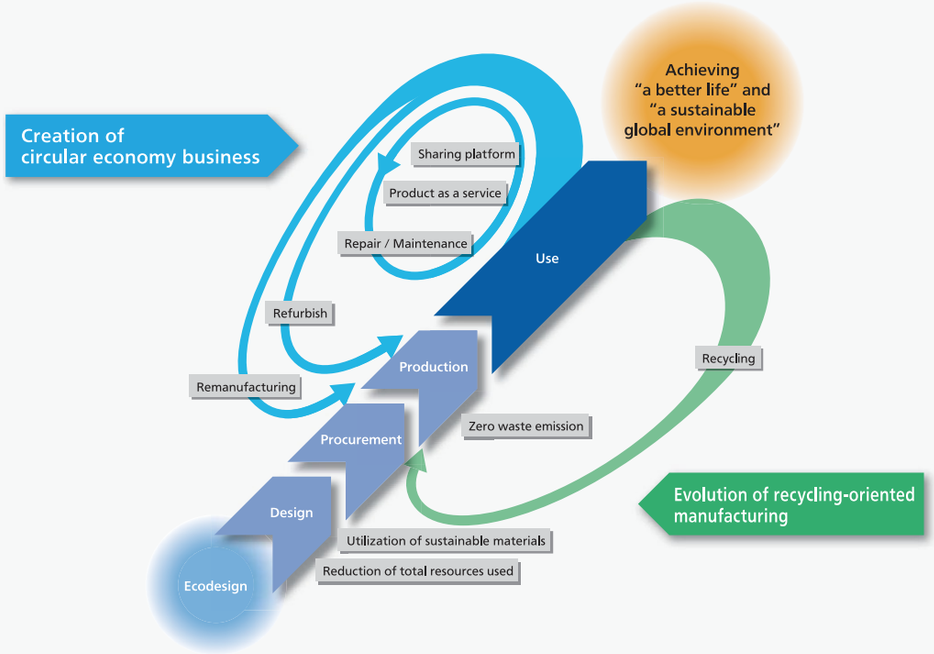
In order to realize the new value of using only product functionalities instead of using or owning the whole product, we will strive to create circular economy businesses. These include a "Sharing service", where multiple users use the same individual product, a "Product as a service" where services are fulfilled based on functions, and "Repair and Maintenance, Refurbish and Remanufacturing", where functions, values, and the lifecycle of a product are utilized in the most efficient manner by recycling or reusing the product itself or the components used in the products.

Alongside this, we continue to implement recycling-oriented manufacturing by reducing the total amount of resources used, utilizing sustainable resources, and striving towards zero waste emissions. Furthermore, we will develop recycling-oriented manufacturing to a higher level by using innovative materials and the latest digital technologies.

With all these activities, we aim to realize both "A better life" and a "Sustainable global environment" towards Panasonic GREEN IMPACT PLAN, based on an ecodesign concept which maximizes customer value in use by increasing resource efficiency at each process in design, procurement, and production.

[Concept for the Actions toward Circular Economy]

We will promote effective utilization of resources and maximization of customer value by creating circular economy business and evolving recycling-oriented manufacturing.



As specific activities, we continue to work towards achieving the resource-related targets listed in GREEN IMPACT PLAN (GIP) 2024. We plan to adjust our existing businesses along the circular economy aspects as outlined in our concept above. We are also using the same mapping with future new businesses, and aim to establish at least 13 new circular economy business models by 2024.

We plan to improve materials to meet both the characteristics requirements and environmental safety, ensure stable supplies, advance production technology to use new materials, and improve recycling technology, through which we aim to achieve a total of more than 90k tons of recycled resin (cumulative from FY2023-2025). Additionally, zero waste emissions are important

for us as a part of efficient usage of resources and we will continue our efforts to achieve a factory waste recycling rate of 99%.

To accelerate these activities, we started the global project in April 2020 with Panasonic Europe as the project lead. This five-year project is still ongoing, and its main aim is to identify the business opportunities related to a circular economy and assess their viability as new business models to be run as pilot programs. The Global Circular Economy Project also plays a role as a business opportunity platform among our group companies to promote collaboration across business boundaries. This project has become increasingly important, and has been fully integrated into the Sustainable Business Consortium, which promotes circular economy as a part of Panasonic GREEN IMPACT.

Creation of Circular Economy Business

In our drive to promote the efficient use of resources and to maximize customer value, we are working to create businesses based on a circular economy model. Our first business model is our "products as a service." We have implemented a scheme to provide display cases with refrigerators/freezers, combined with a refurbishment service for those refrigerators and freezers: Instead of selling refrigeration equipment to supermarkets, convenience stores or other food retailers, the service offers "food refrigeration" as a value. The refurbishment scheme focuses on inspecting and repairing display cases that have been used at retail chain stores for reuse at other retail stores. These services are expected to reduce maintenance and energy costs, and at the same time it will facilitate cheaper, low-budget store renovations by making business management more efficient.

In Europe, we offer a remote monitoring service for the Aquarea Air-to-Water Heat Pump. This cloud-based maintenance service currently in operation in Denmark constantly monitors the operations of the heat pump and detects any faults immediately. The monitoring service then automatically dispatches engineers to inspect and repair the equipment onsite. We plan to expand this maintenance service to other European countries. The use of IoT can ensure the prolonged life of the products, while at the same time improving their safety, reliability, and convenience.

The Revalue Project converts factory wastes into completely different products that offer new value through creative design. To date, the factory wastes generated from production of irons, rice cookers, and system kitchens have been converted into bookends, lighting, and tables through collaboration with our partner companies. This project received a 2022 Good Design Award (Business Model category) in recognition of the business value it offered. We have also started a business to utilize factory offcuts generated in production. This is achieved by the three approaches of data utilization, ecological secondary use, and collaboration with creators. The factory offcuts of synthetic marble, which is used to make kitchen counters, has particularly grown into a promising project. We continue to offer new value through expanding collaborative creation.


Subscription service "noiful"

As another subscription model, we started a service for our rental housing, "noiful," in January 2022. Noiful[*2] offers a rental service for the latest home appliances pre-installed in a rental property, including support services to explain how to use the appliances, repairs and replacements, and appliance cleaning when moving in and out. In the domestic real estate market, housing stock is on an increasing trend due to the population decrease etc. This becomes a range of social issues, such as an increase in aging buildings and more vacancies. Noiful offers "plentiful life without owning" to tenants, enabling people to move houses more easily, which should help invigorate the rental housing market. This novel solution also contributes to solving the social issue of increasing vacancies by adding a value to the rental property for owners and management companies. Noiful is also designed to be a business model offering a recurring and stable high income, and new value to the three parties usually involved in the business: property owners, management companies, and tenants. The reuse and recycling of home appliances reduces environmental impact by eliminating the necessity of disposal and contributes to building a sustainable society and life.

Paper-based battery packaging

Employment of paper packaging also reduces environmental impact and provides ease of use at the same time, encouraging environment-friendly consumption (consumer behavior that takes the environment into consideration).[*3, *4] As our first change, paper-based battery packaging was employed for some models of the EVOLTA NEO Battery in October 2021. The coverage of such paper-based battery packaging was widened to include more EVOLTA NEO Battery models, and the original EVOLTA Battery in April 2023. We also released an improved version of our eneloop rechargeable nickel hydride battery that also incorporates paper-based battery packaging. The new version offers longer usage duration per charge through its increased capacity while retaining the same number of recharges. Demand for environment-friendly packaging has been increasing in recent years due to the worsening effects of climate change and plastic waste problems. According to a survey conducted by the Panasonic Group, 90% of respondents

thought that excess packaging and plastic are used in products in general, and 80% of them value environment-friendly packaging when purchasing products. For eneloop, the packaging materials have been reduced by between 38% and 70% compared to the conventional blister pack by adopting paper-based battery packaging. By increasing use of environment-friendly packaging in the eneloop lineup, we aim to reduce 5.7 tons of plastic and 21.5 tons of paper in our usage every year, making a combined total of approximately 27 tons of packaging. The elimination of shrink film to cover the batteries also makes it easier to open. The package can also be used as storage for unused batteries and be disposed of as recyclable paper or general waste. Less packaging materials reduces the environmental impact and easy-to-handle packaging reduces the labor of opening and disposing. We thereby offer a little help in the lives of our environmentally-conscious customers.

Under a partnership with Lawson, we are jointly working on energy saving, CO_2 emissions reduction, and more efficient usage of resources. The Lawson store opened in Nanjing in July 2020 was built with significantly less building waste through prefabricated construction and material recycling. The same kind of stores have also been built in Shenyang and Tianjin. Further, we started operating mobile convenience stores in Shenyang and Wuhan. The store vans are equipped with refrigerators and other electrical equipment realizing flexible and effective sales. Another ecological scheme recycles refurbished store facilities in Chongqing, Shanghai, and other areas to reduce facility waste. In addition, model eco-friendly stores were opened in Shanghai in April 2021, and Dalian in July 2021. These next-generation stores boast high environmental performance through the latest energy and CO_2 emissions saving solutions, including an Energy Management System (EMS) that visualizes and controls electricity usage by refrigerators and air conditioners. These solutions received high praise in the China International Import Expo (CIIE) held in Shanghai in 2022.

Prefabricated Lawson store

As described above, we are working to create circular economy businesses. We completed mapping out the relationships between our existing businesses and a circular economy based on the analytical method that we developed in fiscal year 2020. According to this mapping, we are steadily converting our businesses to a circular economy structure and four more circular economy businesses were created this fiscal year in addition to our six existing ones. We are continuing to expand the scale of our circular economy business.

1	Subscription services for refrigerator/freezer display cases
2	Subscription services for cooling box for pharmaceuticals
3	Akari E Support services (LED Lighting leasing service)
4	Battery management business in the PC subscription services
5	Effective utilization of owned buildings
6	Business development of mixed cellulose plastics
7	Refurbishment services with Lawson
8	Subscription services for home appliances (noiful)
9	Use of factory wastes for parts
10	Adoption of paper-based battery packaging

*1 See WEB https://www.tennoz-rim.tokyo/
*2 See WEB https://news.panasonic.com/jp/press/data/2022/01/jn220119-1/jn220119-1.html
*3 See WEB https://panasonic.jp/topics/2023/03/000000746.html
*4 See WEB https://news.panasonic.com/jp/press/jn230330-1

Evolution of Recycling-Oriented Manufacturing

We use many kinds of resources, including iron (28 % of total resources used) and plastic (10 % of total resources used), because of our wide range of products and businesses, from home appliances, components such as semiconductors and batteries, housing, and B2B solutions. In recycling-oriented manufacturing, we are further working on reducing the input of virgin resources, while increasing the amount of recycled resources. And in that context, we are working to establish a circular system according to resource type and features.

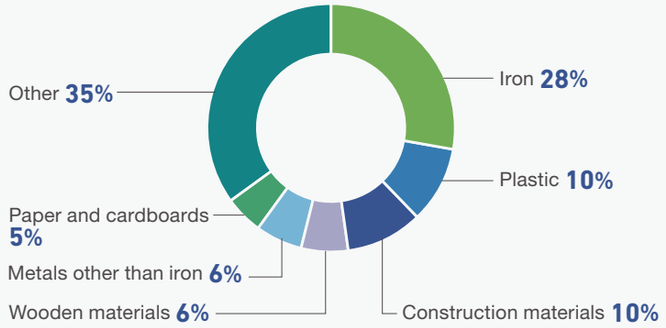
Furthermore, we are clarifying recycled resource use by identifying the volume of each type of resource used across the Panasonic Group. For example, in the case of recycled resin, we used approx. 12.4 kt of recycled resin in our products in fiscal 2023. In order to achieve the respective GREEN IMPACT PLAN (GIP) 2024 target, we worked on responding to the characteristic required for components, ensuring a stable supply, devising ways to use at the manufacturing site, and developing recycling technologies.

As for the factory waste recycling rate*5, we had traditionally set different targets for Japan and countries outside Japan according to the relevant local infrastructures. However, given increased awareness of the importance of zero waste emission activities, we have set a globally standardized target since fiscal year 2011 and are taking steps to improve the standard level of waste recycling across the entire Group. The factory waste recycling rate in fiscal year 2023 was 99.1% compared to our target of more than 99%, falling short of the target (see page 51). We

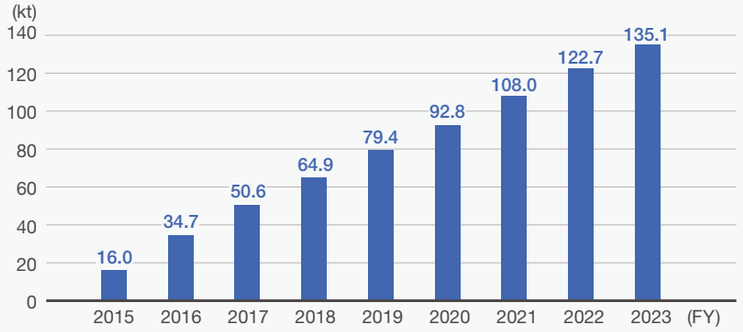
will continue to implement measures to achieve the zero waste emissions.

*5 Factory waste recycling rate = Amount of resources recycled/(Amount of resources recycled + Amount of landfill)

Breakdown of Input Virgin Resources Used in Fiscal 2023 (by category)



Results of Recycled Resin Usage (Cumulative total from fiscal 2015)



Reduction in Resources Used

To minimize the use of resources for production, we continuously look to reduce the weight of our products. Through the Product Environmental Assessment (see page 39), we have been promoting resource saving from the product planning and design stage, such as using less resources, making our products lighter and smaller, and using less components. We also implement various measures from the standpoint of resource recycling throughout the product life cycle, such as component reuse, longer durability, use of recycled resources, easier battery removal, and labels necessary for collection/recycling.

Examples of weight reduction and recyclable product design are also introduced in the following website.

WEB https://www.panasonic.com/global/corporate/sustainability/eco/resource/recycling_oriented_manufacturing.html

Use of Sustainable Materials

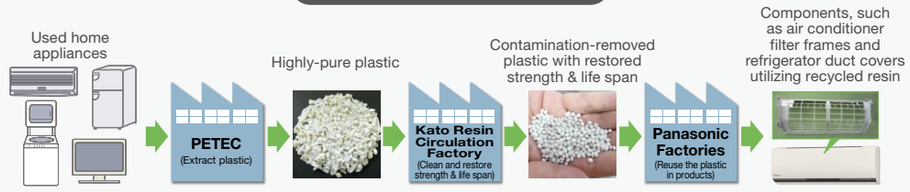
Under the concept of "product-to-product", we are enhancing our initiatives of utilizing resources recovered from used products. As for resin, we promote the reuse of resin recovered from our used home appliances (refrigerators, air conditioners, washing machines, and TVs) for our products. We also started recycling scrap iron recovered from used home appliances in our products in 2013.

WEB **Our approaches to Resources Recycling**
https://www.panasonic.com/global/corporate/sustainability/eco/resource_sp.html

Enhanced Use of Recycled Resin

To efficiently utilize resin recovered from used home appliances in addition to metals such as iron, copper, and aluminum, our recycling factory, Panasonic Eco Technology Center Co., Ltd. (PETEC), and Kato Plastic Recycling Factory of the Appliances Company work together for resin recycling.

Process of Resin Recycling



Using technologies such as our original near-infrared identification technology, PETEC is capable of sorting shredder residue of waste home appliances into three major types of resins with different purposes and properties—polypropylene (PP), acrylonitrile butadiene styrene (ABS), and polystyrene (PS)—at a material purity of over 99%.

Near-infrared sorting machine that can sort three types of resin simultaneously

The recycled single resins sorted and recovered at PETEC are then transferred to the adjacent Kato Plastic Recycling Factory to be further purified and processed to recover their chemical properties. Kato Plastic Recycling Factory is a manufacturing and development site that demonstrates promotion of use of recycled resin at our Living Appliances and Solutions Company, a home appliance manufacturer and seller. The factory plays an important role in enhancing recycled resin utilization by developing recycling technologies, such as a more efficient method that improves the performance of recycled resin. Generally, the strength and lifespan of resin deteriorate over time. This is why its chemical properties have to be recovered to the level of new resin to make them usable as materials and components in new products. Because of the differences in the physical properties required by different products, we have been examining the properties of recycled polypropylene, polystyrene and acrylonitrile butadiene styrene, and have developed technologies to create new formulas for resin components, adding our own proprietary antioxidant and mixing recycled resin with new resin. To increase usage of recycled plastic across Panasonic, we plan to find recycled plastic suppliers based on the recycled plastic development and quality assessment techniques cultivated in our Kato Plastic Recycling Factory.

Development and Use of New Sustainable Materials

Cellulose fiber can be derived from various natural resources, such as wood residues from forest thinning, and other organic wastes, and it is now drawing attention as a resource with low environmental impact. In fiscal 2019, we developed a composite polypropylene (PP) resin containing plant-derived cellulose fiber as an additive. Also, we developed a molding material mixed with plant-derived cellulose fiber. This new eco-conscious material is used in the frame parts of our cordless stick-type vacuum cleaner and contributes to its reduced weight, one of the most important features of the product. In fiscal 2020, the content of the cellulose fiber could even be increased to more than 55% while maintaining the whiteness of the material thanks to our special processing technology.

In fiscal 2021, we further advanced the technology to increase the amount of cellulose fiber, and established a process that enables 70% cellulose fiber composition, along with a technology that can smoothly mold the material into products. These technologies increase the plasticity of the material despite the high content of cellulose fiber, enabling product designs intended to feature the natural feel of the material. (The product received the MEXT Minister's Prize under the FY2021 50th Japan Industrial Grand Prize held by Nikkan Kogyo Shimbun, Ltd.) In March 2023, we started sales of sample molding materials made of plastic and plant-derived cellulose fiber, kinari CeF70-PP, "kinari70."

We successfully established a commercial level of technology to mix a high density plant-based cellulose fiber into resin. We then applied the same technology to mix cellulose fiber into plant-based resin (bio-polyethylene) and successfully developed 90% high density cellulose fiber composition materials. Mixing a high density cellulose fiber into soft bio-polyethylene enabled us to achieve the same strength as our conventional kinari, but in a white color.


Cellulose fiber composition materials with a biomass content of 90% or more

To produce fully biodegradable composition materials, we combined plant-based cellulose fiber with biodegradable resins. Conventional biodegradable resins have more restricted applicability compared to generic resins, such as polypropylene, due to their lower strength and durability. When mixed with cellulose fiber, such biodegradable resins show poor fluidity, therefore their application became even narrower. We developed composition materials that offer biodegradability and high plasticity to the level of 1 mm-thick molding, by blending multiple biodegradable resins, including plant-based polylactide resin, with appropriate additives.

Just in the same way as conventional kinari, the new material is also available as white pellets that can be colored as required.

The new material has been certified as a biodegradable biomass plastic by the Japan BioPlastics Association.

In the area of housing materials, we exclusively developed an eco-conscious wood-based flooring substrate that utilizes 100% recycled wooden materials (excluding glue) made from construction waste and unused materials. Thanks to our wide-ranging processing technologies, we successfully created a substrate with high density with superior solidity compared with general plywood and which offers excellent scratch and dent resistance. The starch in wooden materials can attract insects (lyctus), however, our product is insect resistant as it has a low starch content. The substrate also offers excellent scratch and dent resistance and is therefore ideal for coping with wheels on chairs and furniture. The board's tongue and groove structure is also designed to deliver easy installation. Further, a part of the sales revenue from this sustainable flooring is donated to Gunma Prefecture's forestry fund. The entire life of the floorboarding is consistent with an environment-friendly approach. This product can reduce the consumption of natural materials and also contributes to preserving biodiversity (see page 57). We intend to develop more new products with this technology, focusing also on developing

new recyclable resources.

Developed a high-density cellulose fiber composition material which has flexibility in design
https://news.panasonic.com/jp/press/data/2019/07/jn190708-1/jn190708-1.html

Commenced sales of samples of kinari, high density cellulose fiber composition materials
https://news.panasonic.com/jp/press/data/2021/12/jn211201-2/jn211201-2.html

Jointly developed ECOALF, the sustainable fashion brand of Sanyo Shokai Ltd.
https://news.panasonic.com/jp/press/data/2022/03/jn220330-2/jn220330-2.html

Jointly developed the K-WORLD ism products with Panasonic Production Engineering Co., Ltd.
https://news.panasonic.com/jp/press/data/2022/04/jn220419-3/jn220419-3.html

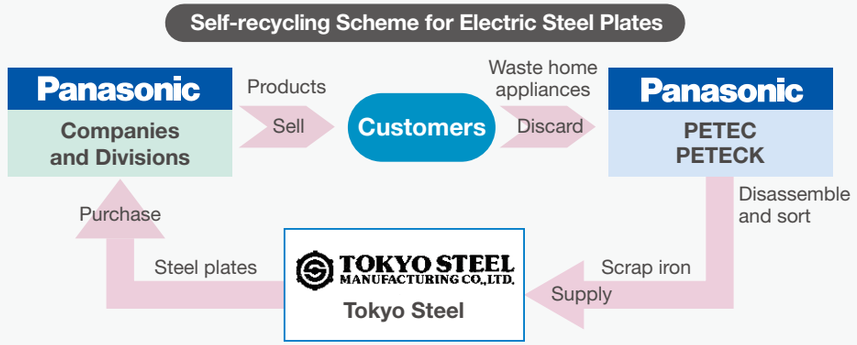
Developed 70% high density cellulose fiber composition materials
https://news.panasonic.com/jp/press/data/2021/02/jn210204-1/jn210204-1.html

Developed 90% high density cellulose fiber composition materials.
https://news.panasonic.com/jp/press/data/2022/03/jn220318-2/jn220318-2.html

Developed fully biodegradable cellulose fiber molding material
https://news.panasonic.com/jp/press/jn221206-1

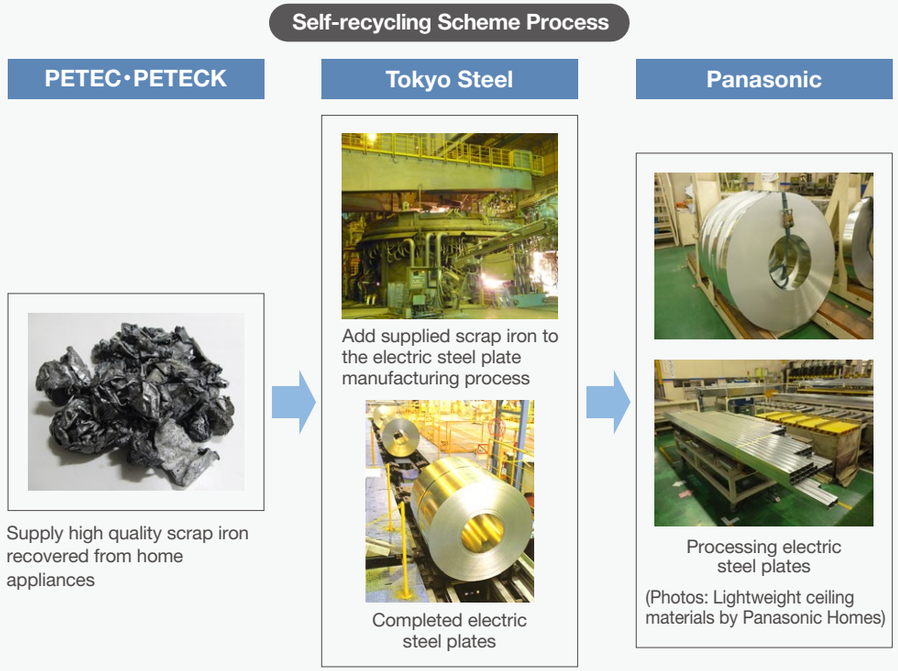
Building a Recycling Scheme for Scrap Iron

Jointly with Tokyo Steel Co., Ltd., we started a recycling scheme for scrap iron in July 2013. In this scheme, we recover the scrap iron from used home appliances and Tokyo Steel makes it into steel sheets. We then purchase the sheets back as a material for our products. Supplying scrap iron for recycling and repurchasing the recycled iron is the first scheme of its kind in the Japanese electrical manufacturing industry.



Specifically, scrap iron from home appliances collected and treated at PETEC and Panasonic Eco Technology Kanto Co., Ltd. is supplied to Tokyo Steel, where the scrap iron is processed into electrical steel plates.[6] We procure the recycled steel plates and utilizes them in products. Discussions with Tokyo Steel commenced in 2010, and we have worked together since then to improve the quality of recycled iron to a level sufficient for production use, as well as developing the technology to improve the applicability of the recycled iron. From this we identified the optimum application of the electrical steel plates, and refined its specific features (e.g. shape, strength, and weldability) to meet application-specific requirements. Use of thin electrical steel plates in our products was first made possible in 2011. Through this close collaboration, we materialized this recycling scheme in 2013, a scheme where a home appliance recycling company that we own supplies scrap iron to be used to make electrical steel plates.

The amount of scrap iron we initially supplied to Tokyo Steel was about 50 t per month. In fiscal 2023, it reached over 2.6kt per year, and the recycled steel is being used in our products, including washing machines and ceiling materials for housing.



The increase in electrical steel plate usage leads to an increase in the usage of scrap iron, which is one of the most important resources in Japan. In addition, producing steel plates from scrap iron emits much less CO_2 compared with producing steel plates from scratch. This scheme also stabilizes the procurement price, because the price of scrap iron supplied from PETEC and the price of electric steel plates procured from Tokyo Steel are determined by the scrap iron fluctuation rate agreed between the two companies. We will further expand this recycling

scheme for more efficient resource utilization, CO_2 emissions reduction, and stabilization of procurement prices.

*6 Steel produced from scrap iron melted and refined in an electric arc furnace.

Zero Waste Emissions—Improving Factory Waste Recycling Rate

From the viewpoint of effective usage of resources, we believe that generation of waste and revenue-generating waste at factories must be minimized, even if such waste could be sold as valuable commodities. Based on this belief, we identify the amount of generated waste (including both revenue-generating waste and factory generated waste) and classify it into: (1) recyclable waste (including those that can be sold and those which can be transferred free of charge or by paying a fee), (2) waste that can be reduced by incineration or dehydration, and (3) landfill (waste with no option other than being sent to landfills).

We reduce the emission of waste by boosting yield in our production process and increasing the recycling rate of our waste materials. Accordingly, we strive globally toward achieving our Zero Waste Emissions from Factories*7 goal by reducing the amount of landfill to nearly zero. We have reinforced such efforts particularly in China and other Asian countries, where many of our factories are located.

With the waste plastic import control introduced in China, the volume of material being recycled has dropped, leading to an increase in landfill waste disposal. As a result, the factory waste recycling rate in fiscal 2023 was 99.1%, achieving the 99% target in our GPI 2024. We will introduce more activities which aim to maintain and improve the factory waste recycling rate.

As a means to reduce the generation of waste, we are fostering resource-saving product design. In our production activities, we are engaging in resource loss reduction, employing our own unique material flow analysis methods. We consider materials that do not become products and excessive use of consumables as resource losses, and make the material flow and lost values for each process visible in order to resolve the issues in close collaboration with the design, manufacturing, and other relevant business divisions. In the future, we will promote further reductions in resource losses through the Resource Loss Navigation, our original system developed to automatically display information to help reduce resource losses.

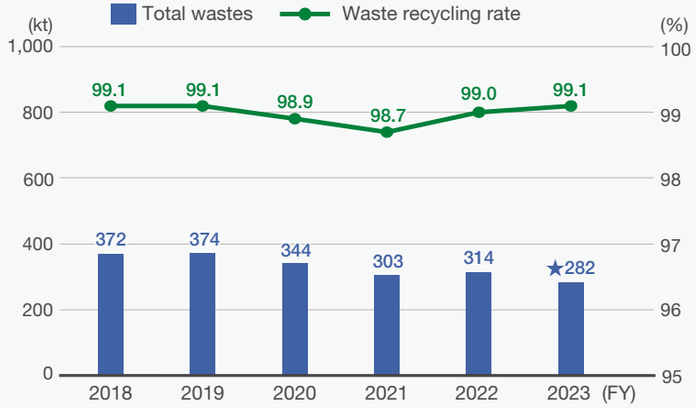
As an initiative to reduce the amount of final disposal of waste and valuables, we will reduce the amount of materials that are particularly difficult to recycle, such as thermosetting resins. We are also strictly adhering to waste sorting practices in production processes to further expand the reuse of resources.

Because waste recycling rates in our overseas factories lag behind those in Japan, we have worked to improve the average level of recycling activities by sharing information within and between regions outside Japan. Specifically, in addition to accelerating the information sharing on waste recycling issues between our local factories and group companies in Japan, we also promote the sharing of excellent examples and know-how among our factories across regions by utilizing BA Charts*8 prepared by each region, following our long-standing approach toward CO_2 reduction activities.

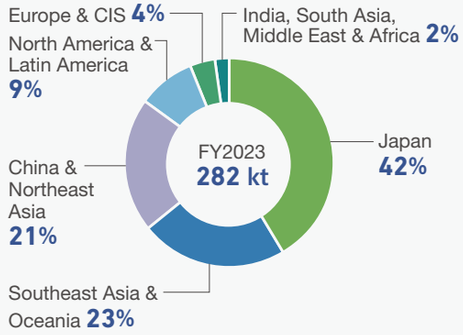
*7 Definition by the Panasonic Group: Recycling rate of 99% or higher. Recycling rate = Amount of resources recycled/(amount of resources recycled +amount of landfill).

*8 A chart-format summary of comparisons between "before and after" implementation of waste reduction and recycling measures.

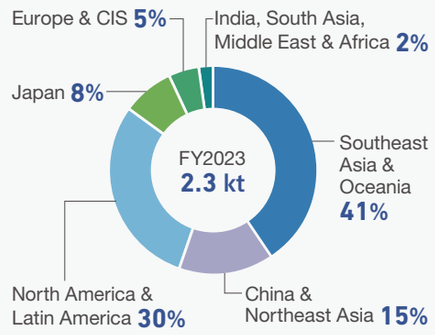
Amount and Recycling Rate of Total Wastes Including Revenue-generating Waste



Breakdown of Total Wastes Including Revenue-generating Waste (by region)



Breakdown of Landfill (by region)



Breakdown of Total Wastes Including Revenue-generating Waste for Fiscal 2023 (by category) (kt)

Items	Total wastes	Recycled	Landfill
Metal scrap	127	126	0.6
Paper scrap	31	31	0.1
Plastics	34	32	0.7
Acids	14	9	0.05
Sludge	8	7	0.2
Wood	24	24	0.01
Glass/ceramics	4	4	0.1
Oil	12	11	0.05
Alkalis	15	14	0.003
Other *8	11	10	0.6
Total	282	268	2.3

*8 Combustion residue, fiber scraps, animal residue, rubber scraps, debris, ash particles, items treated for disposal, slag, infectious waste, polychlorinated biphenyls (PCBs), waste asbestos.

Global Initiatives for Used Product Recycling

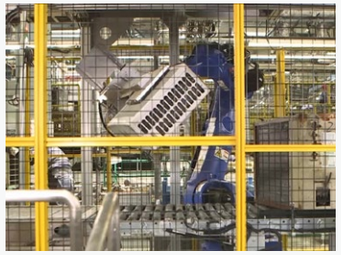
For the purpose of efficient use of natural resources and prevention of environmental pollution, many countries around the world have been enacting recycling laws and developing their recycling systems. Examples include: the Law for Recycling of Specified Kinds of Home Appliances (Home Appliance Recycling Law) and the Act on the Promotion of Effective Utilization of Resources in Japan, the WEEE (Waste Electrical and Electronic Equipment) Directive in the European Union, and recycling-related laws in many states in the United States as well as in China. In addition to complying with the Basel Convention which controls the transfer of hazardous waste to non-OECD countries as well as with related laws in respective countries, the Panasonic Group strives to establish the most efficient recycling system in each country that is in line with its local recycling infrastructure, including the utilization of third parties.

Product recycling results in fiscal 2023 are as shown below. As for the situation outside Japan, with the decrease in the volume of collection and recycling due to recent reforms of business areas in various countries, the weight of collected products is on a flat or downward trend.

FY2022 Results

Japan Processed approx.	161.91 kt of four kinds of used home appliances
USA Collected approx.	76 t of used electronic products

Product Recycling Initiatives in Japan


Machine to turn over air conditioner outdoor units at PETECK

In response to the Home Appliance Recycling Law of 2001, which covers four specified kinds of home appliances*9, manufacturers were grouped into two groups, Group A and Group B, to collect and recycle the four specified kinds of used home appliances. We belong to Group A, and to work on recycling, we have established Ecology Net Co., Ltd. jointly with Toshiba Corporation to operate and manage a geographically dispersed recycling network through the effective use of existing recycling facilities nationwide. This management company supervises 329 designated collection sites (shared by Group A and Group B) and 30 recycling plants, based on consignment from Group A manufacturers (18 companies including the Panasonic Group). Additionally, we invest in Panasonic Eco Technology Center Co., Ltd. (PETEC), Panasonic Eco Technology Kanto Co., Ltd. (PETECK), and Chubu Eco Technology Co., Ltd. (CETEC)*10 and exchange information with product manufacturing divisions to develop easy-to-recycle designs, as well as conducts research and development to efficiently recover and supply more resources. In fiscal 2023, we recycled approx. 161.91 kt of the four specified used home appliances.

Although the statutory recycling rate*11 is being raised in phases, our recycling plants have been achieving recycling rates higher than the legal requirement by reviewing and improving recycling equipment and processes in view of the characteristics and materials of respective products as well as higher recycling efficiency.

In the summer of 2019, PETECK automated a part of its air conditioner processing line, using an articulated robot to turn over and transfer air conditioner outdoor units during the dismantling process. The recognition device identifies the position and size of the outdoor unit, and based on the identified information the articulated robot picks up and moves the unit to the standard dismantling process or to the process for dismantling special items such as window-type units. This has enabled safe and efficient air conditioner processing, relieving workers of dangerous work that required physical strength to turn outdoor units (weighing 33 kg in average) upside down. As for PETEC, it promotes high grade single-plastic recycling using plastic recognition equipment.
See pages 48-49 for more details.

*9 Air conditioners, TVs, refrigerators/freezers, and washing machines/clothes dryers.
*10 PETEC is a company fully invested by the Panasonic Group, and PETECK and CETEC are joint ventures between Mitsubishi Materials Corporation and the Panasonic Group.
*11 Statutory recycling rate = Recycling rate specified by law (Valuable resource weight/Total weight of used home appliances).
The statutory recycling rates were raised in 2009 and 2015, and are currently at least: 80% for air conditioners, 55% for CRT TVs, 74% for LCD and plasma TVs, 70% for refrigerators and freezers, and 82% for washing machines and clothes dryers.

WEB Overview of Recycling of Specified Home Appliances (Japan)
https://www.panasonic.com/global/corporate/sustainability/eco/resource/recovery/recycling.html
WEB Panasonic Eco Technology Center Co., Ltd. (PETEC)
https://panasonic.net/eco/petec/

Efforts in the Europe / CIS Region

In 2021, we collected approx. 21.87 kt[*12] of used products covered by the WEEE Directive across Europe.

Circular Economy as the main trigger for usage of recycled material in products

The EU released its 1st and 2nd 'Circular Economy Action plan in 2018 and 2020, and in a similar way, many EU Member States have published their own national Circular Economy Action Plans. Meanwhile, we see more and more legislative requirements coming up in in Europe that put the usage of recycled material in new products in its focus. As an example, the draft EU Ecodesign for Sustainable Products Regulation (ESPR) has been published – expected to enter into force 2024 or 2025 – will set the legal frame for minimum amounts of recycled material that will be individually defined for different product groups. Accordingly, Panasonic has started considering how to prepare our business for such new recycled material requirements in future. For instance, this includes ensuring stable material supplies with guaranteed quality. In addition, we intensified the internal discussion about the impacts on product design, the enhanced reuse of products and components, or how to further improve and simplify the recyclability of products.

*12 Calculated by multiplying the weight of collected products per collection system by our market share in terms of weight per collection system.

Efforts in North America

The Panasonic Group continues its leadership role in establishing and operating a recycling system for waste batteries and consumer electronic products in North America. Following the startup of a state recycling law in Minnesota in July 2007, we established the Electronic Manufacturers Recycling Management Company, LLC (MRM), jointly with Toshiba Corporation and Sharp Corporation in September of the same year, and began recycling TVs, PCs, and other electronic equipment.

With collaborative ties to several recycling companies, MRM operates collection programs on behalf of numerous companies across 20 states and the District of Columbia. The cumulative total of collection by MRM has exceeded 1.2 billion lbs. (approximately 600 kt) since its inception in 2007. With the changes in our business strategies in the US, our remaining collection obligations are de-minimis, MRM will continue operating its collection programs on behalf of the manufacturers it serves.

As for waste batteries, we established Call2Recycle in 1994 jointly with other battery manufacturers, and now provide recycling programs for rechargeable batteries throughout the US and Canada. Call2Recycle provides collection program and a robust retail collection network for over 300 companies, and collected more than 94.5 kt of primary and rechargeable batteries in the US and Canada since the organization's inception.

Recycling end-of-life products in Canada started in 2004 with the Alberta Government Extended Producer Responsibility (EPR) Regulation. Since then a total of ten provinces and two territories have legislated WEEE, each with their own unique parameters and requirements. In an effort to harmonize these programs, Panasonic Canada takes an active role in the governance of the Electronic Product Recycling Association, a not-for-profit management organization. The currently active provincial EPR programs have proven to be very effective in diverting e-waste as reflected in 2020 totals, where 109.41 kt in Canada were collected.

Efforts in China

In China, we are engaged in activities to clarify the products covered by the Second Catalog (published in February 2015) of the Regulation for the Administration of the Recycling and Treatment of Waste Electrical and Electronic Products, which was published in May 2012 and enforced in July of the same year. In addition, we actively gather information and submit comments on setting unit-based rates for the covered products, toward early disclosure of information by Chinese governmental organizations such as the Ministry of Environmental Protection and the Ministry of Finance.

We are also carrying out an assessment of the development of the Plan on Promoting Extended Producer Responsibility promulgated by the government in January 2017, as well as reviewing our responses toward the expected publication of operational rules to the China Solid Waste Environmental Pollution Prevention Law which was enforced in September 2020.

Efforts in Southeast Asia and Oceania

Vietnam

With the introduction of recycling law in July 2016, producers and importers are required to establish a take back scheme for their products sold in Vietnam. Panasonic Sales Vietnam (PSV) has since set up 7 collection points: two in Ho Chi Minh, and one each in Hanoi, Thanh Hoa, Nghe An, Da Nang, and Can Tho. In 2022, PSV has continued to collect 16.4 tons of e-waste which were sent to licensed recyclers for proper treatment despite the recycling law being superseded by the Law on Environmental Protection 2020 effective since January 2022.

The Law on Environmental Protection 2020 sets out requirements for a wide range of environmental issues, including the enhancement of e-waste management in Vietnam. The Government has also issued "Decree 08/2022 Detailing a Number of Articles of the Law on Environmental Protection" and "Circular 02/2022/QD-TTg Detailing the Implementation of a Number of Articles of the Law on Environmental Protection" under the Law on Environmental Protection 2020 which took effect since 10 January 2022 and requires producers/ importers to

contribute financially for waste treatment of primary batteries from 1 January 2022. PSV has since made the necessary financial contribution for primary batteries placed in the market in 2022 to ensure proper waste treatment for these batteries. Moving forward, producers/ importers will also be required to contribute financially or self-manage e-waste recycling for rechargeable batteries from 1 January 2024 and electronic products from 1 January 2025.

Panasonic Sales Vietnam will work closely with the Vietnamese government to support the implementation of an effective waste treatment and e-waste recycling scheme.

Australia

The National Television and Computer Recycling Scheme (NTCRS) was established in Australia in 2011. Since 1 July 2021, the NTCRS has been superseded by the Recycling and Waste Reduction (Product Stewardship –Televisions and Computers) Rules 2021 made under the Recycling and Waste Reduction Act 2020, which will provide a new legislative framework to manage waste, recycling and product stewardship. Currently, the national framework covers televisions and computers, including printers, computer parts and peripherals.

Panasonic Australia (PAU) partnered with Ecycle Solutions, a co-regulatory arrangement approved by the Australian government to fulfill its obligation under the national scheme, since May 2021. Between January 2022 and December 2022, 23 tons of e-waste were recycled.

Since April 2021, PAU has also joined the Battery Stewardship Council (BSC) as a member. As part of obligations of a member, PAU has been contributing to recycling costs for batteries imported, including 91 tons of batteries imported between January to December 2022.

Singapore

The Resource Sustainability Act introduced in Singapore in 2020 requires producers of regulated consumer products to join the licensed Producer Responsibility Scheme (PRS), which started in July 2021. For Compliance Year 2 (July 2022 – June 2023), a Collection Target of 60% (of weight supplied) was set for regulated Large Household Appliances (LHAs) and 20% for Portable Batteries. Panasonic Singapore has been working closely with the authorities and PRS operator to ensure the smooth implementation of the PRS. A total of 5,963 tons of regulated e-waste were collected by the PRS operator, of which LHAs comprised of a total of 91% by weight between January to December 2022.

Other Countries in Southeast Asia and Oceania

Regulators in Malaysia, Thailand, the Philippines, and New Zealand are also gearing towards the global trend of mandating end-of-life product recycling. Discussions with regulators and industry bodies are in progress. We hope to contribute to the formulation of sustainable e-waste management policy in each country through engagement with local governments and industry associations and participation in pilot recycling projects.

Efforts in India

In India, the new e-waste recycling law has been implemented by the Ministry of Environment, Forests and Climate Change (MoEFCC) from the 1st of October 2017, with Extended Producer Responsibility (EPR) targets based on end-of-life (EoL) defined in the e-waste (Management) rules 2016. To fulfill the compliance, we will collect and recycle waste home appliances through the "I Recycle" program already established by Panasonic India (PI).

We have also been taking part in the Consumer Electronics and Appliances Manufacturers Association (CEAMA), which promotes an analysis of current recycling activities in India as well as a long-term plan for waste problem solutions.

We are having various dialogues with the Indian government, jointly with CEAMA, about the EPR target and EoL definition for recycling management.

We are also actively engaged in different active associations including the Federation of Indian Chambers of Commerce and Industry (FICCI) and Confederation of Indian Industry (CII) to establish an even more efficient and robust recycling system and to submit industry comments to the Indian government for a better governance system.

Efforts in Latin America

In response to a growing trend in stricter environmental laws in Latin American countries, discussions on the establishment of recycling laws and actual enforcement are being conducted.

In Brazil, a sectoral agreement on home appliances was concluded in October 2019, and a Federal Decree specifying a system to collect and recycle household electrical and electronic equipment was enforced in January 2021. As one of the main members of a waste home appliance management body (ABREE), we collaborated in the establishment of a reverse logistics system (a system to collect used products), and promotes efficient collection and treatment of used products.

In Peru, under the recycling law that came into force in 2016, we joined a nonprofit waste management organization (ASPAGER) as a leading member, and started a used-product recovery program.

In Colombia, a framework law for home appliance recycling was enacted in 2018. We have been a member of a used-product collection program (Red Verde/Lumina) conducted by an industry group (ANDI) since 2014, prior to the enactment of operational rules.

In Mexico, a collection program is implemented under the government-approved recycling management plan.

In Chile, the legislation is being considered, and preparations for setting up a collection program are underway through continuous discussions with the government.

Biodiversity Conservation

Ways of Thinking about Biodiversity

Our social lives and business activities are based on various benefit provided by the natural capital (ecosystem services). It has been recognized that conservation of biodiversity is as important as measures for climate change and resource recycling and they are closely linked each other in establishing a society where humans and nature coexist in harmony which is a long-term vision of the Sustainable Development Goals (SDGs) and the United Nations Convention on Biological Diversity.

In December 2022, "the Kunming-Montreal Global Biodiversity Framework (GBF)" was agreed in the UN Biodiversity Conference (COP 15) held in Montreal.

Aiming to achieve the 2050 Vision for 'a world living in harmony with nature', the framework covers the 2030 mission, which aims to 'take urgent action to halt and reverse biodiversity loss'. The international targets to achieve a nature-positive world by 2030 are 'the GBF targets' and 23 action-oriented global targets were determined in the COP15.

As the biodiversity goal in our GREEN IMPACT PLAN 2024 (GIP2024), we set targets to reduce the impact from business activities on the ecosystem for its recovery, aiming at a nature positive world as a front runner.

Three Targets in GIP2024

Targets		SDGs
Sustainable procurement of raw materials	Promote sustainable procurement of wood and paper, etc.	12,13,15,17
Utilization of greenery in business sites (land use)	Utilize greenery in business sites, considering conservation of biodiversity	13,15,17
Products and services	Offer products and services that contribute to conservation of conservation	11,12,15,17

We will continue to work on activities for biodiversity conservation by disclosing data on our business dependencies and impacts on nature through the Taskforce on Nature-related Financial Disclosures (TNFD), Science Based Targets for Nature (SBTN), and the like.

The Green Impact Plan that is reviewed and revised every three years is equivalent to the Biodiversity Action Plan under the Convention on Biological Diversity

Initiatives for Sustainable Procurement of Raw Materials

Firstly, we plan to include our consideration for biodiversity protection in Procurement Department's "Green Procurement Standards" to ensure that these practices are carried out across our whole supply chain.

In regard to procurement for wood, we discussed extensively with World Wide Fund for Nature (WWF) Japan over our green procurement; and formulated the "Panasonic Group Green Procurement Guidelines for Wood" aiming for conservation of biodiversity and sustainable use of natural resources in 2010. Based on these guidelines, we conduct an annual survey on wood material procurement among our suppliers.

In fiscal 2022, we exchanged opinions about sustainable material procurement with WWF Japan. In the discussion with WWF Japan, we confirmed growing importance of environmental and social (human rights) considerations, in addition to importance of compliance with laws and regulations for our timber procurement. This discussion also gave us an opportunity to think about future measures.

Exclusion of timbers and wood materials whose regulatory compliance in their logging has not been confirmed (Category 3)

The survey results in fiscal 2023 are as follows.

Green Procurement Guidelines for Wood Consulted and Formulated with WWF

Total procurement of timber and wood materials	241 thousand m^3

PDF **"Green Procurement Guidelines for Wood"**
https://holdings.panasonic/jp/corporate/about/procurement/green/pdf/green_wood_J.pdf

WEB **"Green Procurement Standard"**
https://holdings.panasonic/global/corporate/about/procurement/green.html

WEB **How to respond to the "Act on Promoting the Distribution and Use of Legally Harvested Wood and Wood Products" (called Clean Wood Law) (Japanese)**
https://www2.panasonic.biz/es/sumai/law/cleanwood/

Activities for Land Use

Once an ecological network that connects greenery in our business divisions, neighboring woodlands and parks is formed, living things such as birds, butterflies, and dragons in each area can move around wider areas for flowers and water through the ecological networks, and their habitats are expanded. Green areas in our business divisions have a lot of potential to contribute to conserving biodiversity in that area. In particular, hardly any natural environments where wild animals can live and breed remain in urban areas. Therefore, even small areas of green in corporate premises can become a precious habitat of a variety of living things if they have indigenous vegetation and a watery environment.

Acquisition of Eco-Certification Based on Quantitative Evaluation from external accredited body

Panasonic Corporation's Living Appliances and Solutions Company's (LAS) Kusatsu site in Shiga Prefecture, obtained an eco-certificate from the Association for Business Innovation in harmony with Nature and Community (ABINC)*1 in March 2018, as a business site for its contribution to biodiversity. In the course of assessment, we received high ratings for how we are making green corridors to be suited to diversified living creatures by appropriately conserving the natural environment, keeping invasive non-native species under proper management by continuously monitoring to understand their status, and the active use of woodland nearby the factory, in liaison with external eco-related organizations and local people, such as the local public bodies and primary school students.

In the monitoring survey we have conducted since 2011, 840 species of flora and fauna were confirmed. At the same time, the survey result has indicated that the woodland is an important biotope in the area where urbanization is taking place, which contributes to the formation of local ecological networks. In addition, our continuing implementation of the environmental learning program on acorns for elementary school students was highly evaluated; and won an Award of Excellence in the 2nd ABINC award held in January 2020, as an 'activity contributing to the biodiversity mainstreaming'.

<External certifications and awards>

- Acquired three stars under the Shiga Biodiversity Action Certification Program (2018)*2
- Acquired ABINC certification (March 2018) and renewed the certification (February 2021)
- Received an Award of Excellence in the 2nd ABINC Awards (January 2020)

*1 ABINC is a certification system by third-party evaluation on greenery improvement and management at business divisions based on the land use score (biodiversity quantitative assessment tool in environmental assessment) and Guidelines for Sustainable Business Sites developed by the Japan Business Initiative for Biodiversity (JBIB).

*2 Shiga Biodiversity Action Certification Program is the first system in Japan for rating wide range of activities conducted by business enterprises in the area of biodiversity conservation with 1 to 3 stars granted by governor.

In March 2022, LAS joined the Global Ocean Alliance 30by30 initiated by Japan's Ministry of the Environment, which is a global initiative to designate at least 30% of the global oceans as Marine Protected Areas (MPAs) and Other Effective area-based Conservation Measures (OECMs)*3 by 2030, because LAS considers its Sustainable Forest can contribute to it. LAS also applied for its participation in 'the Conservation Site for Human-Nature Symbiosis (tentative name) certification' trial program led by the Ministry of the Environment. In September 2022, LAS got its rating of 'the greenery area equivalent to the certification' as a contributor to the 30by30 OECMs through expert screening; LAS plans to get the official certification within fiscal 2024.

WEB **News release by the Ministry of the Environment on May 27, 2022.**
https://www.env.go.jp/press/111067.html

*3 OECM: Other Effective area-based Conservation Measure
Areas other than national parks and other already protected areas that would contribute to biodiversity protection, such as shrine or temple woodlands, woodlands owned by companies or which form part of company premises, rural village zones, etc. Japan's 30by30 would include national parks and other protected areas.

The 30by30 Alliance logo mark

ABINC Certification

Three-star rating in Shiga Biodiversity Action Certification Program

LAS's Sustainable Forest

Initiatives for Products and Services

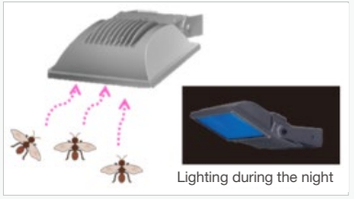
Contributing to Biodiversity Conservation through Lighting

The Lighting Business Division of Electric Works Company, Panasonic Corporation develops and sells lighting products that care for the environment and biodiversity.

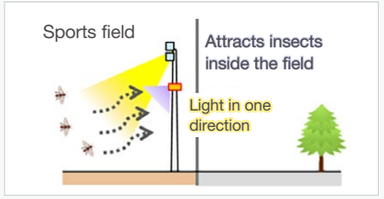
LED Insect Attractor (Product name: Mushi Keeper)

An insect attractor lures insects away from shops, warehouses, and sports fields, where they gather because of the lights, in order to reduce damage and nuisance caused by insects. Conventionally, the device attracted insects with a UV fluorescent lamp and killed them with a high voltage grid. In June 2021, the company launched an LED insect attractor (Mushi keeper). The product's UV and blue LED lights attract and retain insects, enabling reduction of insect damage and without killing them. This helps protect the ecosystem as the insects can return to nature. Conventional insect killers emitted light in all directions, attracting excessive insects. However, this newly adopted LED can emit light in the desired direction only, contributing to protecting biodiversity by its efficient insect attraction. The LED insect attractor has been confirmed to have a higher performance of insect attraction according to the insect attractiveness index.*4

*4 The insect attractiveness index is a theoretical index and does not represent the actual number of insects attracted by the light. (Source: AOKI, S. et al. (2005) Evaluation of Insect Attractiveness by New Index. Proceedings of 2005 Annual Conference of The Illuminating Engineering Institute of Japan, 284.)



LED insect attractor (keep attracting with UV + blue lights)



Emits a directional light to attract insects efficiently

WEB **LED Insect Attractor: Mushi Keeper**
https://www2.panasonic.biz/ls/lighting/outdoor/invites-insects/

Developing IDA-certified LED Light

An LED security light and street light designed by the Lighting Business Division to minimize light pollution were approved as Dark Sky Friendly Lighting by the International Dark-Sky Association (IDA)*5 in February 2020. This was the first such achievement by a Japanese manufacturer*6. One of the approval criteria requires that lighting must have a correlated color temperature of 3,000 kelvin and lower (warm color) not only to reduce light pollution but also to lessen any adverse impact on wildlife.

*5 As IDA-certified lighting made by a Japanese manufacturer (according to IDA Tokyo, as of February 20, 2020).
*6 The International Dark-Sky Association: The leading global organization addressing light pollution.

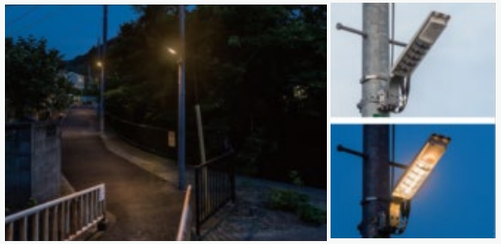
IDA "Dark Sky Approved"

"Guidelines for Countermeasures against Light Pollution" (issued in March, 2021), by Japan's Ministry of Environment. Panasonic Group cooperated to formulate the guidelines.

PDF https://www.env.go.jp/air/hikarigai-gaido-R3.pdf.pdf

Firefly-Friendly Street Lighting

Preceding our IDA-certified LED light, we had already developed an LED light with a spectrum and optical properties that had less impact on fireflies in 2016 and installed the LED lights on streets in different municipalities. According to the study made in Numama, Zushi City, Kanagawa Prefecture, the number of fireflies observed increased from 68 in the previous year to 145*7.



Street lights in Zushi City are replaced with firefly-friendly LED lights

*7 The light was designed purely to minimize disturbance to the firefly habitat and does not guarantee for improving growth of fireflies or increase of the population.

Floor Boards Made from Wood 100% Recycled from Construction Waste Unused Wood Materials, and the like

Panasonic Housing Solutions Co., Ltd. is reducing its use of natural materials to preserve wood resources. 'Sustainable Board' is a new, eco-friendly material that uses 100% recycled wood (excluding adhesives) from construction waste and unused wood materials on a wood-based flooring substrate.

WEB https://holdings.panasonic/global/corporate/sustainability/environment/biodiversity.html#biodiversity_04_01

WEB **Flooring: Eco-conscious material**
https://sumai.panasonic.jp/interior/floor/concept/detail.php?id=eco_coordination

Development of World's First Fiber Board Made from Waste Oil Palm*8

In March 2022, we announced the world's first technology to produce fiber board from waste oil palm as PALM LOOP*9 and started market testing in the domestic furniture area. We are planning to expand sales of the new material to a wider range of markets and sales channels starting in fiscal 2024, scaling-up our activities.

1. We can contribute to reducing methane gas and other GHG generated by decaying waste oil palm.
2. We developed a technology to produce fiber board from waste oil palm.
3. We can prevent deforestation to create new farming areas through utilization of waste material.

We will contribute to alleviating global warming by reducing 'GHG emissions' and preventing 'deforestation'.

WEB **Development of world's first fiber board made from wastes of oil palm trees**
https://news.panasonic.com/jp/press/data/2021/11/jn211115-1/jn211115-1.html

WEB **Launching our PALM LOOP™ technology that can produce fiber boards from wastes of oil palm trees**
https://news.panasonic.com/jp/press/data/2022/03/jn220317-1/jn220317-1.html

WEB **The special PALM LOOP website**
https://panasonic.co.jp/phs/technology/palmloop/

*8 Based on our research as of March 2022.
*9 PALM LOOP™ is a trade mark of Panasonic Corporation.

Conservation of Biodiversity through Collaboration with and Support for NGOs and NPOs

Introduction of MSC-ASC certified sustainable seafood at employee canteens

The Panasonic Group has been involved in marine protection activities*10 for some 20 years through collaboration with WWF Japan. Main activity at present is continual supply of MSCand ASC-certified*11 sustainable seafood*12 to employees' canteens that started for the first time in Japan at Panasonic headquarters in March 2018. As the same as last fiscal year, the number of employees work in the office decreased due to the COVID-19 pandemic. This led to the temporary closure of canteens and a significant reduction of menu items, as well as suspending the sustainable seafood menu in nearly half of the applicable canteens. As difficulties continued, sustainable seafood was newly introduced to only two of the Panasonic Group sites this year, making an accumulated total of 56 sites. Note that as for our continued support for other companies adoption of sustainable seafood into their canteens, the number of adopting companies is steadily increasing. The running total of the canteens of partner companies using sustainable seafood has exceeded 50, making more than 100 when combined with our Group's accumulated total.

Cumulative total of sites offering the menu exceeded 50


Deep fried oysters made in Tokura, South Sanriku; the oysters obtained Japan's first ASC certificate (Panasonic supported the activity.)

In addition to corporate canteens, Yokohama City University COOP has obtained the MSC-ASC certification with the Panasonic Group's support and collaboration, towards the first adoption of sustainable seafood to a university canteen in Japan. Sustainable seafood is now creating a new trend and is expanding its market.

By expanding availability of sustainable seafood, such as serving it at corporate canteens, and communicating with employees and the next generation about sustainable seafood and the IUU fishing issues*13 through media, we are working to change the behavior of our employees as consumers and the public at large. This contributes to SDG 14 Life below Water and promotes to make the topic of biodiversity mainstream.

Partners and Canteens That Have Adopted Sustainable Seafood (Accumulated)

	FY2018	FY2019	FY2020	FY2021	FY2022	FY2023
No. of sites with sustainable seafood menu	2	12	42	52	54	56
No. of certified catering companies (Partners proposed by the Panasonic Group only)	1	6	11	13	17	20
No. of adopting companies (Our partners only)	0	2	4	4	9	11
No. of adopting sites under the above companies(Our partners only)	0	5	27	38	51	55

<External awards>
Champion in the Initiative Category of the 1st Japan Sustainable Seafood Awards (November 2019)

*10 Including supports for the conservation of the tidal flats in Ariake Sea (2001 to 2006) the Yellow Sea Ecoregion (2007 to 2015), and the reconstruction of aquaculture industry in environmentally friendly manner at Minami Sanriku, Tohoku (2014 to current).
*11 MSC certification is certified by Marine Stewardship Council for sustainably and properly managed fisheries. ASC certification is certified by Aquaculture Stewardship Council for responsible fish farming to minimize environmental load on the environment and society.
*12 Seafood that has been certified sustainable production with MSC and ASC certification and managed under CoC certification*14
*13 IUU fishing issues: Fishing that is illegal, unreported and unregulated. It is one of the international issues that threaten the effectiveness of resources management.
*14 CoC is the acronym for Chain of Custody. Certification on securing management and traceability in processing, distribution, and marketing.

WEB **References on sustainable seafood**
https://news.panasonic.com/jp/topics/204140.html

Promotion of activities for conservation of biodiversity around the world through NGOs and NPOs

Continuing protecting satoyama and rivers through citizen networks

The Panasonic Group companies located in Japan, and their labor unions and retiree association conduct a variety of environmental protection activities as Panasonic Eco Relay Japan (PERJ) in a one team.


Wastes at Yodo River


Activities at Yodo River

Since its foundation in October 2010, PERJ has been working with a variety of stakeholders*15 to conserve local environments through efforts such as Hirakata City Hotani Satoyama Conservation Activity; Tanba Sasayama City Unitopia Sasayama Satoyama Revitalization Activity; Kadoma City Eco Network Activity; and Osaka City Yodo River and Johoku Wand*16 Conservation Activity. During these years, we have received the following awards in recognition of our contribution to nurturing the next generation to act for the environment under collaborations with local companies, universities, and citizen groups. These activities are for the purpose of biodiversity conservation, however, the cleaning activities at the rivers reduce marine plastic wastes which are directly flowing into oceans. For this reason, we will continue to promote these activities in the future.

<External awards>
- Hirakata City Environment Award (February 2018)
- Biodiversity Action Grand Prize (December 2018)
- Kadoma City Environment Award (February 2019)
- Osaka City Environment Award (February 2020)

*15 Wand is terrain just like a small pond surrounded by river structures, although Wand is connected to a mainstream of the river. Wand provides stable habitats for fish and other aquatic life, and at the same time, it is breeding grounds for a variety of plants.
*16 Collaborating with numerous stakeholders, including NPOs, citizen groups, universities, administrative bodies, local governments, research institutes, corporations, and local farmers.

WEB **Panasonic Eco Relay Japan (PERJ)**
https://www.panasonic.com/jp/corporate/sustainability/citizenship/environment/perj.html

WEB **Unitopia Sasayama Satoyama Revitalization Plan**
https://unitopia-sasayama.pgu.or.jp/ecorelay/

WEB **One of the Panasonic Group's corporate citizen activities (environment-related social contribution activities by Panasonic business sites and employees across the world).**
https://panasonic.co.jp/citizenship/activity/environment/

Participation in Biodiversity Initiatives

The Panasonic Group has been participated in biodiversity initiatives and related industry organizations, as shown below. This is to accurately understand biodiversity policies in Japan and global trends concerning biodiversity, such as the Post-2020 Biodiversity Framework of the Convention on Biological Diversity, TNFD, and SBTN through study meetings. We feed these domestic and global policies back into Panasonic Group businesses and assess opportunities and risks. We also make an appeal about activities by Japanese corporations through the Convention on Biological Diversity under the COP.

<Participation>
- Participating in TNFD Forum.
- Keidanren Committee on Nature Conservation: Keidanren Initiative for Biodiversity Conservation. The Panasonic Group also participates in the initiative.
- Japan Business Initiative for Biodiversity (JBIB)
- Biodiversity Conservation Committee of the Japan Association of Industries and Environment
- Biodiversity Working Group of four Electrical and Electronic Industry Associations*17

Keidanren Initiative for Biodiversity logo mark

Additionally, Panasonic Holdings Corporation is participating in the Clean Ocean Material Alliance (CLOMA) to accelerate innovation in solving marine plastic waste issues.

*17 Four industry associations: The Japan Electrical Manufacturers' Association (JEMA), Japan Electronics and Information Technology Industries Association (JEITA), Communications and Information Network Association of Japan (CIAJ), and Japan Business Machine and Information System Industries Association (JBMIA).

Water Resource Conservation

Ways of Thinking about Water Resource Conservation

It is said that available fresh water is only about 0.01% of the Earth's total water resources. We understand that the water crisis is one of the global risks, considering further increase in water consumption because of economic growth and population increases in near future.

As risks of extreme water shortages is becoming higher as one of social issues, the Panasonic Group has been working to conserve water resources both in its products and production activities, in order to fulfill its social responsibility and to reduce risks in the management. Our Environmental Policy (Refer to page 10) sets that we make efforts to conserve water resources by using water efficiently and preventing water pollution. We are working hard to reduce water usage in our business activities and through our products and services by setting water resource conservation in Our GREEN IMPACT PLAN 2024 as one of the continuing efforts. As for risk management, we had conducted water conservation activities, aiming to complete our water risk assessment at all our production sites by fiscal 2019, and have completed 100% of the assessments.

Specifically, we evaluated the scale of water risk at all regions where our production sites are located, in order to identify and mitigate effects of water on our business activities. In the evaluation, we utilized evaluation tools such as Aqueduct supplied by the World Resources Institute (WRI) and the Water Risk Filter supplied by the Worldwide Fund for Nature (WWF), which can evaluate risks in various aspects; not only from physical risks such as water shortages, but also from the risks in water-related regulations as well as reputation risks in each region. We also made use of public databases available from respective national governments. In areas with higher water risks, we collected information through public local information as well as through hearings with relevant organizations, etc. By conducting detailed analyses and close examination of the local information and the site data including water use volumes, we, more specifically, identified the effects on our business activities. We steadily proceeded processes of the water risk assessments, and in fiscal 2018, completed water risk assessments at all of our production sites of the Panasonic Group. None of our production sites is under water stress. At present, no water risks that could affect the Panasonic Group's business activities have been reported. Yet, we will continue to make efforts to reduce water consumption in our production activities in the future under the water risk assessment that had been implemented.

For promoting these activities, the Panasonic Group have established a structure for the promotion of environmental management, including water management (see page 23). We are now conducting environmental activities using PDCA cycle under the structure, and are upgrading the environmental management level. In addition, we have organized an Environmental Risk Management Structure to continuously reduce environmental risks; under the structure, we (1) identify environmental risks and promote risk management in the whole Panasonic Group every fiscal year and (2) promptly respond to the risk when it arises (see page 25). Through these activities, we will continue to manage our environmental risks.

Moreover, the Panasonic Group has participated in the Water Project, a public-private partnership project aimed at boosting awareness of water conservation, which was launched under the initiative of Japan's Ministry of the Environment in 2014. Objectives of the project are to maintain a sound water cycle and promote its recovery. The project distributes water-related activities conducted by corporations, and water-related information including importance of water. The Panasonic Group will work in cooperation with the Japanese government and other companies to conserve water resources.

Water Resource Conservation through Products

By thoroughly analyzing the use of water through our products, we have developed functionalities that allow a considerable amount of water conservation by utilizing water at a maximum level through improvement of water flow control and cyclic use. We continue to develop products with low water usage.

Example of water-saving products are introduced in the following website.
WEB https://www.panasonic.com/global/corporate/sustainability/eco/water.html

Initiatives for Water Resource Conservation through Production Activities

By collecting and reusing wastewater from our manufacturing processes and air conditioning systems, the Panasonic Group has been reducing the amount of makeup water used and wastewater effluent. Through these activities, we reduce environmental loads on water resources due to the intake and effluent of water in production activities.

As many regions around the world are threatened by water shortages, the Panasonic Group has been conducting production activities, balancing water resource conservation in focused regions.

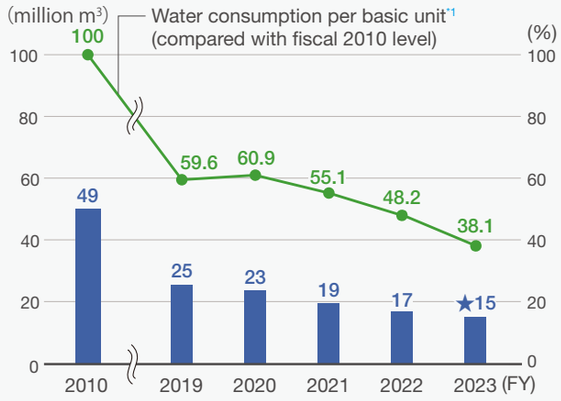
The amount of water used at factories in fiscal 2023 resulted in 15.27 million m^3, which is reduced by 11.4% versus the fiscal 2022. The water used at our factories per basic unit of production[*1] got better year-on-year thanks to positive effects of the structural reform.

Our use of recycled water[*2] in fiscal 2023 was 1.55 million m^3, accounting for 10.2% of the total amount of water used. The amount of discharged water in fiscal 2021, 2022 and 2023

resulted in 14.81 million m³, 13.39 million m³, 11.78 million m³, respectively.

*1 Water used at factories per basic unit of production = Water used at factories/Production volume.
*2 The calculation excludes the water circulating for a single purpose (e.g., water in a cooling tower).

Water Consumption in Production Activities and Water Consumption Per Basic Unit



Note: Then-SANYO Electric and Panasonic Liquid Crystal Display not included in fiscal 2010.

FY2023 Breakdown of Water Consumption (by region)

(10 thousand m³)

Region	Consumed	Municipal water/ industrial water	Groundwater	Rivers/lakes	Discharged	Sewer systems	Waterways
Japan	822	312	510	0	687	158	529
China & Northeast Asia	339	337	1	0	233	176	57
South East Asia, & Oceania	292	268	24	0	207	157	50
North America & Latin America	45	33	13	0	35	32	2
Europe & CIS	10	9	1	0	9	8	1
India, South Asia, Middle East & Africa	20	1	18	0	7	7	0
Total	1,527	960	567	0	1,178	539	639

Panasonic Industry Co., Ltd. (54 sites), uses the highest amount of water in all operating companies in the Panasonic Group. The company managed to achieve a year-on-year decrease of 18.0% in water consumption (6.47 million m³) in fiscal 2023, thanks to their focused efforts and business restructuring. The achievement rate for reducing the amount of water used per basic unit was 103%.

Against the backdrop of the increasing occurrence of natural disasters in recent years, such as earthquake and flood disasters, Panasonic Industry Co., Ltd. Saga site achieved a reduction of environmental risk and environmental impact, considering a possible chemical leakage from the outdoor storage site in the company premises. This was accomplished by replacing their water purification system, which used a chemical-based regeneration method for the ion-exchange resins, to a system that uses an electrical regeneration method.

At the same time, the company installed a wastewater collection system that separates the wastewater generated by the water purification into concentrated wastewater and collection water. The company is now able to reduce the water consumption for the entire factory by 18 thousand m³ per year by reusing the collection water.

The Panasonic Group will continue our efforts to conserve water resources.

Device Solutions Business Division Saga, Panasonic Industry Co., Ltd.

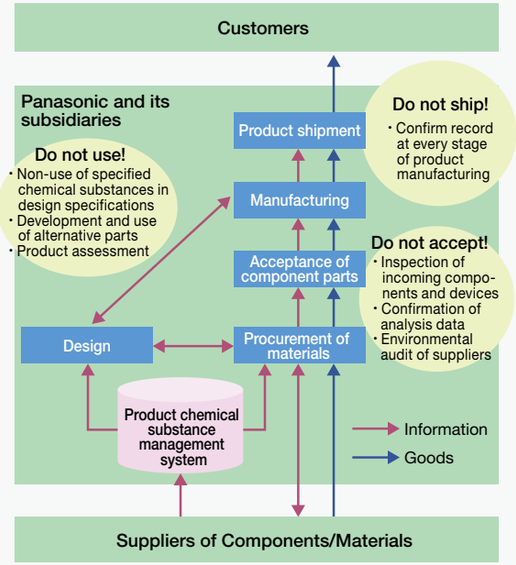

Water purification system with electrical resin regenerator

Chemical Substance Management

Approaches to Reducing the Environmental Impact of Chemical Substances

In order to prevent contents of hazardous substances prohibited under the EU RoHS Directive*1, published in 2002 and revised in 2011, and the like in Panasonic Group's products, it is important not only to pay attention to the contents at the stage of product design, but also to ensure that specified substances are not contained in products to purchase. Therefore, the Panasonic Group has rolled out the "Do not accept! Do not use! Do not ship!" campaign throughout the each production process from designing to shipment inspection in production activities at business sites across the world since October 2005. Specifically, as for the stage of inspection for incoming components, we have established a mechanism to check and analyze whether specified chemical substances are included by introducing an analyzer. In addition, we have supported to establish a Product Chemical Substances Management Structure, by periodically conducting environmental audits for suppliers of components/materials which may have high risks of containing specified chemical substances.

Specified chemical substance management system

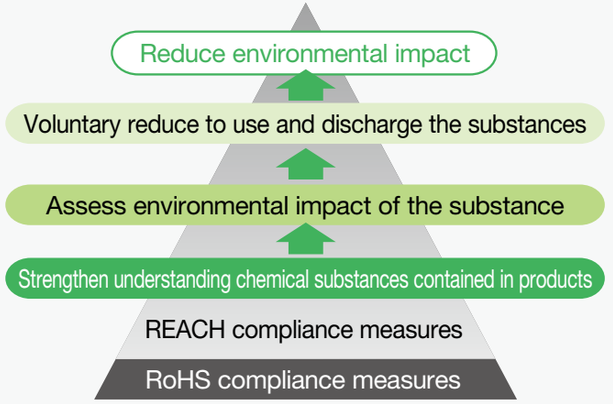


Meanwhile, as represented by the enforcement of the REACH regulation*2 in the European Union, the world implemented measures toward the goals agreed at the World Summit on Sustainable Development (WSSD) held in 2002, which is to produce and use all chemical substances in a manner that minimizes their impact on human health and the environment. The further framework after 2020 is currently under discussion. It is now at the stage of reviewing and summarizing its efforts to date. In support of the precautionary approach proposed in the Rio Declaration made at the Earth Summit in 1992, the Panasonic Group aims at manufacturing products in line with our basic policy of reducing the use of chemical substances that might adversely affect human health and the environment throughout their lifecycles. We set chemical management in our GREEN IMPACT PLAN 2024 as one of our continuous issues, and we are constantly working to reduce environmental impact from the chemicals used in our business activities and products. As for concrete activities, we have worked to comply with relevant regulations such as EU RoHS, as a matter of course. In addition, we have worked to reduce the environmental impact of our products by (1) identifying hazardous substances contained in our products, (2) evaluating these substances on their environmental impact, and (3) voluntarily reducing or discontinuing their use in case of any environmental risks.

*1 Directive on the Restriction of the use of certain Hazardous Substances in electrical and electronic equipment
The RoHS Directive currently restricts use of the following ten substances beyond the specified concentrations shown in parentheses:
lead (0.1%), cadmium (0.01%), mercury (0.1%), hexavalent chromium (0.1%), polybrominated biphenyls and polybrominated diphenyl ethers (0.1%), four types of phthalates (0.1%).
However, the RoHS Directive allows exemptions from its restrictions for a limited time if substitution is technologically or scientifically impossible. Exemptions stipulate specific restrictions in details on the use, concentration limit, and time frame for each substance.
<Exemption examples>
Lead: Glass, ceramics, and high-temperature soldering used in electronic components.
Mercury: Cold-cathode tubes used in LCD backlighting and fluorescent lighting.
Note that vehicles and batteries are not subject to the restrictions under the RoHS Directive.
The EU End of Life Vehicles Directive details restrictions for vehicles and the EU Battery Directive details restrictions for batteries.

*2 Regulations on the registration, evaluation, authorization, and restriction of chemical substances.

Process to Reduce the Environmental Impact of Chemical Substances



In order to definitely implement such activities described above, we issued our Chemical Substances Management Rank Guidelines that specifies prohibited chemical substances and management substances concerning products and activities at factories. We request to take actions to the chemical substances in accordance with the guidelines, not only to Companies in the Panasonic Group, but also to our suppliers. In fiscal 2013, we added Level 3 of prohibited substances to the category of the Chemical Substances Management Rank Guidelines (For Products). We not only consider nonuse of the prohibited substances, or the substances to be prohibited under laws and regulations, but we also consider prohibiting concerned substances that may adversely affect human health and the environment in the future. Further, we are striving to comply with relevant laws and regulations, and mitigate effects of toxic substances on human health and the environment by increasing the number of globally prohibited substances (Level 1) beyond boundaries of countries subject to the applicable laws and regulations from 21 substances/groups in fiscal 2015 to 30 substances/groups in fiscal 2024.

The Chemical Substances Management Rank Guidelines (For Products) and relevant documents, which includes clear description of prohibited substances and management substances, is available in PDF file for your downloaded from the following website. (Green Procurement).

Green Procurement (Download of Chemical Substances Management Rank Guidelines (For Products)) in PDF file
https://holdings.panasonic/global/corporate/about/procurement/green.html

Chemical Substances Management Rank Guidelines (For Products)

Rank		Definition
Prohibit	Level 1	(1) A substance contained in products that is prohibited by existing laws and regulations; or a substance where the upper limit of concentration is specified. (2) A substance that will be prohibited in products by laws and regulations or where the upper limit of concentration will be specified within one year after the revision date of this Guidelines. Note that there is a case that a substance is specified as the Level 1 prohibited substance more than 1 year before the enforcement date, because of the enforcement dates of the law and the Rank Guidelines.
	Level 2	Substances other than those specified as Level 1 and to which either of the following criteria applies: (1) Substances to be prohibited in products after a certain period by a treaty, law, or regulation. (2) Substances that are prohibited in products by the Panasonic Group prior to the effective period specified by a treaty, law, or regulation. (3) Substances whose use is voluntarily restricted by the Panasonic Group.
	Level 3	Any substance other than those specified as a Level 1 or Level 2 Prohibited Substance that is under review for prohibition by laws, regulations, etc., and the clarification of substitution-related issues as well as the timing for prohibition will be reviewed by the Panasonic Group in light of future legislation trends.
Manage		Substances whose actual use in products needs to be understood and for which consideration needs to be given to human health, safety and hygiene, adequate treatment, etc. The intentional use of these substances is not restricted, but their use and contained concentration must be monitored.

Note: The laws, regulations and the substances subject to the above table are chemical substances specified as Class I Specified Chemical Substances under the Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc.; toxic substances whose manufacture etc. is prohibited by Article 55 of the Industrial Safety and Health Act; EU RoHS Directive; and Annex XVII of the EU REACH Regulation. For more details, see the chapter on Specified Managed Substances in the Chemical Substances Management Rank Guidelines (For Products).

Chemical Substances Management Rank Guidelines (For Factories)

Rank	Definition
Prohibit	Use of the following substances should be immediately discontinued: Carcinogens for humans Ozone depleting substances Substances whose use is prohibited by Panasonic Chemical substances designated as Class I Specified Chemical Substances by the Japanese Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc. Substances whose manufacture is prohibited by the Japanese Industrial Safety and Health Act Substances whose manufacture and use are prohibited by international treaties
Reduce	Substances whose use, release and transfer should be identified and reduced. Substances other than prohibited substances that might pose risks to human health and the environment.

Note: Covered legislation include: PRTR Act (chemical substances), environmental criteria under the Basic Environment Act; the Industrial Safety and Health Act; and the Stockholm Convention. For more details, see the contents on The Aim of Establishing the Chemical Substances Management Rank Guidelines (For Factories) in the Chemical Substances Management Rank Guidelines (For Factories).

History of Panasonic Group's Initiatives to Reduce the Environmental Impact of Chemical Substances

Social trends

- 1989: The Montreal Protocol entered into force
- 1992: Earth Summit in Rio de Janeiro—Agenda 21
- 1996: Discontinuance of the use of specified chlorofluorocarbons by industrialized countries
- 2002: WSSD in Johannesburg
- 2006: The RoHS Directive entered into force
- 2007: The REACH Regulation entered into force

Panasonic Group — 1990 | 1995 | 2000 | 2005 | 2010 | 2015

All products

- 1992: Discontinued use of PVC resin in packaging materials
- March 2003: Discontinued use of lead in solders globally[*3]
- October 2005: Discontinued use of six RoHS substances globally[*3]
- March 2009: Discontinued use of PVC in internal wiring of new products to be sold in Japan[*3]
- March 2011: Discontinued use of PVC in internal wiring of new products globally[*3]
- July 2018 Discontinue use of the four phthalates specified by the RoHS Directive in new products globally

Individual products

- 1991: Released mercury-free manganese dry cells
- 1992: Released mercury-free alkali dry cells
- 1995: Discontinued use of CFC refrigerant in refrigerators globally
- 2002: Discontinued use of HCFC refrigerant in air conditioners (Japan)
- 2004: Refrigerators in Japan market became fluorocarbon-free (Japan)
- 2006: Released lead-free plasma display panels
- 2010: Released fluorocarbon-free freezers using CO_2 refrigerant and compatible display cases
- 2013: Released air conditioners using new refrigerant R32 with low Global Warmer Potential (GWP) (Japan)

Chemical substances used at factories

- 1996: Discontinued use of chlorinated organic solvents
- 1997: Began identification work for PRTR
- 1999: Launched the "33/50" reduction activity[*4]
- 2004 (Japan): Achieved Voluntary Action Plan Reduced use by 75% Reduced release and transfer amount by 62% compared to fiscal 1999 level
- 2010 (Global): Achieved Voluntary Action Plan Reduced release and transfer amount of key-reduction target substances by 46% compared to fiscal 2006 level

*3 Excluding applications where the quality such as safety cannot be ensured, or applications where the material is designated by laws and regulations.
*4 A reduction activity that promotes cutbacks in the use, release, and transfer of chemical substances by 33% in three years and by 50% in six years, compared to the fiscal 1999 level.

Management of Chemical Substances in Products

To minimize the environmental impact of chemical substances contained in products, we endeavor to identify chemical substances used in the components and materials of our products. In addition, for substances that are prohibited in products in major developed countries because of laws and regulations such as the European RoHS Directive, we manage the substances not to be used and/or contained in our products by designating them as prohibited substances except the substance for specific usage which is unavoidable to use its substitution. We will also conduct environmental impact assessments for the managed substances contained in our products. As for a substance whose impact on human health and/or the environment cannot be ignored, we plan to reduce or prohibit use of the substance.

Continuously updating information concerning chemical substance contents

The electrical and electric products The Panasonic Group manufactures and sells consist of various raw materials and components supplied through a long supply chain from material manufacturers to many component manufacturers. To contribute to the achievement of the global goals set at the WSSD, it is important for us to disclose and communicate information on the chemical substances used in our products across the supply chain, for which we must promote cross-industrial initiatives to establish and disseminate an effective system.

The Panasonic Group is a member of the Joint Article Management Promotion consortium (JAMP). Approximately 440 major companies from various industries, such as chemical, component, and equipment manufacturers are also members of JAMP. We are proactively formulating, utilizing, and disseminating chemical substance management standards and systems through this organization.

The Panasonic Group has started up a product chemical substance management system in fiscal 2005. From July, 2009, our 10,000 suppliers of materials and components provided us the data on chemical substances contained in their products, using JAMP's data transmission formats (JAMP_AIS and JAP_MSDSplus).

Meanwhile, in Japan alone, the workload of upstream suppliers increased, as a number of hazardous substance inspections were carried out throughout the supply chain using own company format. Having recognized the issues obtained from the inspections, the Ministry of Economy Trade and Industry proposed a new scheme to introduce "chemSHERPA," for sharing and exchanging information on chemicals contained in components and products. Because the format adopted for chemSHERPA complies with IEC62474, the international standard on material declaration for the electrical and electronic machinery industry and their products, the Panasonic Group agreed to use chemSHERPA format, and in January 2018, started full-scale use of chemSHERPA as a data gathering format. With the supply chain expanding to a global scale, it is particularly important for overseas suppliers to deepen their understanding on the handling of hazardous chemical substances. Therefore, we carried out education programs for persons in charge of chemical substance management and suppliers at more than 100 of our business sites in ten countries including China and other Asian countries. At the same time, we completed conversion from JAMP format to chemSHERPA by June 2018, when the JAMP format became unusable.

WEB **chemSHERPA website:** https://chemsherpa.net/english

(The JAMP website was merged into chemSHERPA on March 15, 2019)

While the Japanese automotive industry has been using the JAMA/JAPIA sheet*5 to share information on chemicals used in products in the supply chain, IMDS*6 is actually the de-facto standard material data system used by the international automotive industry. With the backdrop of the Japanese automotive industry now shifting to IMDS from JAMA/JAPIA sheets, in October 2020 the Panasonic Group undertook a full data migration to IMDS for use in our automotive business. We held seminars to more than 200 suppliers and completed a successful data migration. This means that the Panasonic Group can now obtain data for the materials in the components received from our suppliers through IMDS into our management system for the chemical substances in our products, and, at the same time, we can deliver product chemical data to our customers. The system thus makes for easier material data communications throughout the supply chain.

Companies that procure electronic components need to fully understand the information on the substances contained in the components at the point of selection or usage in order to comply with the EU RoHS Directives and REACH regulations. Particularly, as the REACH Substances of Very High Concern (SVHC) List is updated every six months, those companies expect their suppliers to speedily provide information on the latest substance to the Panasonic Group.

In order for the companies procure electric components to speedily and effectively understand information on chemical substance contents, the Panasonic Group has published a table of RoHS and REACH compliance status on our website since November 2012. The table covers our RoHS Directive compliance information and the substances designated in the RoHS/REACH Confirmation Report for all our major generic electronic components.

*5 The standard material data format in the Japan's automotive industry (standardized by the Japan Automobile Manufacturers Association and the Japan Auto Parts Industries Association).
*6 International Material Data System: Material data system for automotive industry that is globally used.

WEB **RoHS / REACH Confirmation Report for major generic electronic components**
https://industrial.panasonic.com/ww/downloads/rohs-reach

For products covered by the Act on the Promotion of Effective Utilization of Resources of Japan, the Panasonic Group does not manufacture, import, or sell products that contain specified chemical substances which exceeds the limited value in non-exempt parts. For more details, see Information on the Content of specified chemical substances Chemical Substances in Covered Products below.

WEB **Information on the Content of specified chemical substances Chemical Substances (Japanese)**
https://holdings.panasonic/jp/corporate/sustainability/environment/chemical/jmoss.html

In June 2015, the Act on Preventing Environmental Pollution of Mercury was enacted to implement measures agreed in the Minamata Convention on Mercury. The act requires manufacturers of products containing mercury to provide information such as labelling as manufacturers responsibility, so that such products are appropriately sorted and discharged when being disposed of. In order to communicate information concerning the mercury used in our products to customers, the Panasonic Group established a new webpage, Information Based on the Act on the Preventing Environmental Pollution of Mercury, in May 2017.

PDF **PDF file of the Act on Preventing Environmental Pollution of Mercury**
https://members.wto.org/crnattachments/2015/TBT/JPN/15_2560_00_e.pdf#search=%27Act+on+Preventing+Environmental+Pollution+of+Mercury%27

WEB **Information Based on the Act on Preventing Environmental Pollution of Mercury (Japanese)**
https://holdings.panasonic/jp/corporate/sustainability/environment/chemical/jmoss/mercury.html

Assessing the Impact of Chemical Substances

Scientifically identifying the impact on human health and the environment of products containing chemical substances is vital to the development of products with low environmental impact. We are engaging in activities designed to assess the levels to which customers are exposed to substances of very high concern (SVHC), as well as safety during product usage. To date, we have assessed effects of ceramic fibers used in certain models of commercial microwave ovens. As part of our efforts to comply with the EU REACH regulation which requires preparing information for the safe use of products containing a certain amount of SVHC, we have created and publicized the safety assessment document. The exposure was considered to be nominal with little concern for any effects on human health. Furthermore, usage of ceramic fibers in our products was discontinued in December 2010.

PDF **Product Safety Assessment Report**
https://holdings.panasonic/global/corporate/sustainability/pdf/RCF_Professional_microwave_oven.pdf

Reduction in Use and Discharge of Chemical Substances

Fluorocarbons (CFC) used as refrigerants, insulating materials, and the like for freezers and air conditioners, have properties which are known to cause ozone layer depletion and global warming. Therefore, the Panasonic Group had devoted to develop the technology to use CO_2 as a refrigerant which has extremely low effects on ozone depletion and global warming, and has sold a home water heater using the low CO_2 refrigerant since 2001. Although the low CO_2 refrigerant is suitable for heating to maintain a certain degree of temperature, it was difficult to be used in refrigerators and freezers, especially in large commercial equipment due to insufficient cooling efficiency and size. However, with support from the New Energy and Industrial Technology Development Organization (NEDO), the Panasonic Group developed a refrigeration system using CO_2 refrigerant, and has delivered CFC-free freezers and refrigeration showcases to supermarkets and convenience stores with the CO_2 refrigerant in Japan since 2010. We have also commercialized high-power freezers designed for distribution warehouses and food factories, and have been

expanding their market opportunities with wider scope of their usability from domestic to international.

For wall-mounted home air-conditioners (AC), we are promoting changing over from non-inverter types of AC, not only to more eco-friendly inverter types of AC with high energy-efficiency, but also to the AC with new refrigerant R32 whose Global Warming Potential (GWP) is low. In fiscal 2020, we introduced into Hong Kong's window air-conditioner market new models with the industry's first inverter system using the new R32 refrigerant, which has contributed to reduce environmental loads.

In addition, as measures against ozone depletion caused by HCFCs, a refrigerant called R410 that does not deplete the ozone layer was used in room air conditioners; however, this substance has an issue of its very high very high Global Warming Potential (GWP). Therefore, the Panasonic Group developed a model that uses a new refrigerant R32, which has a lower GWP and introduced it launched sales of the model in 2013. Furthermore, PT. The Panasonic Manufacturing Indonesia, which owns the factory for manufacturing room air conditioners in Indonesia, redesigned its production facility that used an ozone-depleting HCFC refrigerant R22 to one using R32 in fiscal 2015, and started supplying new R32-based air conditioners. Thereby, we contributed to the Indonesian government's initiative to eliminate the use of HCFCs.

OCU-CR2001MVF, a fluorocarbon-free freezer using CO_2 refrigerant

FPW-EV085, a display case compatible with a fluorocarbon-free freezer

Window air-conditioner unit with the new R32 refrigerant, CW-HZ180YA

An air-to-water heat pump that utilizes R290 natural refrigerant for residential use

In May 2023, we became the first Japanese manufacturer in Europe to launch new three models of an air-to-water heat pump that utilizes R290 natural refrigerant for residential use, which has extremely low Global Warming Potential (GWP).

Restriction on Use of PVC Resin

Polyvinyl chloride (PVC) is a material of concerns to the generation of hazardous substances from inappropriate disposal, as well as the harmful effects of certain additive agents (phthalates) used to render PVC more pliable. In light of the significant potential for inappropriate disposal of the PVC resin used in the internal wiring of products, due mainly to difficulties associated with the sorting of this resin from used products, we have switched our new products launched from April 2011 to non-PVC.

List of Our PVC-free Products

https://holdings.panasonic/jp/corporate/sustainability/pdf/eco_pvclist2023.pdf

Restriction on Use of Phthalates

Phthalates are often used in PVC products, and the use of four phthalates[*7] was restricted under the EU RoHS2 from July 22, 2019. Panasonic Group classified these substances as Level 1 Prohibited Substances in our Chemical Substances Management Rank Guidelines Ver. 11 (for products) issued in July 2018, and delivery of materials and components contain the phthalates was prohibited from July 22, 2019. We have classified other phthalates as Level 3 Prohibited Substances, and are promoting their substitution.

We worked on creating an analysis and management structure for the four phthalates to ensure their substitution. Since phthalates have a migration characteristic (where a substance from another article migrates through contact), materials may be contaminated by migration from production facilities as well as process equipment containing the four phthalates, which are specified as Level 1 Prohibited Substances. Accordingly, we also discussed introducing preventive measures against contamination through contact. To build a structure for incoming inspection for phthalate, we amended the standard for incoming inspection and determined to conduct incoming inspections on supplied components with a high risk of containing phthalates, such as PVCs, elastomers and glues. We have already selected and assessed an analyzer for phthalates to use for these inspections, and installed the analyzer at our business division. The phthalates contained in Panasonic Group's products exported to Europe used to be as high as 10t. However, total elimination of the phthalates has been completed as of March 31, 2019.

*7 Bis(2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP), Dibutyl phthalate (DBP), and Diisobutyl phthalate (DIBP).

Activities to Reduce Negative Environmental Impact at Factories

The Panasonic Group has been working to minimize environmental impact by identifying the hazardous substances used in our products, assessing the impact of such use, and voluntarily discontinuing the use or reducing the release of such substances. Since 1999, we have been conducting the 33/50 Reduction Activity to materialize reduction by 33% in three years and by 50% in six years. In Japan, we started promoting reduction of amounts to use, release, and transfer specified chemical substances at our factories in fiscal 2000. Against the target in our voluntary action plan, a reduction by 50% from the fiscal 1999 level, we achieved a 75% reduction in the chemical substance use and

a 62% reduction in the release and transfer in fiscal 2005. Since then, we have been continuing the activity, focusing on substances with particularly large amounts of release and transfer, setting a voluntary action target of reduction by 30% compared to the fiscal 2006 level. As a result, we achieved a 46% reduction in the amounts of release and transfer of specified key reduction-target substances across all factories worldwide in fiscal 2011.

Reflecting international trends in chemical substance management, our reduction measures have focused increasingly on particularly hazardous substances from fiscal 2011. Our Chemical Substances Management Rank Guidelines (for Factories) was established in 1999 as a guideline to help manage the above chemical substance reduction activities. In Version 1, the guidelines specified a list of chemical substances to be managed, mainly focusing on carcinogenic substances. The guidelines were later updated to Version 2 in 2000 to include rules concerning the Japan PRTR Law. Version 3, introduced in 2004, additionally covered a list of substances specified by chemical substances management legislation in Japan. The chemical substances covered by Version 4 and later from 2009 are those specified in legislation on human health and environmental impact in Japan, the U.S., and Europe, as well as those specified under international treaties.

Under our Chemical Substances Management Rank Guidelines (For Factories), we have focused our management on select chemical substances that are hazardous to human health and the environment. Further, the Panasonic Group created a unique indicator, the Human Environment Impact,*8 which is used globally in all our factories. Conventionally the chemical substances were managed by "quantity," such as usage amount or emissions/release. However, such quantity-based management has a problem in that some highly hazardous substances do not become subject to reduction or management if the usage amount was small, and therefore would fall out of the scope of impact assessments. In addition, the toxicity criteria varied according to substance types and regional legislation, which made standardized management across the Group difficult. To address this issue, we worked together with experts from both within and outside the Group, reclassified chemical substances based on an overall assessment of their hazardousness, and specified a hazardousness factor for each classification. Specifically, we set a hazard classification to each substance by utilizing carcinogen risk assessments issued by international organizations, together with publicly available hazard information and lists of ozone depleting substances. For substances that have multiple hazard information items, the item ranked with the highest hazard risk is used for classification. We utilize this Panasonic Group internal indicator as the Human Environmental Impact indicator to promote efforts to ensure reduction of highly hazardous substances with greater environmental impacts, such as carcinogens and ozone depleting substances, according to the risk level. The Panasonic Group Chemical Substances Management Rank Guidelines is also available on the website on Panasonic Group Green Procurement activities to promote collaboration with our suppliers, encouraging them to offer materials that do not contain hazardous substances.

WEB Green Procurement (PDF file Download of Chemical Substances Management Rank Guidelines (For Factories))
https://holdings.panasonic/global/corporate/about/procurement/green.html

*8 Human Environmental Impact = Hazardousness factor x Release and transfer amount

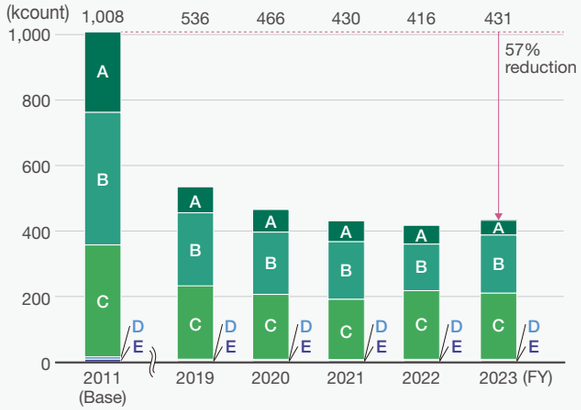
Further, we maintain our compliance in different countries by obtaining the latest information about the various chemical regulations enforced in each country through our regional headquarters and local industrial organizations. As for the VOC regulations amended in China in 2020, we successfully completed compliance confirmation and replacement with compliant components in each business division thanks to cooperation from local suppliers.

Classification of Hazards

Classification	Hazards*9	Hazardousness factor
A	Carcinogenicity/Ozone layer depletion	x 10,000
B	Serious or direct impact	x 1,000
C	Medium impact	x 100
D	Small or indirect impact	x 10
E	Minor impact or not assessed	x 1

*9 In addition to carcinogenicity, hazards to human health include genetic mutation, reproductive toxicity, and acute toxicity. In addition to ozone depleting substances, hazards to/substances with impact on the environment include ecological toxicity, substances that impact global warming, and substances that generate photochemical oxidants.

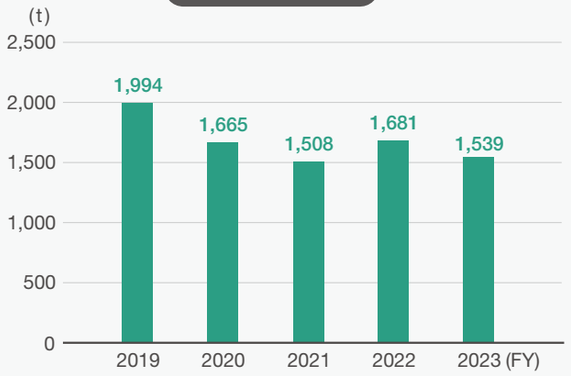
Human Environmental Impact



Note: Overseas sites of former SANYO Electric not included in fiscal 2011.

In fiscal 2023, we were able to reduce Human Environmental Impact by 57% compared to fiscal 2011 by substituting highly hazardous substances in paints, improving yields, promoting recycling, introducing substances with low-solvents and hazards, and improving processes, including reviewing the amount of paint or the number of washing cycles, as well as improving the efficiency of removal/deodorization equipment. We will continue our initiatives to minimize the amount of substances with environmental impact released through our production activities.

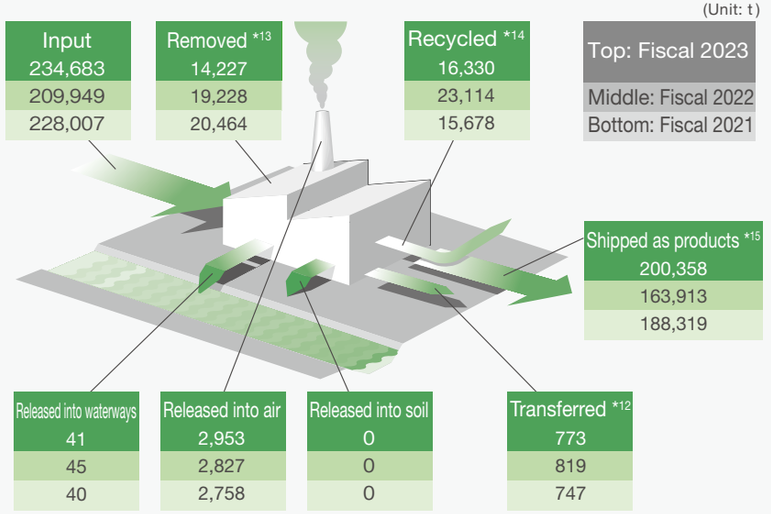
VOC*10 Emissions



*10 Emissions of Volatile Organic Compounds (VOC) into the air caused by use. The calculation covers 100 major VOC substances that Panasonic Group selected from those listed in the Air Pollution Control Act.

Material Balance of Substances in the Management Rank*11

(Unit: t)



*11 Based on the Chemical Substances Management Rank Guidelines (for factories). Includes all the substances specified in the Pollutant Release and Transfer Register Act.

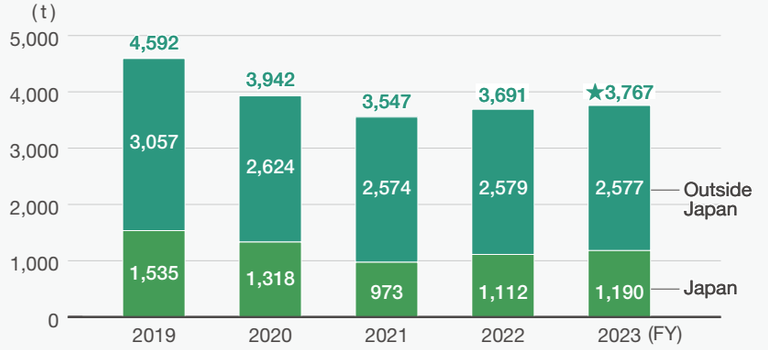
*12 Includes substances transferred as waste, as well as those discharged into the sewage system. Recycled amount which is free of charge or accompanies treatment cost under the Waste Management Law is included in "Recycled." (Different from the transferred amount reported under the PRTR Law.)

*13 The amount of substances converted into other substances through neutralization, decomposition, or other chemical treatment.

*14 The amount of substances recycled with revenue, as well as those recycled free of charge or with any payment.

*15 The amount of substances that have been changed to other substances as a result of chemical reactions, and/or those that are contained in or accompanied with products and shipped out of factories.

Release/Transfer of Substances Requiring Management*16



*16 Hussmann Parent Inc. and its consolidated subsidiaries not included.

Collaboration Across the Supply Chain

Collaboration with Suppliers and Transportation Partners

As the Panasonic Group backed by a number of suppliers, we must consider the environmental impacts of our entire supply chain, and not just of our own operations. Through our coordination efforts with suppliers and transportation partners, who form an integral part of our business operations, the Panasonic Group strives to minimize our environmental impact across the entire supply chain, focusing on the reduction of CO_2 emissions, resource recycling, chemical substance management, and biodiversity conservation.

Activities for Green Procurement

Activities for Green Procurement Since the publication of the "Green Procurement Standards" in 1999, the Panasonic Group has been promoting the manufacture of eco-conscious products in partnership with our suppliers. In the "Green Procurement Standards", we set up groups of suppliers who support the Panasonic Group's Environmental Policy in supplying products and goods in order to materialize the targets in supplier collaboration with our Group. In addition to cooperation in 'reducing environmental loads in supplier's business operation areas' and 'sharing achievements through collaboration with the Panasonic Group', we are asking our suppliers to 'seek the cooperation of upstream business partners' to expand the scope of activities of reducing environmental impact throughout the entire supply chain. In September 2019, we revised "the Green Procurement Standards" to deepen and widen their influence throughout the entire supply chain—beyond our Group and across society—following the Panasonic Group's environmental action plan.

We also published "Panasonic GREEN IMPACT" in 2021, regarding information about our contribution to CO_2 emissions reduction from Panasonic Group's business activities and from society in general, indicating our determination by setting our own targets to achieve both 'a better life' and 'a sustainable global environment' at the same time. We plan to expand this effort across the entire supply chain.

In response to more stringent and expanded regulations such as EU RoHS Directive, the Panasonic Group has been engaging in continual environmental quality assurance audits of our suppliers since 2005 to improve the management level throughout the entire supply chain. In fiscal 2023, we conducted the audits at some 800 suppliers and have supported their efforts to upgrade their management levels.

WEB Green Procurement Standards

https://www.panasonic.com/global/corporate/management/procurement/green.html

Estimation of Environmental Impacts in Business Activities by Suppliers

In order to assess greenhouse gas (GHG) emissions across the entire supply chain (scope 3[*1]), the Panasonic Group made original calculations based on the Greenhouse Gas Protocol, the international accounting standard for GHG emissions. Since fiscal 2012, the Panasonic Group has estimated its overall GHG emissions in the upstream range by multiplying the volume of materials purchased with the resource-specific GHG emissions per basic unit based on the Input-Output Table published by the Japanese government. The estimation results based on fiscal 2022 data is 21.55 Mt, roughly 12 times the GHG emissions of our Panasonic Group's own production activities.

*1 Other indirect emissions, excluding Scope 1 (direct emissions from facilities owned and controlled by the Panasonic Group) and Scope 2 (emissions from production of energy consumed at facilities owned and controlled by the Panasonic Group).

Sharing Achievements through Collaboration with the Panasonic Group

Since fiscal 2010, the Panasonic Group has been implementing the ECO-VC Activity[*2] Activity with our suppliers. This program is a collaboration between the Panasonic Group and our suppliers, aimed to both reduce environmental impact as well as reinforce product capability and achieve further rationalization for the Panasonic Group products and suppliers. In fiscal 2010, the target for reducing environmental impact was limited to energy saving (CO_2 emission reduction). However, this was extended in fiscal 2011 to Recycling-oriented Manufacturing aiming at saving resources and using recycled materials. The geographical range of our activities has also extended. Initially centered in Japan, actions accelerated to China and other parts of Asia in fiscal 2013, and later extended to a global scale in fiscal 2015.

We have stored case examples of ECO-VC Activity in a database for broader and effective use throughout the Panasonic Group. At the same time, as for outstanding activities, we provide awards in occasions such as 'ECO-VC Activity award and information exchange meeting'. Furthermore, the Panasonic Group formulated "an Environment Vision 2050" in 2017 to achieve 'a better life' and 'a sustainable global environment' compatibly, aiming for societies where residents use clean energy and live a more comfortable lifestyle. Under the vision, through the development of products, technologies, and solutions relevant to energy creation, storage, saving, and management, the Panasonic Group has worked towards creation and more efficient utilization of energy which exceeds the amount of energy used.

We added renewable energy to conventional evaluation items such as energy conservation (CO_2 emission reduction), cost reduction, resources conservation and use of recycled materials in fiscal 2019. Starting in fiscal 2024, we plan to work together with our suppliers to promote decarbonization and reduce CO_2 emissions in conjunction with the Panasonic Green Impact.

*2 ECO-VC Activity: Value Creation Activities

Environmental Achievements Made through Proposals

Items	FY2019	FY2020	FY2021	FY2022	FY2023
Number of proposals	820	772	430	332	264
CO_2 reductions derived from proposals	30.50 kt	280 kt	110 kt	50 kt	80 kt
Use of recycled resources derived from proposals	80 t	100 t	5 t	1500 t	600 t
Reduction in resources used derived from proposals	3.03 kt	19.9 kt	323 kt	255 kt	40 kt

Collaboration with Environmental NGOs

For exhaustive implementation of CSR throughout our global supply chain, we are implementing activities in collaboration with overseas environmental NGOs.

In China, where the Panasonic Group has a large number of suppliers and where commitments by suppliers to environmental issues have been highly demanded by society, we have diligently ensured compliance with China's laws and regulations and conduct responsible procurement throughout the supply chain, working together with environmental NGOs.

In September 2016, the Panasonic Group held seminars for about 400 suppliers on our CSR Procurement Policy and Chinese environmental regulations in Guangzhou, Dalian, and Shanghai. In the seminars, we asked suppliers to take necessary actions in response to China's latest environmental regulations, in addition to ensure CSR in supply chain. In such way, we have been working on to understand possible risks and to reduce environmental impact in our supply chain.

Since 2018, we have conducted on-site environmental audits which focus on response capabilities and CSR audits at the same time in some 20 suppliers per year since fiscal 2019. To ensure responsible procurement, we have been working on reduction of environmental impact collaborating with suppliers, ensuring from a request for the improvement items pointed out by audits to a confirmation of implementation of such improvements. Through on-site environmental and CSR audit, we will ensure compliance with relevant laws, social norms and corporate ethics.

We will also promote procurement to fulfill social responsibilities such as human rights, labor, safety and health, and global environmental conservation together with suppliers.

In addition, collaborating with the Institute of Public & Environmental Affairs (IPE), a China's environmental NGO, we have been working on to improve suppliers CSR environment, through sharing information on latest laws and regulations in a periodical working group meeting, and requesting for suppliers whose regulatory violation is recorded on a monthly base to improve it.

In the Suppliers Green Supply Chain responsibility rating (CITI*3 and CATI*4) that has been published by IPE since fiscal 2015, the Panasonic Group has consistently listed in the top rank each year. We were ranked the third best in the CITI ratings and the top in the CATI ratings for the home appliances industry (33 brands) in fiscal 2023.

*3 CITI : The Green Supply Chain Corporate Information Transparency Index
*4 CATI : The Corporate Climate Action Transparency Index

History of Environmental Activities

Era	Year	Panasonic Group	World	Japan
~1970s	1967			• Basic Law for Environmental Pollution Control enacted
	1968			• Air Pollution Control Law enacted
	1970	• Pollution Survey Committee established		• Water Pollution Control Law enacted • Waste Disposal and Public Cleansing Law enacted
	1971			• Environment Agency established
	1972	• Environmental Management Office established	• U.N. Conference on Human Environment held in Stockholm (Declaration of Human Environment adopted)	
	1973		• First oil shock occurred	
	1975	• Environmental Management Regulations enacted		
	1979		• Second oil shock occurred	• Energy Conservation Law enacted
1980s	1985		• Vienna Convention for the Protection of the Ozone Layer adopted	
	1987		• Montreal Protocol on Substances that Deplete the Ozone Layer adopted • World Commission on Environment and Development (the Brundtland Commission) advocated the concept of sustainable development	
	1988	• CFC-reduction Committee established		• Ozone Layer Protection Law enacted
	1989	• Environmental Protection Promotion Office established		
1990s	1991	• Matsushita Environmental Charter (Environmental Statement and Code of Conduct) enacted • Matsushita Product Assessment adopted and implemented		• Keidanren Global Environment Charter enacted by Japan Federation of Economic Organizations • Law for Promotion of Effective Utilization of Resources enacted
	1992	• Environmental Policy Committee established	• The Earth Summit held in Rio de Janeiro, Brazil; Agenda21 and Rio Declaration on Environment and Development adopted • United Nations Framework Convention on Climate Change adopted	
	1993	• Matsushita Environmental Voluntary Plan (Year 2000 targets) adopted • Matsushita Group' global environmental internal audits launched		• The Basic Environment Law enacted
	1995	• Acquired Environmental Management System Certification at AV Kadoma Site (first in the Matsushita Group)	• First Conference of Parties to the U.N. Framework Convention on Climate Change (COP1) held in Berlin	• Containers and Packaging Recycling Law enacted
	1996		• ISO 14001 International Standard on Environmental Management Systems launched	
	1997	• Corporate Environmental Affairs Division (CEAD) established • Environmental Conference established (held semi-annually)	• COP3 held in Kyoto and adopted the Kyoto Protocol	• Keidanren Appeal on the Environment announced by Japan Federation of Economic Organization
	1998	• Love the Earth Citizens' Campaign commenced • Recycling Business Promotion Office established • First environmental report (1997) published		• Home Appliance Recycling Law enacted (took effect in 2001) • Law Concerning the Promotion of the Measures to Cope with Global Warming enacted • Energy Conservation Law revised: Top Runner Approach introduced
	1999	• Green Procurement launched • Chemical Substances Management Rank Guidelines established • Acquired ISO14001 Certification in all manufacturing business units		• PRTR (Pollutant Release and Transfer Register) Law enacted
2000s	2000	• Lead-free Solder Project commenced • Held first environmental exhibition for general public in Osaka	• Global Reporting Initiative (GRI) issued The Sustainability Reporting Guidelines	• Basic Law for Establishing the Recycling-based Society enacted • Law for Promotion of Effective Utilization of Resources enacted
	2001	• Environmental Vision and Green Plan 2010 adopted • Held Environmental Forum in Tokyo and Freiburg,Germany • Panasonic Eco Technology Center launched	• Reached final agreement on the actual rules of Kyoto Protocol in COP7 held in Marrakesh	• Reorganized into the Ministry of the Environment • Law Concerning Special Measures against PCBs enacted
	2002	• Panasonic Center Tokyo opened	• Johannesburg Summit (Rio+10) held	• Kyoto Protocol ratified • Vehicle Recycling Law enacted • Law for Countermeasures against Soil Pollution enacted
	2003	• Declared 'Coexistence with the Global Environment' as one of the twin business visions • Factor X advocated as an indicator for Creating Value for a New Lifestyle • Completely introduced lead-free soldering globally • Super GP Accreditation System launched • Achieved zero waste emissions in Japanese manufacturing business sites (ongoing program) • Held Environmental Forum in Tokyo	• EU's WEEE Directive was enacted	
	2004	• Environmental Vision and Green Plan 2010 revised • PCB Management Office established • Superior GP Accreditation System launched		• Prohibited manufacturing and use of products containing asbestos in principle
	2005	• Participated in Expo 2005 Aichi, Japan as an official sponsor • Green Plan 2010 revised • Continued with the nationwide Lights-out Campaign • 3R Eco Project launched • Completed the elimination of specified substances (6 substances) in products • Matsushita Group's Green Logistics Policy established • CF Accreditation System introduced	• Kyoto Protocol entered into force	• Expo 2005 Aichi, Japan held • National campaign against global warming "Team –6%" launched • Marking for the presence of the specified chemical substances for electrical and electronic equipment (J-Moss) established

Era	Year	Panasonic Group	World	Japan
		• Panasonic Center Osaka opened • Eco & Ud HOUSE opened • Installed the first commercial household fuel cell cogeneration system in the new official residence of the Japanese Prime Minister • Won the first place in Nikkei Environmental Management Survey		
	2006	• Environmental specialist position established • ET Manifest introduced into all manufacturing sites of Panasonic in Japan • Realized lead-free plasma display panels and introduced them to the market • Full-fledge introduction of biodiesel fuel in logistics	• Restriction of Hazardous Substances (RoHS) Directive took effect in EU	• Relief Law for Asbestos Victims enacted • Energy Conservation Law revised: new cargo owner obligations, widened product scope of its application, and top runner standard revision
	2007	• Energy conservation activities at our factories in Malaysia approved as CDM project by the U.N. • A new environmental mark 'eco ideas' introduced • Panasonic Center Beijing opened • Environmental Forum in China held • "Declaration of Becoming an Environmentally Contributing Company in China" announced • Panasonic 'eco ideas' Strategy announced	• The Fourth Assessment Report of the Intergovernment Panel on Climate Change (IPCC) released • Registration, Evaluation, Authorisation and Restriction of Chemicals entered into force in EU • Framework for CO_2 reduction agreed at Heiligendamm Summit (G8) • The Bali Road Map for the post Kyoto Protocol agreed at COP13 • Administration on the Control of Pollution Caused by Electronic Information Products (China RoHS) came into effect	• 'Cool Earth 50' announced by Prime Minister Abe • '21st Century Environment Nation Strategy' formulated • 'The Third National Biodiversity Strategy of Japan' formulated • 'Ministerial ordinance partially amending the Enforcement Regulation of the Waste Management and Public Cleansing Law' promulgated • 'Domestic Emissions Trading Scheme Review Committee' established • 'The Second Fundamental Plan for Establishing a Sound Material-Cycle Society' formulated
	2008	• Established the Corporate CO_2 Reduction Promoting Committee • Held environmental exhibitions, 'eco ideas' World • Home Appliances Company announced environmental statement in which named its Kusatsu site as 'eco ideas' Factory • Announced 'eco ideas' Declaration in Europe • Established Environmental Strategy Research Center	• G20 (conference of key countries' environmental and energy ministers) held • Hokkaido Toyako Summit held	• Cool Earth Promotion Program announced by Prime Minister Fukuda • Mislabeling incident of waste paper pulp percentage • Long-term Energy Demand and Supply Outlook announced • Japan's Voluntary Emission Trading Scheme started
	2009	• Opened the 'eco ideas' House to demonstrate a lifestyle with virtually zero CO_2 emissions throughout the entire house • Announced the Asia Pacific 'eco ideas' Declaration • Announced 'eco ideas' factories (in Czech, Malaysia, Thailand, and Singapore) • Sanyo Electric joined the Panasonic Group	• China WEEE law promulgated • New framework for countermeasures against global warming on and after 2013 (post-Kyoto Protocol), the Cophenhagen Accord, was adopted at the COP15 (Copenhagen conference) • Seeking to emerge from the Lehman collapse, countries throughout the world accelerated actions for the Green New Deal	• Energy Conservation Law amended: Covered area expanded from factories to commercial sector facilities • Flat-panel TV and clothes dryer added as covered products under the Home Appliance Recycling Law • 'Eco point' system started

Era	Year	Panasonic Group	World	Japan
2010s	2010	• Announced "Vision looking to the 100th anniversary of our founding in 2018" • Announced new midterm management plan, "Green Transformation 2012 (GT12)" • Announced 'eco ideas' Declarations (Latin America, Asia Pacific, and Russia) • Established 'eco ideas' Forum 2010 in Ariake, Tokyo • Commenced business of Factory Energy Conservation Support Service • Announcement of Green Plan 2018	• COP10 held in Nagoya—Nagoya agreement made • APEC meeting held in Yokohama • Ruling party lost in US midterm election—changes in anti global warming policy • Cancun agreement made in COP16—Post-Kyoto framework still to be discussed	• Draft legislation of Basic Law of Global Warming Countermeasures submitted but remained in deliberation • Obligatory greenhouse gas emissions reduction started as a part of Tokyo Emissions Trading Scheme • Waste Management and Public Cleansing Law amended: self treatment regulations tightened • Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc. (CSCL) and Law concerning Pollutant Release and Transfer Register (PRTR) amended
	2011	• Announced North America & Taiwan 'eco ideas' Declarations • Announced establishment of Panasonic Dadi Dowa Summit Recycling Hangzhou Co., Ltd. • Announced the Fujisawa Sustainable Smart Town Project • Established Corporate Electricity Saving Division that bridges functions across the organization	• Rare earth prices soared • Revised RoHS directives enforced in EU • COP17 (Durban Climate Conference): Agreement made on long-term future of the scheme, and the second commitment period for the Kyoto Protocol (Japan announced non-commitment)	• Home appliance eco-point incentive program finished • The Great East Japan Earthquake • Revised Air Pollution Control Act and Water Pollution Control Act enforced • Act on Special Measures Concerning Procurement of Renewable Electric Energy by Operators of Electric Utilities enacted (Feed-in tariff system to be enforced July 2012)
	2012	• Business reorganization due to full acquisition of Panasonic Electric Works and SANYO Electric • Commenced sales of Resources Recycling-oriented Product series • Terminated production of household incandescent light bulbs • Establishment of Environmental Management Group, Environment & Quality Center, Global Manufacturing Division • Communication of 'eco ideas' Declaration (Vietnam)	• United Nations Conference on Sustainable Development (Rio +20) • "Doha Climate Gateway" adopted at COP 18 Doha 2012, to lay down a future legal framework in which all nations can participate by 2020 and onwards • Revised WEEE Directive implemented in Europe	• The Recycle Resource Project, national campaign by Ministry of the Environment, commenced • 2012 Japan Tax Reform Bill enacted (Environment tax came into force in October 2012) • Feed-in tariff for recyclable energy put into effect
	2013	• Announced new midterm management plan Cross-Value Innovation 2015 • Announced new brand slogan "A Better Life, A Better World" • PETEC's home appliance recycling reached a cumulative total of 10 million units • Announced 'eco ideas' factory (Philippines)	• Phase I of the Kyoto Protocol ends. Japan's target expected to be achieved in combination with forest CO_2 absorption and application of the Kyoto Protocol mechanisms. • Minamata Convention on Mercury to internationally regulate import and export of mercury adopted at UN conference • IPCC Fifth Assessment Report (Working Group 1) announced the possibility of human activity being the principal cause of global warming observed since the mid-20th century is "extremely high." Global average surface temperature is expected to rise as high as 4.8°C • COP 19 Warsaw reaffirmed participation of all nations in the future framework of the Convention for 2020 and later. Nations were asked to submit emission pledges well in advance of 2015	• Home Appliance Recycling Law for small household appliances enforced • Basic Plan for Establishing a Recycling-Based Society implemented • Keidanren's "Action Plan Towards Low-Carbon Society" started (until FY 2021) • Amended Law Concerning the Rational Use of Energy and Amended Law Concerning the Promotion of the Measures to Cope with Global Warming established. Amended Act on the Rational Use and Management of Fluorocarbons promulgated (June) • Voluntary Action Plan by the electric and electronics industry terminated. Achieved improvement by 48% in CO_2 emissions per basic unit in average actual production output for fiscal 2009–2013 (compared with fiscal 1991 level) to the target of 35% • Japan announced in November its fiscal 2021 reduction target of 3.8% over fiscal 2006 and registered this with UNFCCC Office (but with a possible review of the tentative target, which does not include possible resumption of nuclear power plant operations)

Era	Year	Panasonic Group	World	Japan
	2014	• Panasonic DADI DOWA Summit Recycling Hangzhou Co., Ltd., started operation • Opening of Fujisawa Sustainable Smart Town • Announced Eco Declaration (Southeast Asia & Pacific) • Communication of housing & town development at the International Greentech & Eco Products Exhibition & Conference (IGEM) (Malaysia)	• Targets for product environmental regulations in Europe begin to shift from energy saving to resource efficiency and environmental impact • EU Parliament reelection results in the appointment of Mr. Jean-Claude Juncker as President of the European Commission. Review of the circular economy package was decided. • IPCC 5th Assessment Report analyzed that the current multiple ways to achieve control of global temperature rise to less than 2°C cannot be materialized unless the target becomes nearly zero by the end of the century. Attention to "adaptation" is growing. • COP12 Convention on Biodiversity, PyeongChang concluded the interim assessment of the Aichi Biodiversity Targets as "progress has been made but remains inadequate" • COP 20 (Peru) reached agreement on the policy of developing reduction targets based on common rules for publication of "a new legal framework beyond 2020 applicable to all Parties"	• The amended Energy Conservation Act was enforced, incorporating action on power conservation during peak periods into existing qualitative reduction targets • Phase II of the Commitment to a Low Carbon Society, a voluntary program promoted by Keidanren as measures against global warming, was newly established in response to government request, setting the target year to 2030 • Toyota Motor launched fuel-cell vehicle MIRAI into the commercial market
	2015	• Won Zayed Future Energy Prize 2015 • Wonder Japan Solutions (Tokyo) held for the first time • Announced the introduction of indirect contributions through housing, automotive, and B2B solutions in the size of contribution in reducing CO_2 emissions • Announced the Tsunashima Sustainable Smart Town development project, together with Yokohama City and Nomura Real Estate Development Company	• Paris Agreement on the international legal framework for global warming control from 2020 and later was adopted at COP21 (Paris) • 2030 Agenda for Sustainable Development was adopted at the UN Summit, focusing chiefly on sustainable development goals (SDGs)	• Draft proposal to cut greenhouse gases by 26% over 2013 levels as its 2030 greenhouse gas reduction target announced by the Japanese government • COOL CHOICE, a new nationwide movement for greenhouse gas reduction, started
	2016	• Establishment of Environmental Management Department, Quality & Environment Division • Announced R&D 10-Year Vision • Revised Green Plan 2018 • Announced participation in Future Living Berlin, the first Smart City project in Germany • Announced collaboration with Tesla Motors for solar batteries	• G7 Toyama Environment Ministers' Meeting held; ministers representing the G7 nations and the EU discussed policies on seven themes including resource efficiency and 3R, biodiversity, climate change, and related measures • UK decided to leave the EU (Brexit) in a national referendum • GRI announced "GRI Standard," the new guidelines for CSR reports • COP 22 held in Marrakesh, Morocco. Agreement reached on establishing a rulebook to make the Paris Agreement effective by 2018 • Donald Trump won the US presidential election • COP 13, the 13th meeting of the Conference of the Parties on Biological Diversity, held in Cancun, Mexico	• The 2016 Kumamoto Earthquake • The Plan for Global Warming Countermeasures was decided by the Cabinet. Direction of Japan's global warming countermeasures to achieve the Intended Nationally Determined Contributions under COP 21 was clarified. Long-term goal of reducing greenhouse gas emissions by 80% by 2050 was set • Act on Promotion of Global Warming Countermeasures was amended; focuses on promoting the enhancement of Cool Choice, the reinforcement of international cooperation, and regional global warming countermeasures

Era	Year	Panasonic Group	World	Japan
	2017	• Announcement of Panasonic Environment Vision 2050 • Opening of Tsunashima Sustainable Smart Town	• France, UK, and China announced the prohibition of sales of gas and diesel cars and the conversion to EVs in the future	• Revision of the Charter of Corporate Behavior delivering on the SDGs through the realization of Keidanren Society 5.0
	2018	• Announcement of Monozukuri (Manufacturing) Vision • Achievement of zero-CO_2 factories at Panasonic Eco Technology Center Co., Ltd. (PETEC), Panasonic Energy Belgium N.V. (PECBE), and Panasonic do Brazil (PANABRAS)	• COP24 was held. The policy based on the Paris Agreements to be uniformly applied to all member countries was adopted	• The fifth Basic Environment Plan was decided by the Cabinet. Set up six cross-field strategies utilizing the concepts of SDGs
	2019	• Announcement of Green Plan 2021 • Participation in 'RE100', an international initiative for the use of 100% renewable energy as electricity used in business operations	• UN Climate Action Summit was held. Rising trend of achieving net zero greenhouse gas emissions, with a target of limiting global temperature rise to 1.5°C • COP25 was held in Spain. The statement urging governments to increase the GHG reduction targets was adopted	• G20 Osaka Summit was held. "Osaka Blue Ocean Vision", which aims to further reduce pollution caused by marine plastic wastes, was shared
2020s	2020	• Launched a Global Circular Economy Project to accelerate corporate-wide activities to build a circular economy • Started Sustainable Management Promotion Consortium where internal members who are interested in sustainablity get together to discuss related topics. • Achieved zero-CO_2 factory in PEC (Wuxi) in China.	• Countries accelerated their decarbonization efforts and subsequently announced carbon neutrality statements. • EU released a new battery regulation proposal.	• Announced carbon neutrality by 2050. • Formulated "Green Growth Strategy Through Achieving Carbon Neutrality in 2050."
	2021	• Environment Vision transformed to GREEN IMPACT. • Set up Sustainability Management Committee led by the Group CEO.	• COP26 was held in UK. Countries agreed to aim for 1.5°C target for global warming.	• Announced reduction of GHG emissions by 46% below FY2013 levels by FY2030 and continuing strenuous effort in its challenge toward a 50% reduction as Nationally Determined Contributions (NDCs). • Formulated the Sixth Strategic Energy Plan.
	2022	• Announced impact targets to reduce CO2 emissions in the world by 2050 that is the target year set in the Panasonic Green Impact. • Announced the Green Impact Plan 2024. • Automotive Systems Co., Ltd. achieved zero carbon at all its sites worldwide.	• COP 27 was held in Egypt. • COP 15 in Canada; the Kunming-Montreal Global Biodiversity Framework (GBF) was adopted. • IPCC announced its Sixth Assessment Report.	• The Japan's government announced 'its basic policy toward achieving GX (Green Transformation)'. • METI announced 'its Growth- Oriented, Resource-Autonomous Circular Economy strategy'. • Keidanren announced 'Towards Green Transformation (GX)'.