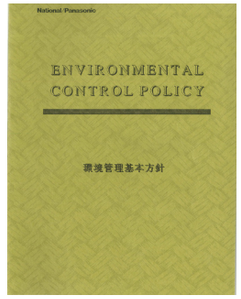
Environmental Management

Policy

Since its establishment, the Panasonic Group has been actively working on a wide range of environmental issues, starting with the pollution problems of the 1970s, under its management philosophy of contributing to the sound development of society. We formulated our Environmental Control Policy (Matsushita Environmental Charter) in 1991 to share our approach to environmental issues that have started spreading on a global scale. In 1993, we introduced our Environmental Statement as a step to serving society as a public entity, announcing our basic stance and increasing our activities globally.

We have announced our current Environmental Policy, both within the Group and to society at large, alongside our Environmental Statement, Environmental Action Guidelines (announced in 2013 as a public statement of our concrete activities; see following page) and our mid-term to long-term Environmental Action Plan. We look forward to each and every employee in the Group approaching environmental issues as laid out in this Policy and at the same time utilizing their technological strengths to create values that preserve and improve the environment. We expect these efforts to help the whole Group with its continuing development. In support of this, it is vital that we gain the understanding and support of our business partners and society at large. We are committed to environmental sustainability management through further support and cooperation with our stakeholders.

Environmental Control Policy
(1991)



- Applied by all business sites worldwide
- Original text in English (Japanese text is a translated version)
- There are punitive clauses

Environmental Statement
(1993)

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.

A clear declaration of the principles described in our Environmental Control Policy, reflecting the thoughts and vision of our founder, Konosuke Matsushita.

In implementing effective environmental sustainability management, companies must share the vision based on the Control Policy, develop an action plan that defines KPIs*1 as key target issues to achieve the goal and fully implement the PDCA cycle*2.

In terms of the vision, we announced the Matsushita Electric Industrial Group Environmental Vision in 2001. In 2017, we announced Panasonic Environment Vision 2050, which is designed to contribute to the realization of a society in which people are able to live in comfort with clean energy. In 2022, we announced our long-term environmental vision, Panasonic GREEN IMPACT (PGI) (See page 15).

In face of the growing need to address the impact of issues such as resources depletion and waste contamination for our customers, society and our business activities, we announced a Circular Economy (CE) Group Policy (see following page) to serve as the foundation of business management, to maintain and improve the value created by resources and to build an economy and society founded on resource recycling. The policy will be employed in identifying CE issues related to the distinctive characteristics of each business and in planning and implementing strategies and action plans.

Action plans so far introduced have been Green Plan 2010, our first long-term environmental action plan introduced in 2001, and Green Plan 2018, announced in 2010. These plans targeted important issues, focusing chiefly on CO_2 reduction and resource recycling. Green Plan 2018 was revised in 2013 in response to revisions to our management policy. Later in 2016, it was revised once again amid the adoption of the Paris Agreement at COP 21*3 to reflect the rising importance of CO_2 reductions and changes in our portfolio, including the expansion of our automotive and B2B businesses.

In 2019, we announced Green Plan 2021, which emphasizes issues linked to CO_2 reduction and resource recycling and synchronizes with our mid-term business plan. Timed to match the announcement of PGI in 2022, we established GREEN IMPACT PLAN 2024 (See page 16), our environmental action plan linked to our mid-term to long-term business strategy.

*1 KPI (key performance indicator): An indicator used by organizations for quantitative evaluation of processes and actions taken to achieve their respective goals.
*2 Method based on the framework, aimed at improving business operations and qualitative advancement, consisting of the four steps: Plan (develop a plan), Do (take action), Check (evaluate) and Action (make improvements) repeated in a cycle for continuous improvements.
*3 The 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC).

Environment

Environmental Policy

Environmental Statement (1993)

Environmental Action Guideline (2013)

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 technological 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

Environmental action plan “GREEN IMPACT PLAN 2024”(see page 16) to realize Panasonic GREEN IMPACT (see page 15)

Circular Economy Group Policy (2023)

The Panasonic GREEN IMPACT is the long-term vision of the Group,
reflecting our sincere determination to address global environmental issues and contribute to solving them through the impact of our business actions.

Acknowledging the contribution of resource efficiency to decarbonization as well as a necessity for decreasing resource consumption due to the earth's limited natural resources, we establish this Panasonic Group-wide Circular Economy Policy as a contribution to achieving a sustainable society.

Circular Economy describes an economic system aiming for the most efficient use of material resources along the product lifecycle. Within the frame of this policy, Panasonic Group Companies define their dedicated approaches, targets, and individual action plans based on the following circularity principles:

(1) Maximize the product lifetime and maintain the material value with a focus on circular business models and product design, extended servicing, as well as through further enhancing recycling activities.

(2) Minimize the use of materials and extend the usage of recycled and renewable materials.

(3) Make a joint approach with customers and partners for establishing circularity-oriented business operations, information sharing, and product usage options.

By establishing this circular economy policy, we will promote the transition of our business from linear to circular as part of our green transformation (GX) activities inside and outside Panasonic.

Mid-term to Long-term Environmental Vision Materiality

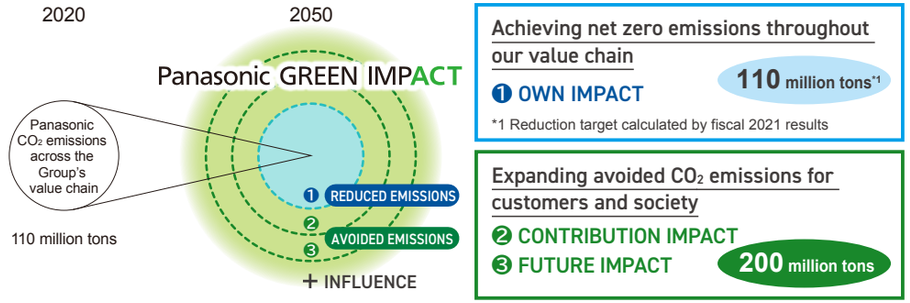
Future Vision of the Panasonic Group and solutions to global environmental issues

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. In 1932, the founder declared his ambition to create an ideal society over a span of 250 years. Since then, taking over the founder's ambition, we have solved social issues by manufacturing useful products and providing useful services, etc., while seeking for happiness of individual customers.

At present, the biggest obstacles preventing us from achieving our mission are global environment issues. In order to reduce depletion of limited natural resources and urgent problems caused by climate change or global warming as much as possible, it is indispensable to take actions to realize a carbon-neutral society (limiting the increase of global temperature to less than 1.5°C) and circular economy business systems. Panasonic has acted promptly to fulfill our corporate responsibility and contribution (ACT). Based on our strong determination to lead to solutions, we announced the Group's long-term environmental vision "Panasonic GREEN IMPACT (PGI)" that leads to achieve much greater contribution to definitely solve such problems in January 2022.

Under the Vision, we have accelerated our activities to reduce environmental loads through our value chains, and at the same time, to contribute to reduce CO_2 emissions discharged from society and customers.

As a part of resource depletion countermeasures, we announced the Circular Economy (CE) Group Policy (see previous page) in November 2023—both inside and outside the company. Through the Policy, we set out the foundations of business management as our contribution to building a sustainable and economically social system from the perspectives of corporate-led innovation and social system reform. The Policy helps us to identify CE-related issues according to business characteristics, as well as to plan and implement CE strategy.



Panasonic GREEN IMPACT - About Panasonic Group - Panasonic Holdings Corporation

Panasonic GREEN IMPACT

PGI is the Panasonic Group's overall vision for our environmental strategies with an eye on the business reforms to be completed by 2050 in order to achieve both "better lives" and "a sustainable global environment." PGI comprises different fields of CO_2 emissions reduction efforts. ❶ OWN IMPACT refers to efforts within our own value chain, ❷ CONTRIBUTION IMPACT and ❸ FUTURE IMPACT are extended effort of contribution, and + INFLUENCE is the positive impact on customers and society. PGI states that, through the above ❶, ❷, and ❸ actions, by 2050, we aim to create an impact that reduces CO_2 emissions by at least 300 million tons[*2] per year, equivalent to approximately 1% of global CO_2 emissions (31.7 billion tons) in 2020.

*2 Based on the total energy-related CO_2 emissions of 31.7 billion tons in 2020 (source: IEA), when PGI started. The emissions factor of avoided CO_2 emissions is based on the data of 2020.

❶ OWN IMPACT (Reduced CO_2 emissions compared with fiscal 2021)

We aim to achieve net zero CO_2 emissions within our own value chain[*3] (110 million tons[*4]), along with the effect of the broader decarbonization of society[*5].

*3 Total of CO_2 emissions from our business activities (Scopes 1 to 3) including emissions from our operating companies (Scopes 1 and 2), emissions from manufacturing components and materials (Scope 3, Category 1), and emissions in product use (Scope 3, Category 11) (see page 37 for details)
*4 Fiscal 2021 actual results
*5 Improvement in CO_2 emissions factor for electricity by respective electric power suppliers.

❷ CONTRIBUTION IMPACT (Avoided CO_2 emissions in present business fields[*6])

We aim to achieve avoided CO_2 emissions of at least 100 million tons per year among customers and society by 2050 through our present business fields.

❸ FUTURE IMPACT (Avoided CO_2 emissions by creating new technologies and businesses[*6])

We aim to achieve avoided CO_2 emissions of at least 100 million tons per year among customers and society by creating new technologies and businesses.

*6 Amount of our contribution as CO_2 emissions reduction to society and customers through using our products and services (see page 18 for details).

+ INFLUENCE (Positive ripple effect of energy reform and decarbonization of society)

We aim to provide a positive influence on society by changing the behavior (ACT) of a wider range of people through the Panasonic Group's products, services, and social communications. We will accelerate energy demand stabilization and decarbonization through our contribution to behavioral changes in our customers, business partners, governments, and investors. Initially, we will undertake action from within our group, as a part of the PGI initiative.

(Examples)
- Promotion of concept of avoided CO_2 emissions (see page 27 for details)
- Free publication of patents (for details, see https://holdings.panasonic/global/corporate/panasonic-green-impact/action/influence.html#module-07)
- Corporate citizenship activities (for details, see https://holdings.panasonic/global/corporate/panasonic-green-impact/action/influence.html#module-04)
- CO_2 ITAKONA Service (for details, see https://www.panasonic.com/jp/pex/business/quality_environment/itakona.html)
- Environmental education (for details, see https://holdings.panasonic/global/corporate/panasonic-green-impact/action/influence.html#module-06)

Environmental Action Plan "GREEN IMPACT PLAN"

As a milestone to achieve Panasonic GREEN IMPACT (PGI), we created and published the GREEN IMPACT PLAN 2024 (GIP2024) that sets out our groupwide environmental actions from fiscal 2023 to 2025, along with fiscal 2031 targets. We are keenly following this plan.

GIP2024 specifies a range of priority issue KPIs* including those for OWN IMPACT, the number of net zero factories, CONTRIBUTION IMPACT, factory waste recycling rate, expansion of recycled resin use, and the number of new circular economy business models.

Also, we continue working on issues related to biodiversity & Nature Positive (NP), water, chemical substances, local communities, and legal compliance, according to the characteristics of business fields and regions. This is because we understand the importance of addressing social issues and gaining the trust of society and customers concerning the Panasonic Group's actions. For details of each KPI and target, effort details, and results, see the table on the right and referenced pages.

* Key Performance Indicators (KPIs) are figures to quantitatively evaluate and analyze progress towards achieving the PGI targets.

Priority Issue KPIs and Targets

The Panasonic Group has been reforming our methods of group management to ensure sustainable growth. We plan to start a new mid-term strategy under the new structure from fiscal 2027 (announced in February 2025). As PGI is linked to business growth, we continue our environmental initiatives by setting single year targets(GIP2024+1) as an extension of the current GIP2024 for fiscal 2026. We have been stably achieving a factory waste recycling rate of 99% or more over the last three years. We are now considering to set a new KPI for the next mid-term plan, to align with international trends.

The new plan will be updated seamlessly with new business strategies. We are constantly refining our efforts to build a sustainable society during the period specified in the next mid-term plan.

GREEN IMPACT PLAN 2024 Targets and Actual Results, Fiscal 2026 Targets (GIP2024+1) and Fiscal 2031 Targets

KPIs				Fiscal 2021 results (Starting point of PGI)	Fiscal 2025 Results	Fiscal 2025 Targets	Fiscal 2025 Achievements	Fiscal 2026 Targets (New)	Fiscal 2031 Targets
					GREEN IMPACT PLAN 2024 +1				
Material issues	CO_2 /Energy	OWN IMPACT **CO_2 emissions reduction in our own Value Chain**[*2]		(Starting point)	**-38.11 Mt**[*6] **(19.01 Mt)**	**16.34 Mt**	× (○)	**-40.12 Mt (17.01 Mt)**	**31.45 Mt**[*9]
		Scopes 1&2[*1]	**Net zero factories**	Total 7 factories	**Total 45 factories**[*7]	**Total 37 factories**	○	**Total 49 factories**	
			CO_2 reductions	(Starting point)	**0.83 Mt**	**0.26 Mt**	○	**0.81 Mt**	
		Scope 3[*1] **(Category 11)**	**CO_2 reductions during use of our products by customers**	(Starting point)	**-25.23 Mt (17.62 Mt**[*8]**)**	**16.08 Mt**	× (○)	**-26.88 Mt (16.11 Mt**[*8]**)**	
		CONTRIBUTION IMPACT **Avoided CO_2 Emissions for society**[*3]		**23.47 Mt**	**53.25 Mt**	**38.30 Mt**	○	**47.50 Mt**	**93.00 Mt**
	Resources/ CE* *Circular Economy	**Factory waste recycling rate**[*4]		98.7%	**99.2%**	**99.0%**	○	(New KPI under consideration[*10])	
		Recycled resin used[*5] (Fiscal 2023 to 2025 total for GIP2024 targets)		15,200 tons	**Fiscal 2023 to 2025 total 45,000 ton**	**Fiscal 2023 to 2025 total 90,000 ton**	×	**Fiscal 2026 25,000 ton**	
		Circular economy business models and products (Total)		5 businesses	**15 businesses**	**13 businesses**	○	**16 businesses**	

Continuing challenge	Biodiversity /NP* *Nature Positive	**Reducing and restoring the impact of business activities on the ecosystem to become nature positive. (See page 68)** - Procurement of sustainable raw materials. - Green space of operating units that contribute to biodiversity. - Products and services that contribute to biodiversity.	**Water**	Reducing water consumption in business activities and products/services. (See page 74)
			Chemical substances	Reducing the environmental impact of chemical substance from business activities and products. (See page 77)
			Local communities	Promoting environmental initiatives to contribute to local communities and educating the next generation.
			Compliance	Ensuring compliance with environmental laws and regulations. (See page 75)

*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 Minus sign (-) means increasing emissions. Including increases or decreases in Scope 1,2 and Scope 3 Category 11, Category 1 (procurement), Category 12 (disposal), and other indirect emissions. The figures in the parenthesis is a comparison with fiscal 2021 results (starting point) reflecting the equivalent amount of emissions from the products whose calculations became available after 2021. *7 Excluding Panasonic Automotive Systems Co., Ltd. *8 Amount of CO_2 emissions reduction since fiscal 2021, calculated with the 33 target businesses in Category 11 in fiscal 2021. *9 The CO_2 emissions factor for electricity calculated with the IEA World Energy Outlook's 2°C scenario. *10 Because the waste recycling rate remains at a high standard of 99% or more, we will exclude this from the fiscal 2026 targets and set a new KPI that matches current global trends.

Fiscal 2025 Results of CO_2-related KPIs

CO_2-related KPIs, including those for OWN IMPACT, CO_2 emissions, net zero factories, and CONTRIBUTION IMPACT (avoided CO_2 emissions), are core PGI indicators to achieve net zero CO_2 emissions across our value chains and for our cooperative efforts toward carbon neutrality together with customers and society. Emissions and avoided emissions are both CO_2-related indicators, but their calculation methods and usage are different. Emissions (upper part of figure) are an indicator representing the amount of CO_2 we need to reduce in our value chains. On the other hand, avoided emissions (lower part of figure) represent the amount of CO_2 emissions reduction from our customers or in society through our businesses that contribute to decarbonization.

CO_2 emissions from our own value chains cannot be offset or reduced by the avoided CO_2 emissions. These two indicators are two sides of the same coin, and at the same time, two pillars of our business activities. We are expanding and accelerating our emissions reduction impact through closely coordinating our efforts under both indicators.

CO_2 Emissions (Upper part of figure)

Scopes 1 and 2 emissions (CO_2 emissions from energy use in factories, etc.) in fiscal 2025 amounted to 1.37 million tons thanks to further introduction of energy-saving activities and renewable energy use. CO_2 emissions from using our products (Scope 3 Category 11) account for 70–80% of the total emissions in our value chains, and these emissions from 33 products marked 85.93 million tons in fiscal 2021, when we started PGI. This figure grew to 111.16 million tons in fiscal 2025, because the business coverage expanded to include 63 products.

The expansion of Scope 3 coverage (dotted area in the bar graph) was due to the widening of responsible areas in line with the introduction of stricter laws and regulations, growing social demands, and increase of strategic importance since 2022, when PGI was established. Contributing factors to this expansion include business growth, business portfolio changes and expansions (freezers, A2W, acquisition of Hussmann Corporation, etc.) and extended coverage of disclosure (e.g. CO_2 emissions from motors and refrigerants).

Since the announcement of PGI in 2022, we have been gaining an understanding of the appropriate recognition and identification of areas subject to Scope 3, and improving the accuracy of our calculations. In GIP2024+1 that we set for fiscal 2026, we will revise the starting point of OWN IMPACT so that our efforts are appropriately evaluated while maintaining the current framework.

When we focus on the emissions from the 33 businesses covered in fiscal 2021, the total emissions in fiscal 2025 were 68.31 million tons, which marks a reduction of approximately 20%. This reduction was achieved by several factors, including changes in sales volumes, evolution of energy-saving technologies, and improvement in the CO_2 emission factor for electricity.

Avoided CO_2 Emissions (Lower part of figure)

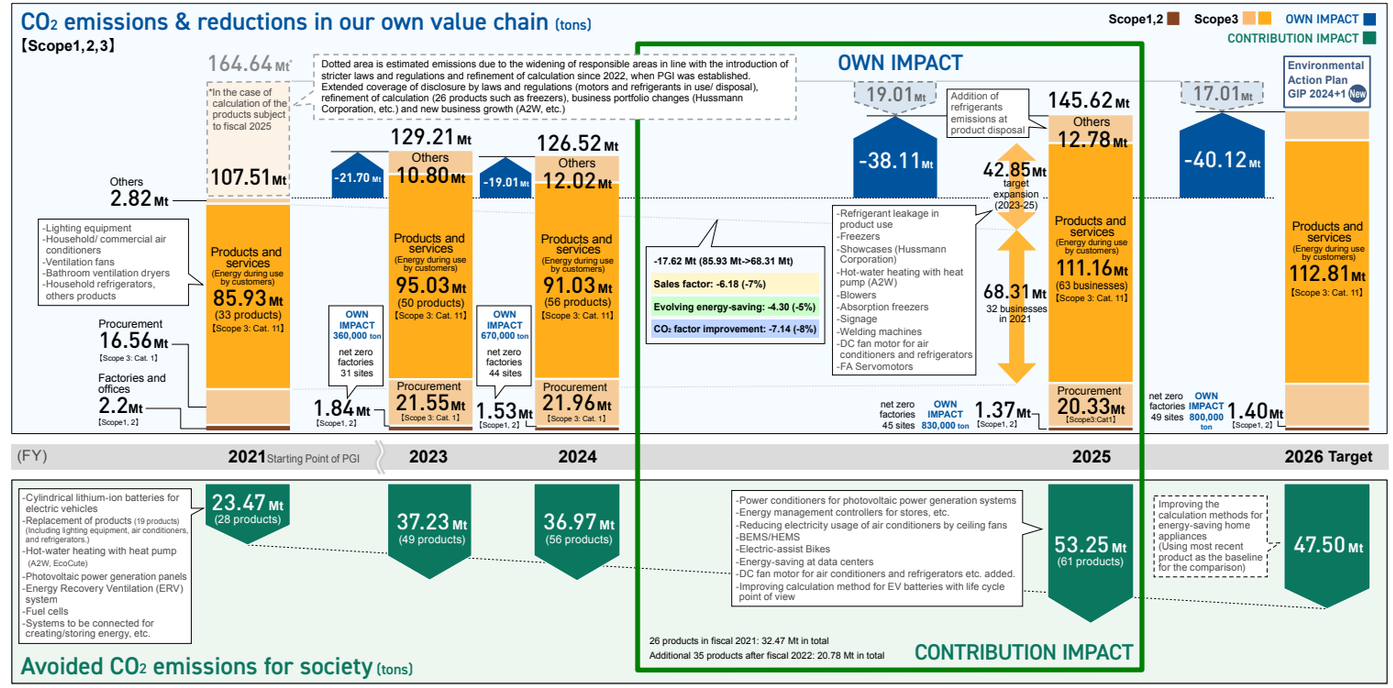
Avoided CO_2 emissions (CONTRIBUTION IMPACT) by our products and services in fiscal 2025 was 53.25 million tons, which significantly exceeded the target figure of 38.30 million tons by 14.95 million tons. The major contributors to this success were expansion of businesses that contribute to decarbonization, and inclusion of new products and services—a DC fan motor for air conditioners and refrigerators (see page 21), and a distributed storage battery system for data centers (see page 23). The number of products subject to CONTRIBUTION IMPACT has increased to 61 in fiscal 2025 from 28 in fiscal 2021.

In fiscal 2024, we altered the emission calculation method for the automotive lithium-ion cylindrical battery series, which generates the greatest avoided emissions in the Group, to a life cycle-based method for better accuracy (only the running time was used in the conventional calculation). This change lowered the avoided emissions volume per battery.

Regarding the calculation method for avoided CO_2 emissions from new products with better energy-saving performance (“replacement” of products), we have used the hypothetical lifetime emissions of a conventional product to be replaced by the new product as the baseline for the comparison. We then use the difference in total emissions between the two as the figure for avoided emissions. From fiscal 2026, we will use emissions from the most recent market-average product as the baseline to comply with requirements for the international standard* for avoided emissions, which are currently under discussion. The fiscal 2026 target includes a reduction of approximately 9 million tons that proactively reflects the latest calculation methods, resulting in a reduction of approximately 10% year-on-year to 47.50 million tons.

*Please see page 27.

GREEN IMPACT PLAN 2024: Status of CO_2-related KPIs



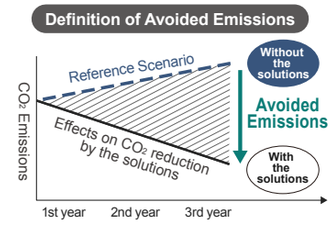
Avoided CO_2 Emissions

Avoided CO_2 Emissions (hereafter, avoided emissions) is an indicator of how much we contributed to reducing CO_2 emissions (hereafter, emissions) from customers and society. We quantify this amount of contribution as KPIs of CONTRIBUTION IMPACT and FUTURE IMPACT according to the nature of the specific business (see page 15).

The amount of avoided emissions is calculated as the difference between before and after the introduction of a new technology, product, or service (hereafter, product), and refers to emissions across the product's entire life cycle, as well as from connected products and services. In the calculation, we set a hypothetical baseline scenario in which the new product is not introduced, and calculate the difference between emissions in the baseline scenario and those in the scenario where the new product has been introduced (emissions are not limited to the product's running time). When a company promotes the widespread use of its products, the emissions that would have occurred if the product had not been introduced are expressed as "Avoided Emissions."

The total emissions across a corporation's value chain (Scopes 1, 2, and 3) are calculated based on an international standard called the GHG Protocol. The reduced volume of emissions (reduced emissions) is calculated in this process. PGI's OWN IMPACT is equivalent to this reduced emissions (see page 15). Reduced emissions and avoided emissions may appear similar, however, they are separate indicators with different purposes and different calculation methods. Avoided emissions cannot offset emissions from our own value chains.

Avoided emissions function as a quantitative indicator of the impact from a business provider or their solutions that contribute to the emissions reduction of other parties. By promoting use of this indicator for business appraisal and investment decisions, Panasonic aims to establish a fair way to evaluate decarbonization-oriented businesses and encourage competition.

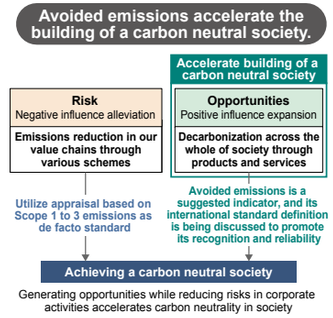


(Note) Avoided emissions cannot be used to offset the emissions within the company.

The avoided emissions are defined as positive impact on society by a solution in terms of CO_2 emissions reduction when comparing to those in the reference scenario where the solution is not used.

WBCSD, 2023/3, "Guidance on Avoided Emissions"

Disclosure is important for validity acceptance as some assumptions are included.



Generating opportunities while reducing risks in corporate activities accelerates carbon neutrality in society

CONTRIBUTION IMPACT through our products sold in fiscal 2025 reached a total of 53.25 million tons across 61 products. The figure was boosted by including data from eight more products. Our efforts for CO_2 emissions reduction can be divided into the following four categories.

- Electrification: Electrified appliances and components that use energy more efficiently than those that use fossil fuels.
- Replacements (Better energy-saving performance): Products with same functional performance but better energy-saving.
- Solutions: Products that optimize power consumption throughout entire building spaces and facilities.
- Others: Various contributions other than above, such as clean power generation, building insulation.,etc

Along with the spread of renewable energy usage thanks to the efforts of energy suppliers (over-the-grid electricity suppliers in each area), improving energy efficiency is also important as it reduces the burden on electricity suppliers while encouraging further use of renewable energy. We contribute to improving energy efficiency in building spaces and infrastructure where our products are used—by means of avoided emissions. The concept of avoided emissions has existed for a while, although an international standard for its calculation method is still under discussion. Also, its recognition is still to develop in different areas of society, such as the financial sector.

Avoided emissions has yet to become an industry standard indicator as there remain issues to be resolved. For example, the interpretation of the hypothetical calculation—that is, the calculation for the case where the energy-saving product is not introduced—varies in terms of methods and disclosure conditions. To bring avoided emissions to a global standard (page 27), Panasonic is developing a rational calculation method compliant with existing electrical standards, and actively disclosing the targets, results, and contribution details*. As a part of these efforts, we renew the basic unit for reduction and baseline per product when we make our annual fiscal business plan. We will increase the competences of the businesses that contribute toward carbon neutrality, and aim at generating avoided emissions as much as possible through dissemination and long use of our products. This is one way in which we are contributing to building a carbon neutral society.

* On the premise of presenting avoided emissions, we set emissions reduction targets across our entire value chains (Scopes 1 to 3) in line with the 1.5°C scenario of the SBTi (page 39). We are currently working to achieve these targets (OWN IMPACT). We are also studying if there is any rebound effect as the products become widespread (as of now, we have not seen any rebound effect other than an increase in life cycle emissions due to the spread of products). To ensure the objectivity of our calculation methods and evidence for the data presented in this report, they are verified by a third party before disclosure.

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

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

CONTRIBUTION IMPACT

Calculation example : Disclosing by the Sustainability Databook 2025.

Category of Contribution Mechanism	Top 21 Businesses in FY2025	
Electrification 9.74 Mt in FY 2021 → 6 products 15.05 Mt	Cylindrical Lithium-ion Batteries for In-vehicle Use Calculation example (P20)	
	Hot-Water and Heating Systems with Heat Pump (A2W) Calculation example (P19)	
	Electrically-assisted Bikes	
	Hot-Water Heating with Heat Pump (EcoCute) Calculation example (P19)	
	Total 6 products	
Replacements <Energy efficiency performance> 9.45 Mt in FY 2021 → 36 products 20.93 Mt	DC*1 Fan Motor for Air Conditioner New Calculation example (P21)	Electric Showers/ Electric Water Heaters
	Household Air Conditioners	Electric Fans/Ceiling Fans
	LED Lighting	LCD TVs
	Household Refrigerators	DC*1 Fan Motor for Refrigerator New
	Commercial Air Conditioners	CO_2 freezers
	*1 Direct Current Total 36 products	
Solutions 8 products 5.27 Mt	Distributed Storage Battery System for Data Centers New Calculation example (P23)	
	Energy-Saving of Air Conditioners by Ceiling Fan	
	Energy-Saving of Air Conditioners Energy Recovery Ventilators (ERV) System Calculation example (P22)	
	BEMS*2/HEMS*3	
	*2 Building Energy Management System *3 Home Energy Management System Total 8 products	
Others 11 products 12.00 Mt Calculation example Vacuum Insulated Glass (P24) Home Delivery Communication Box (P25) New kinari (P26)	Photovoltaic Power Generation Systems (Japan, India, North America, Southeast Asia)	
	Household Fuel Cell Cogeneration System/ Pure Hydrogen Fuel Cell Generators	
	Lithium-ion Storage Batteries for Housing	
	Total 11 products	
Total 61 products: 53.25 Mt		

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

*1 A2W (Air to Water) : Air-to-water Heat Pumps for Europe

Main 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

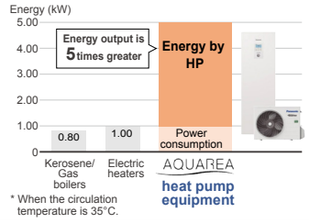
A heat pump (HP) is equipped with electrification technology that captures heat energy from the ambient air and transfers it to heat water or air utilizing the characteristic that temperature changes when gas is compressed or expanded. With the technology, the equipment with heat pump is 2.4 to 4.3 times 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.

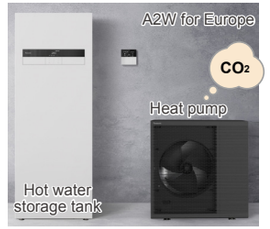
*2 Our own calculation based on information in METI's 'Top Runner Program'.
https://www.enecho.meti.go.jp/category/saving_and_new/saving/enterprise/equipment/

Avoided CO_2 emissions mechanism

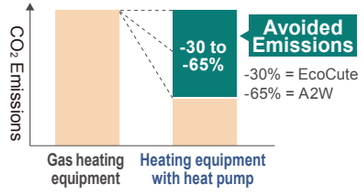
Our heating system, which uses a heat pump of equivalent capacity, emits less CO_2 from the electricity used throughout its lifetime than the average gas combustion type hot water and heating system that is widely available in market.

Comparison: Energy output per 1kW power consumption





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



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]

*3 Japan: Approximately 70% of sales are heating equipment with heat pump replacing gas heating equipment.
Europe: 100% of sales are heating equipment with heat pump replacing gas water heaters.

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

(Ten years)

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 Data from the Ministry of the Environment used globally.

Baseline (Subject to comparison)

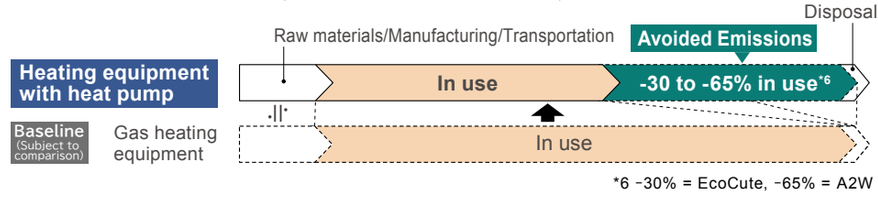
CO_2 emissions from combustion for the average gas water heater on the market in fiscal 2025[*4] that produces the same amount of heat energy as when using a heat pump. Conventional gas by gas combustion is predominantly used in Europe where there are many cold climate areas. (Transformation of an A2W to its electrification is possible by using gas pipe used for the existing gas heating equipment.)

*4 From ANRE's Top Runner Program for Gas Water Heaters
https://www.enecho.meti.go.jp/category/saving_and_new/saving/enterprise/equipment/toprunner/14_gasonisui.html

Coverage of quantification (Concept and rationalization)

When the heating system uses a heat pump. Both heat pump systems and gas systems have a CFP*, and HP systems have a smaller CFP when they are not in use[*5]. However, it is small compared to the difference with the CFP when in use, so we decided not to add it to the Avoided emissions to retain a conservative viewpoint in the calculation.

*5 1 to 3% of the avoided emissions (actual results for Panasonic in FY2025)



Amount of activities (Unit)

EcoCute: The number calculated by the following equation: the annual sales volume in Japan x 70%[*7] which is the replacement ratio of gas heating equipment with heating equipment with heat pump.

*7 Our own calculation based on data from the Japan Refrigeration and Air Conditioning Industry Association (JRAIA).

A2W: The number of annual sales of A2W in Europe (Unit)[*8]

*8 We deemed that replacement ratio of old A2Ws with new ones can be ignored as the sales started in 2008.

Avoided CO_2 emissions per unit of amount of activities (Latest 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 of repair parts. CO_2 emissions reduction effect continues during that period.

* **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).

Electrification Cylindrical Lithium-ion Batteries for In-vehicle Use

Main product life stages subject to avoided CO_2 emissions

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

Sales regions: **North America**

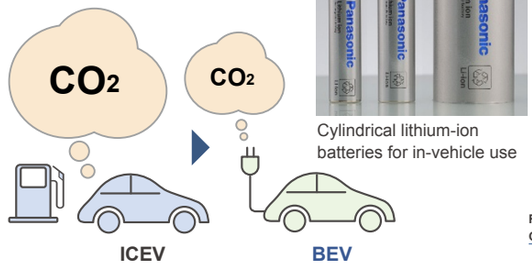
■ Overview

Transition from internal combustion engine vehicles (ICEVs) to electric vehicles (EVs) is expected to hasten decarbonization in transportation sectors all over the world as EVs, in addition to their energy efficiency advantages[*1], emit only small amounts of direct CO_2. In particular, Battery Electric Vehicles (BEVs) that do not use an internal combustion engine, employ a motor driven by electricity supplied from a rechargeable battery. Thus the rechargeable batteries that are equivalent to the fuel supply function in an ICEV, are recognized as one of the most important components of the BEV.

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

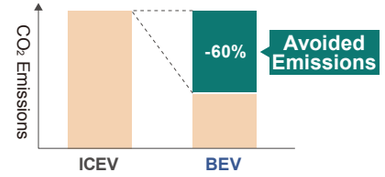
■ Avoided CO_2 emissions mechanism

In the case that a BEV and an ICEV with our rechargeable batteries installed drives the same distance, a difference arises between the amount of CO_2 emissions converted from fuel consumed by the ICEV and the amount of electricity charged and discharged in the BEV because BEV’s energy conversion efficiency to electricity is high.



Cylindrical lithium-ion batteries for in-vehicle use

CO_2 emissions throughout the entire product life cycle of an ICEV and a BEV in the U.S.



Refer to ICCT (The international council on clean transportation)
Global-Vehicle-LCA-White-Paper-A4-revised-v2.pdf (theicct.org)

■ 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 BEVs of the battery capacity sold per year

*2 Not only during use of batteries (driving the vehicle), but also at every stage from the mining of raw materials needed for production, manufacturing, transportation, and disposal.

$$\times \left(\underbrace{\text{CO_2 emissions for an ICEV throughout the entire product life cycle}^{*2}}_{\text{(kg } CO_2\text{ /km)}} - \underbrace{\text{CO_2 emissions for a BEV throughout the entire product life cycle}^{*2}}_{\text{(kg } CO_2\text{ /km)}} \right) \times \text{Lifetime mileage}$$

Annual avoided emissions per travel distance for one BEV replacing an ICEV

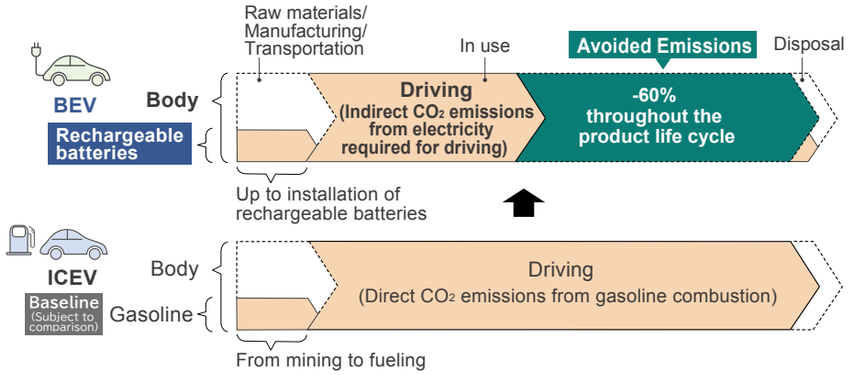
Lifetime mileage: Average annual mileage respectively in Japan, U.S. and Europe x 10 years

■ Baseline (Subject to comparison)

CO_2 emissions for an average ICEV throughout the entire product life cycle including gasoline usage.

■ Coverage of quantification (Concept and rationalization)

The difference in total CO_2 emissions for BEVs and ICEVs compared in emissions at each stage for rechargeable batteries or gasoline from mining raw materials, disposal, recycling and emissions during driving respectively.



■ Amount of activities (Unit)

CO_2 emissions converted from the number of sold cylindrical lithium-ion batteries for in-vehicle use per year to the number of BEVs.

■ Avoided CO_2 emissions per unit of amount of activities (Latest basic unit)

Difference in total CO_2 emissions per travel distance throughout the entire life cycle for one BEV replacing an ICEV.

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

Lifetime travel distance.
- Average annual travel distance respectively in Japan, U.S. and Europe[*3] x Vehicle life (10 years)
- CO_2 emissions reduction effect continues during that period.

*3 Assuming that vehicles equipped with cylindrical lithium-ion batteries are sold on the global market, we used the average for the three regions.

Replacements (Energy Saving) DC Fan Motor for Energy Saving in Air Conditioning Systems New

Main product life stages subject to avoided CO_2 emissions

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

Sales regions: **Japan, Europe, North America, China, India, Southeast Asia, Central and South America, Middle East and Africa**

■ Overview

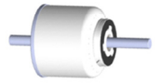
Improving energy efficiency in common electric appliances reduces the burden on the local electric grid where the appliances are used, and lowers concern for renewable energy supply sufficiency. In other words, it accelerates the shift to carbon neutrality driven by demand side of energy. Replacing old products with new ones with better energy efficiency reduces CO_2 emissions from both customers and energy suppliers. Motors in air conditioning systems are a major component in terms of overall system performance. Although the motor's power consumption is less than 10% that of the entire system, the motor's energy-saving performance directly reduces CO_2 emissions from the customer who uses the air conditioning system over the entire product lifetime.

■ Avoided CO_2 emissions mechanism

Compared to an Alternating Current (AC) motor, the speed of a Direct Current (DC) motor can varies according to the applied voltage or current, thereby reducing energy consumption losses.

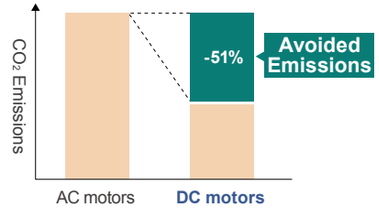
Example
Annual power consumption of AC motor
5,897 kWh
Concentric motor

Annual power consumption of DC motor
2,876 kWh
AR-9H



Energy-saving effect by switching from AC motors to DC motors: -51%

[Example] Comparison of CO_2 emissions converted from lifetime power consumption between AC motors and DC motors



■ Calculation formula of avoided emissions

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

[Amount of activities] (Number of units)
The number of units sold per year
× **AC motor penetration rate per sales region**
× (Annual power consumption of AC motors (kWh) − **Annual power consumption of DC motors** (kWh))
× **CO_2 emission factor for electricity per sales region** (kg CO_2 /kWh)
× **Period** (9 years)

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

CO_2 Emission Factor
(IEA2021)
Unit: kg/kWh

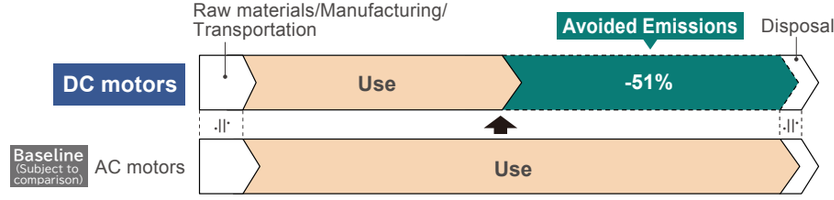
Region	Factor
Japan	0.487
Europe	0.277
North America	0.383
China	0.623
India	0.723
Southeast Asia	0.386
Central and South America	0.252
Middle East and Africa	0.616

■ Baseline (Subject to comparison)

The baseline is the volume of CO_2 emissions equivalent to the lifetime power consumption of an AC motor, that is an equivalent model to the DC motor, in the case that is used in the same conditions in each motor sales region. The areas where the air conditioning systems are used are assumed to be the same as the motor sales region.

■ Coverage of quantification (Concept and rationalization)

When the motor is in use. The subject of calculation is the motor's CFP*, and the CFP when in use is an average of 80 to 90% of the air conditioning system's total CFP. The CFPs of two systems, one with an AC motor (baseline) and the other with a DC motor, are the same when not in use. Therefore, we determined that we need only study the difference in the CFP between the baseline and the DC systems in use, ignoring the impact from any differences in the CFP at other times.



■ Amount of activities (Unit)

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

■ Avoided CO_2 emissions per unit of amount of activities (Latest basic unit)

Difference between CO_2 emissions converted from lifetime power consumption*1 between those from the products before and after replacement in each sales region.

*1 Rated power in design x annual time in use x efficiency

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

- 9 years. (Product life defined by Panasonic)
  CO_2 emissions reduction effect continues during that period.
- We deemed that 9 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.

■ Avoided CO_2 emissions in fiscal 2025 : 8.16 million tons

* **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 (Reducing heat loss)

Heat Exchange System

Main product life stages subject to avoided CO_2 emissions *1 Reduction in CO_2 emissions from reducing air conditioning heat loss from room spaces during the period of use of the products.

Raw materials > Manufacturing > Transportation > **Use*1** > Disposal/Recycle

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

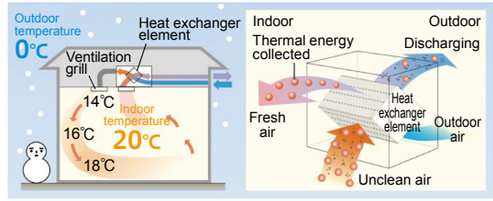
Overview

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. Energy Recovery Ventilators (ERV) System reduces heat loss from the interior of buildings and provide comfort maintaining appropriate air quality at the same time. ERV 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, ERV 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 ERV System in room spaces under the same conditions compared to those from average ventilation method for ventilation in the market.

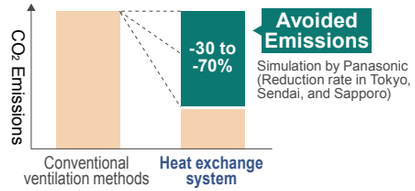
How ERV System works (winter)



* Efficiency varies according to model.

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

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



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 /kWh or liters)

− **Annual energy consumed by air conditioning in a residential house with a ERV 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 ERV System × **Period** (Ten years)

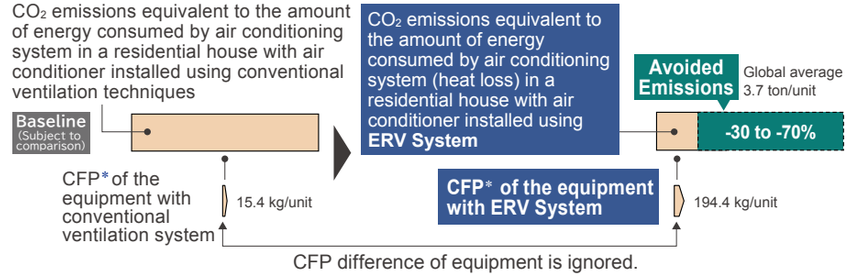
- CO_2 emission factor for **electricity**: **0.487** kg/kWh in Japan, **0.623** kg/kWh in China, **0.383** kg/kWh in North America, and **0.277** kg/kWh in Europe (Source: IEA 2021)
- CO_2 emission factor for **kerosene**: **2.49** kg/liter Data from the Ministry of the Environment used globally.

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 (Concept and rationalization)

Difference in the heating and cooling load of the house before and after installation of the heat exchange system (this product). The CFP* for this product is greater than for a conventional ventilation system; however, the equivalent CO_2 emissions from the difference in the heating and cooling load in a residential house before and after installation of a heat exchange air system is small (our calculation). Therefore, we decided that the effect can be ignored.



Amount of activities (Unit)

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 (Latest 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*1 by each sales region.

*1 Kerosene was used as the fuel.

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

- Designed lifetime of ERV System (10 years)
- CO_2 emissions reduction effect continues during the period.

* **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 (Energy saving) Distributed Storage Battery System for Data Centers New

Main product life stages subject to avoided CO_2 emissions *1 Reduction of CO_2 emissions in data centers during the period of use of the products

Raw materials > Manufacturing > Transportation > **Use*1** > Disposal/Recycle

Sales regions: **North America**

■ Overview

Along with the rapid evolution of generative AI, power consumption in data centers (DCs) is also increasing due to the growing complexity of and advancements being made in data processing. In such DCs, more and more storage batteries are being used. One type of power source arrangements in DCs is a common centralized power supply arrangement in which lead-acid and LFP-type batteries are placed in a room managed separately from the server room. The other is a distributed power source arrangement, where high-power and compact lithium-ion batteries are installed within each server rack. Compared to the centralized arrangement, the distributed arrangement is more efficient as a power supply to the servers. This is because the distributed arrangement is space saving, and allows finer electricity and source management, optimizing energy usage.

[Reference] DC storage battery business (Japanese) https://holdings.panasonic/jp/corporate/investors/pdf/20241127_ai_j.pdf

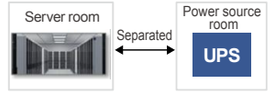
■ Avoided CO_2 emissions mechanism

The distributed arrangement requires less number of voltage conversions from the supply to the server, compared with the centralized arrangement. This improves power efficiency in DCs.

Wide ← Installation space → Narrow

Centralized power source arrangement

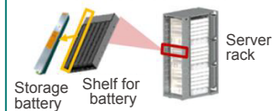
Power source is managed from the separated server room



UPS: Uninterruptible Power System

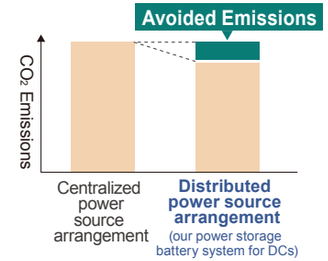
Distributed power source arrangement

Power source is installed within each server rack



Back up batteries

CO_2 emissions from lifetime power supply by DCs



■ 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 power storage battery system for DCs sold per year

× (Annual power consumption by centralized power source arrangement (MWh) − **Annual power consumption by distributed power source arrangement** (MWh))

× **CO_2 emission factor for electricity in North America** (0.325 ton- CO_2 /MWh) × **Period** (Designed product life)

(0.325 ton- CO_2 /MWh)

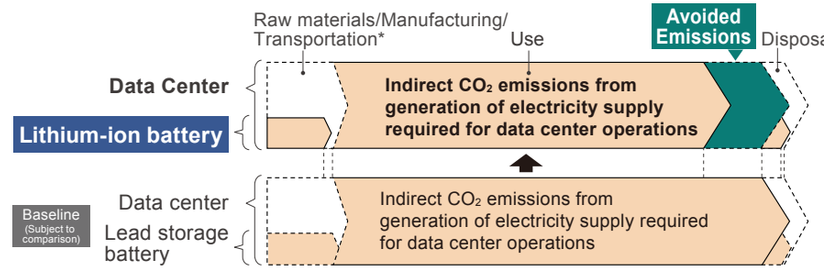
Annual avoided emissions from energy loss reduction by distributed power source arrangement

■ Baseline (Subject to comparison)

CO_2 emissions converted from lifetime power consumption by using distributed power source arrangement.

■ Coverage of quantification (Concept and rationalization)

DC's CFP* was deemed to be the same in the two arrangements, except in use. The calculation subject is the difference in CO_2 emissions from the storage batteries required to run the DCs in the two arrangements.



* A lithium-ion battery's CFP (1.6 kg/kWh) is about 80% of a lead storage battery's CFP (2 kg/kWh). This difference was not included in the avoided emissions to retain a conservative viewpoint in quantification.

[Reference] LCAs of lithium-ion batteries and lead storage batteries https://doi.org/10.1016/j.jclepro.2022.131999

■ Amount of activitie (Unit)

The annual sales of distributed storage battery systems containing lithium-ion batteries installed in DCs.

■ Avoided CO_2 emissions per unit of amount of activities (Latest basic unit)

Multiply the difference in the amount of electricity supplied from the centralized power source and the distributed DCs power source by the CO_2 emission factor.

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

- Designed product life.
- CO_2 emissions reduction effect continues during the period.

* **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 (Reducing heat loss)

Vacuum Insulated Glass, Glavenir

Main product life stages subject to avoided CO_2 emissions *1 Reduction in CO_2 emissions from reducing loads in cooling or heating in the building during the period of use of the products.

Raw materials > Manufacturing > Transportation > **Use*1** > 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 in spaces in residential houses and offices by maintaining stable room temperatures through improved building insulation. In particular, heat inflow and outflow from windows account for 73% (inflow) of heat during summer cooling and 58% (outflow) during winter heating*2.
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.

*2 Source: Japan Construction Material & Housing Equipment Industries Federation (J-CHIF) (Japanese)

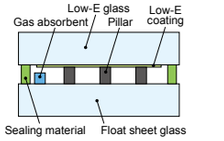
■ Avoided CO_2 emissions mechanism

Vacuum insulated glass (VIG) shows significantly higher thermal insulation compared to those of single-pane glass and Low-E multi-pane glass.*3 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.

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

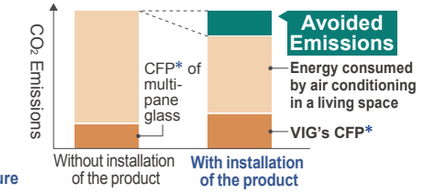
1/4 of multi-pane glass

VIG: **0.7** w/ m^2·k
Multi-pane glass: **2.9** w/ m^2·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.*



■ 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] (m^2)
Amount of VIG sold per year

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

× (Power consumed by air conditioning in a residential house with single-pane or Low-E multi-pane glass*4 per year (kWh/ m^2) − **Power consumed by air conditioning in a residential house with VIG*4 per year** (kWh/ m^2))

× CO_2 emission factor for electricity (kg CO_2 /kWh)

× **Period** (Designed lifetime)

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

Annual avoided emissions achieved by installation of 1 m^2 of VIG

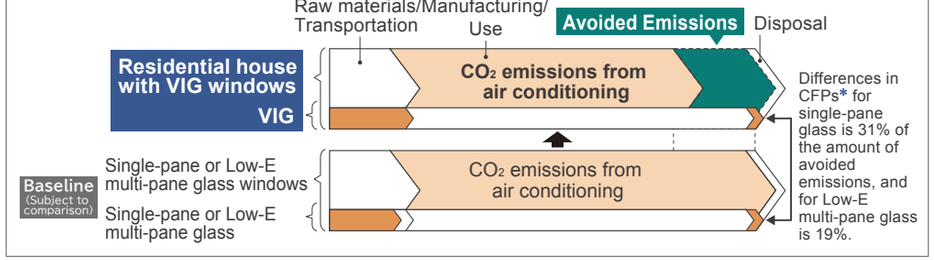
− (VIG's CFP*,*5 (kg CO_2 / m^2) − Single-pane or Low-E multi-pane glass's CFP*,*5 (kg CO_2 kWh/ m^2))

■ Baseline (Subject to comparison)

CO_2 emissions converted from electricity consumed by air conditioning operations in the entire space of a respective 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 (Concept and rationalization)

- In use: CO_2 emissions derived from electricity consumed by air conditioning in an entire residential house.
- Glass's CFP*: VIG's CFP* 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* 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 (m^2)

Amount of VIG sold per year.

■ Avoided CO_2 emissions per unit of amount of activities (Latest basic unit)

- In use: Differences in electricity consumed by air conditioning in residential houses per different type of glass.
  Note: Annual power consumption was calculated by us, using a simulation of a two-story wooden house with a floor space of 120 m^2 based on standard weather data from the Architectural Institute of Japan using air conditioning heat load computing software.
- CFPs* 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 in one time)

- Designed lifetime of VIG.
- CO_2 emissions reduction effect continues during the period.
- We believe that the CO_2 emissions effects are estimated from a conservative view because the life of a Japanese residential house is generally deemed much longer.

*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 (Reduction of redelivery) Home Delivery Communication Box, e-COMBO

Main product life stages subject to avoided CO_2 emissions *1 Reduction of CO_2 emissions by home delivery services during the period of use of the products

Raw materials > Manufacturing > Transportation > **Use*1** > Disposal/Recycle

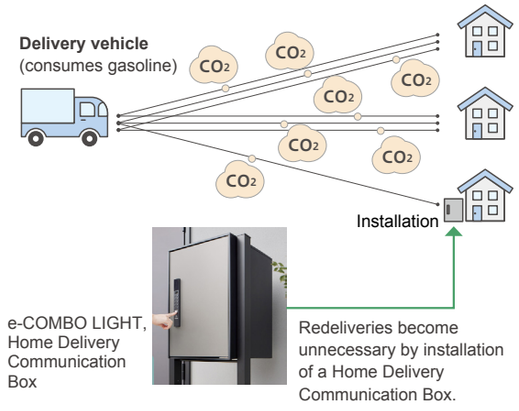
Sales regions: **Japan**

■ Overview

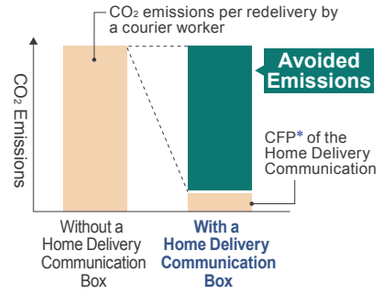
In the household business sector in Japan, because of increase in e-commerce trading and increase in the time when none is at home along with changes in lifestyle, load for distribution on couriers is on increase as the number of redelivery of goods increases. Installation of a Home Delivery Communication 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* of the Home Delivery Communication Box)



■ Calculation formula of avoided emissions

Amount of activities | Avoided emissions for a given amount of activities | Values related to CO_2 emissions | Period, etc.

[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** × **Period** − **CFP* of a Home Delivery Communication Box**)

* Verified data by Ministry of Land, Infrastructure, Transport and Tourism (MLIT)
* Verified data by Panasonic
(Designed lifetime of the product)
* Estimated by Panasonic

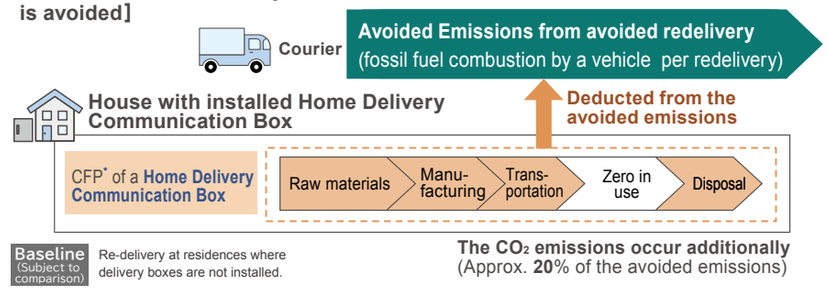
■ Baseline (Subject to comparison)

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 (Concept and 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* 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.

[Situation where redelivery is avoided]



■ Amount of activities (Unit)

The number of Home Delivery Communication Boxes sold per year.

■ Avoided CO_2 emissions per unit of amount of activities (Latest basic unit)

- Avoided emissions per redelivery: **0.46** kg (Source: Verified data by MLIT)
- The number of redeliveries: Verified data by Panasonic

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

- Designed lifetime 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.

* **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).

Resource recycling (Plant-based fiber materials)

High Concentration Cellulose Fiber Molding Material, kinari New

Main product life stages subject to avoided CO_2 emissions

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

Sales regions: **Japan**

Overview

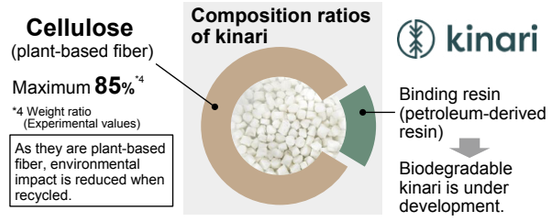
The production volume of petroleum-derived plastic (hereafter, resin) is expected to increase to 610 million tons by 2030 from 450 million tons in 2020[*1]. However, its recycling rate is limited to 9%[*2], posing a challenge in terms of waste recycling and carbon neutrality. For 20 more years in Japan, Panasonic has been recycling the home appliances that we produced, promoting recycling-oriented manufacturing. However, the single resin (high purity and quality) that can be manually collected from waste home appliances is limited to 20% of the entire resin used in a product. Also, much of the mixed resin (low purity and medium quality) collected by machine shredding cannot be used for new products.

One of the solutions to this issue is replacing the resin components with bio resin, which is made from corn and other materials. Nonetheless other problems still remain, such as the impact on food production and occasional issues with functionality. Our high concentration cellulose fiber molding material, kinari, is made from plant-based materials such as forest thinning timber and industrial wastes, and has a competitive advantage due to its better density, strength, and price compared to other fiber materials. Kinari can contain up to 85% cellulose fiber, yet it is lighter than petroleum-derived resin. It can also be shaped by existing molding machines. Increasing use of kinari should contribute to building a circular economy and achieving carbon neutrality.

*1 Bioplastics 2020-2025 (IDTechEx Report)
*2 Production, use, and fate of all plastics ever made | Science Advances

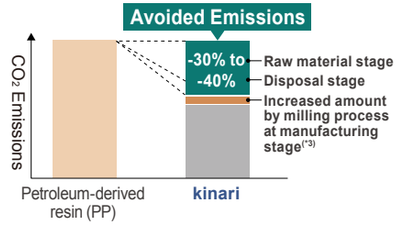
Avoided CO_2 emissions mechanism

Compared to a standard petroleum-derived resin molding, a kinari molding can offer a CO_2 emissions reduction effect in the phases of material procurement and molding disposal. Although kinari requires the shredding of plant materials, even taking account of the impact from such shredding, kinari molding's CO_2 emissions across its life cycle are smaller than those from petroleum-derived molding.



kinari – Molding solutions – Business – Panasonic Production Engineering Co., Ltd. – Panasonic

CO_2 emissions of petroleum-derived resin and kinari
(CFP* comparison between molding product)



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] **The number of kinari packages sold per year** (1 pack: 25 kg) × (CFP* for standard polypropylene resin molding – **CFP* for kinari resin molding**) × **1 (once)**

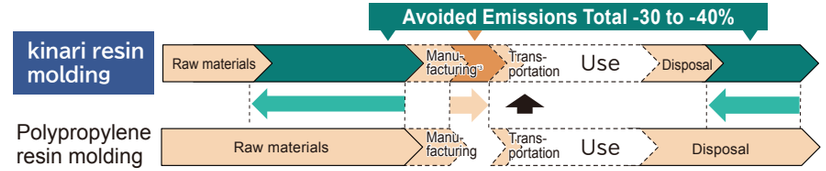
- CFP* for standard polypropylene resin molding: Calculated under the SuMPO EPD program
- **CFP* for kinari resin molding**: Including the amount of carbon stock of kinari at disposal.
- **1 (once)**: Reduction effect takes place once in a molding's life cycle.

Baseline (Subject to comparison)

CFP* for standard polypropylene resin molding.

Coverage of quantification (Concept and rationalization)

The difference in CO_2 emissions between kinari and the baseline must be determined covering the phases of material procurement, production, transportation, and disposal. However, we did not include the phases of production, transportation, and usage for quantification. This was because the difference in emissions during use was zero, and the production and transportation processes are identical for both kinari and the baseline.



*3 kinari molding requires a process to shred plant-based materials, which is not required for PP resin molding. Emissions from this process were added to the kinari calculation.

Amount of activities (Unit)

The number of kinari packages sold per year (1 pack: 25 kg)

Avoided CO_2 emissions per unit of amount of activity (Latest basic unit)

The difference between CO_2 emissions[*5] across the life cycle of a standard PP resin molding and that of a kinari molding.

*5 Figures calculated by us based on the SuMPO EPD program. The calculations took account of the amount of carbon stock of kinari at disposal.

Period: Once

Reduction effect takes place once in a molding's life cycle.

Avoided CO_2 emissions in fiscal 2025 : 11 tons
Petroleum-based plastic reduction in fiscal 2025 : 2.4 tons

Tableware made with kinari

∗**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).

Activities to raise awareness of and valorize Avoided CO_2 Emissions

Under the current GHG Protocol, it is possible to evaluate 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 the avoided emissions, in reality awareness of the avoided emissions is still low in society and no uniformed standard for the avoided emissions has been established. Therefore, it is a must to establish a structure to facilitate and encourage respective corporations efforts to decarbonation (technical development and innovation), as well as to contributes to the acceleration of the realization of a carbon-neutral society by preparing environment where respective corporation's contribution to decarbonization is properly evaluated.

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 to spread significance of the avoided emissions as 'a standard measurement' to evaluate the corporation's contribution to decarbonization efforts and expand awareness of the avoided emissions, together with stakeholders such as corporations and financial institutions who share the same ambitions. Therefore, we are currently implementing the following activities regarding the avoided emissions towards its global standardization, and raising and spreading its awareness

Standardization Activities

International Electrotechnical Commission (IEC)

In September 2020, activities of standardization of a new IEC standard proposed by Japan's proposal started. Specifically, the activities are calculation of the avoided emissions from new technologies, such as AI, IoT, and a digital twin; provision of requirements for the calculation methods; establishment of requirements for communications and information disclosure, and preparation of an international standard IEC63372 titled "Quantification and communication of GHG emissions and emission reductions/avoided emissions from electric and electronic products and systems - Principles, methodologies, requirements, and guidance." In June 2025, the Final Draft International Standard was completed for IEC TC111 (Environmental standardization for electrical and electronic products and systems) and it is scheduled to be published as an IEC standard by the end of 2025, if progress continues smoothly. We are participating in this activity as a IEC technical committee member to promote standardization, such as through our proposal for calculating our avoided CO_2 emissions.

World Business Council for Sustainable Development (WBCSD)

WBCSD is a global organization of approximately 200 leading companies committed to sustainable development, working together to contribute to transformation to sustainable society. Endorsing the principles of WBCSD, Panasonic Holdings Corporation (PHD) joined WBCSD in 2022 to accelerate the Panasonic Group's PGI activities. Since publication of the Guidance on Avoided Emissions in 2023, WBCSD is reviewing its updated version and developing guidance for each industrial sector. We have been involved actively in their development, working in close cooperation with the organization and its member companies to conduct standardization and disseminate information on avoided CO_2 emissions.

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

GX League*

To establish a system whereby the opportunities for Japan's corporations contributions to climate change, such as by reducing emissions from the products and services they provide to the markets, are properly evaluated, Panasonic has participated as a leading member of the GX Business Working Group since its inception, in the area of rulemaking for market creation that is one of the GX League activities.

To expand awareness of the avoided emissions that is one of the disclosure items used in the Panasonic Group's long-term environmental vision in evaluating opportunities related to climate change, we jointly published with other GX league member company a collection of use examples by financial institutions in December 2023, and in May 2024 a virtual collection of recommended information disclosure by our operating companies, following to "the Basic Policy for disclosure and evaluation for opportunities related to climate change" published in fiscal 2023.

* 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 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

Appeal of the avoided emissions at international events

As a result of our fiscal 2023 activities for raising awareness and dissemination of the avoided emissions at international events, the activities were clearly stated in the 2023 G7 outcome documents. We have continued working to raise awareness and valorize the avoided emissions in fiscal 2025.

COP29 (The 2024 Conference of the Parties of the United Nations Framework Convention on Climate Change (UNFCCC))

In November 2024, the Group gave a presentation on the importance of standardizing avoided CO_2 emissions and the progress achieved to date at a seminar titled “Moving forward with standardization of avoided CO_2 emissions in the industrial and financial sectors,” held at the Japan Pavilion. In addition, we reported that we are involved in standardization at the International Electrotechnical Commission (IEC) for IEC 63372 and that we are also working in coordination with ISO and WBCSD. We expect that standardization of avoided CO_2 emissions will lead to appropriate assessment of businesses that contribute to decarbonization by governments and financial institutions, and that the findings will be used in investment decision-making and in granting incentives. Additionally, we emphasized that it is important for the entire industrial sector to achieve the climate targets adopted at COP21, not only the electrical and electronic industries.

Panasonic Takes Part in COP29 Discussions and Exhibition to share the Group’s Contribution to a Decarbonized, Circular Economy-Based Society
https://news.panasonic.com/global/stories/16642

CES2025

In the opening keynote at CES 2025 held in January 2025, we announced that resolving issues in the global environment is our top priority in building an ideal society that offers material and spiritual affluence and stressed the need to preserve a sound and healthy global environment for future generations. We stressed the importance of avoided CO_2 emissions by working in cooperation with WBCSD to speed up action on the development of and innovations for decarbonization technology across society as a whole.

CES 2025 opening keynote
Expressing Firm Determination to Solve Global Environmental Problems and Promote Business Transformation Using AI
https://news.panasonic.com/global/stories/17191

Environmental Governance

Promoting Groupwide Environmental Sustainability Management Centering on PDCA

The Panasonic Group is committed to creating both a better life and a sustainable global environment by fulfilling its social responsibilities through its business activities, and at the same time engages in resolving major issues such as decarbonization of society and resource recycling through its products and services. We are executing our initiative in accordance with the following PDCA under the Group CTO (Tatsuo Ogawa, Executive Officer as of June 2025).

Based on the Environmental Policy (Page 14), each operating company, under its Autonomous and Responsible Management, sets key environmental KPIs and goals linked to its annual business plans, aiming to fulfill its environmental responsibilities and strengthen its competitiveness in line with common areas within the Group and the characteristics of its business. This common area is the GREEN IMPACT PLAN (GIP), the group's medium- to long-term environmental action plan. [Plan]

Achieving groupwide targets involves collecting monthly, quarterly and yearly business results as environmental performance data, sharing the data within each business division and across the Group and acting to address the various changes in the surrounding environment. [Do]

Annual performance data undergoes independent assurance through a third-party audit, including on-site audits, and is fed back to the Group and disclosed to the public. We apply the opinions and suggestions of our stakeholders in subsequent activities and measures for continuous improvements. [Check]

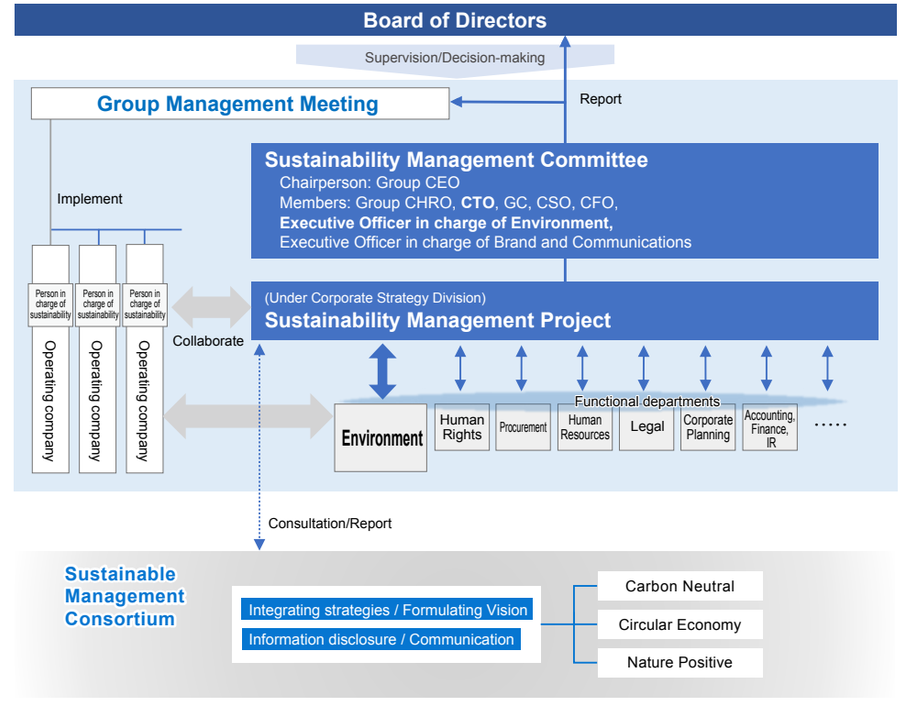
Since 2021, progress made in the KPIs established under GIP, as well as issues and social trends, are deliberated on by the Sustainability Management Committee (Page 4). Decisions on important issues are made swiftly at Group Management Meetings consisting of the Group CEO and the presidents of the operating companies. [Action]

Through this process, the long-term environmental vision “Panasonic GREEN IMPACT” was formulated in 2022, and since then, a group-wide PDCA cycle has been implemented. Furthermore, the “Sustainability Management Project” was launched in 2024 to strengthen coordination in the activities such as information disclosure.

Initiatives on global environmental issues, which are seen as medium- and long-term issues for the entire Group, are becoming increasingly important and urgent each year. In order to accelerate decision-making and action, highly efficient information sharing and coordination across business fields has become vitally important. In addition to specialized committee activities on such as chemical substance control and CO_2 reduction at manufacturing factories, the Sustainable Management Consortium, a groupwide community that voluntarily gathered to solve sustainability issues, was established in 2020 (approx. 1100 participants as of June 2025).

With the assumption that the ideas will be applied to their primary tasks, the consortium participants are working to define and incubate various common issues for the Group, shift gears to address these important issues, and accelerate problem-solving by pooling their collective wisdom. The activities of the Consortium platform utilize the expertise of each participant to allow them to coordinate functions and resources across organizational boundaries, improve productivity and act more swiftly.

Structure for Promoting Sustainability Management (as of June 2025)



* See page 4 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, in principle, 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 our nonmanufacturing sites; 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+1.

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. Due to the COVID-19 pandemic, holding trainings in conventional assembly form was impossible from fiscal 2021. The remote training scheme has enabled employees who could not participate in training because of time constraint participate in the training actively, resulting in highly effective training. Since fiscal 2024 when the pandemic subsided, holding training in face-to-face form has been possible, and some of our operating companies restarted training in hybrid form with face-to-face and online, utilizing merits of both forms. Furthermore, each operating company is upgrading its program contents to implement and enhance their management on sits. Such programs include practical programs including various methods such as roleplaying, and audit-related programs such as on audit policy and focused auditing points aiming to standardize internal auditors skills at high level.

As an independent activity focusing on legal compliance, an important element in the environmental management system, our Group holds cross-company mutual environmental audits (details on Page 33). The Panasonic Corporation of China organizes training for auditors carrying out cross-company mutual environmental audits every year, inviting outside experts on environmental audits to give our auditors that latest information on environmental regulations and to strengthen their auditing skills and capabilities. In fiscal 2025, a simulated on-site audit was conducted at Panasonic Kitchen Appliances Technology (Jiaxing) Co., Ltd.

Simulated on-site audit at Panasonic Kitchen Appliances Technology (Jiaxing) Co., Ltd.

Acquired status of the ISO 14001 Certification (as of March 31, 2025)

Region	Number of certifications obtained*1		Total
	Manufacturing	Non-manufacturing	
Japan	18	10	28
North America & Latin America	9	0	9
Europe & CIS	6	1	7
Southeast Asia, & Oceania	33	7	40
China & Northeast Asia	41	1	42
India, South Asia, Middle East & Africa	6	1	7
Total	113	20	133

*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.

Panasonic Group ISO 14001 Certification Sites

https://holdings.panasonic/jp/corporate/sustainability/pdf/eco_isolist2024.pdf

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.

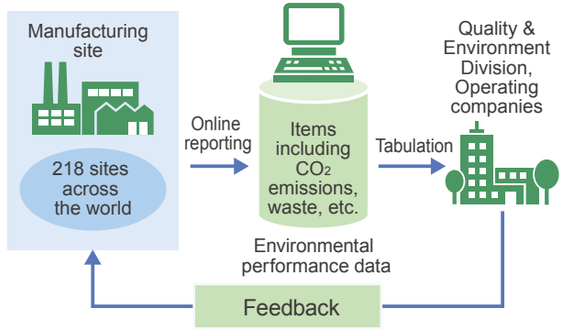
In addition, Panasonic Group newly established an environmental information infrastructure, aiming to store and share the data necessary for promotion of Panasonic GREEN IMPACT, and for disclosure and appeal of the environmental data, in order to respond to legal demands appropriately and efficiently for environmental information disclosure and stakeholders' requests. The infrastructure centrally manages the information related to calculation and tally of CO_2 emissions across the entire value chain (Scopes 1, 2, and 3), as well as information on the avoided emissions.

As for products, legislation relating to chemical substances in products is becoming more stringent in the world, for example, and communication and disclosure of chemical information in the EU supply chain are mandatory under the REACH Regulations. The 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.

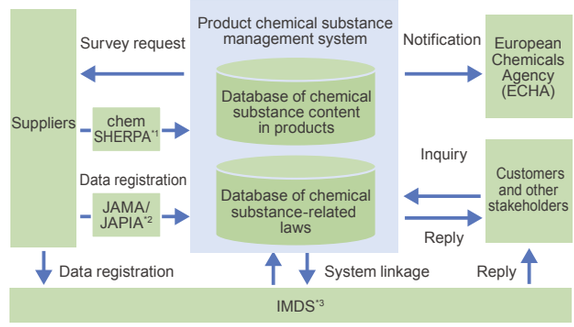
In January 2017, we renewed our product chemical substance management system to adopt chemSHERPA[*1] based on EC62474, the international standard on material declaration for electrical and electronic equipment, i.e., declaration of information of chemical substances and materials comprise such products. Along with the expansion of Panasonic Group's automotive business, we also adopted the JAMA/JAPIA integrated data sheet,[*2] the standard material data format for the Japanese automotive industry. These adoptions enabled us to respond to increasingly complex and diverse regulations covering the chemical substances used in products in a variety of fields. 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 Panasonic Group 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. The JAPIA Standard Material Datasheet prepared and introduced by the Japan Auto Parts Industries Association (JAPIA) is currently used as its successor tool.
*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)

Eco-conscious Products and Factories

Initiatives for Eco-conscious Products (Green Products)

Panasonic Group conducts an environmental assessment to evaluate the product in advance in terms of its possible detrimental effects to the environment from the development stage. In the product environmental assessment, the five environmental issues specified in the Environmental Action Guideline have been set as assessing items for the whole product life cycle.

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*1		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

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

For global warming in particular that has been a big issue these days, we are working on eco-conscious products to achieve a target set to achieve 'an impact from our emissions reductions of more than 300 million tons by 2050' under our long-term environmental vision, 'Panasonic GREEN IMPACT'.

As for CO_2 emissions in our Group value chain, it is important to enhance energy-saving performance of products during product use, since most of the emissions are discharged when the products are in use. In the Energy Conservation Grand Prize 2024, Panasonic group companies won awards for two themes in the Product and Business Model category.

Category	Award	Recipient	Theme
Product/ Business Models	ECCJ Chairperson's Award (Home Appliance category)	Panasonic Corporation Heating & Ventilation A/C Company	Clothes drying dehumidifier F-YEX120B with the new eco hybrid system
	ECCJ Chairperson's Award	Panasonic Corporation Cold Chain Solutions Company Panasonic Housing Solutions Co., Ltd.	Freezing Reach-in Showcase using vacuum insulated glass (RE series)

Panasonic won awards for four themes in Energy Conservation Grand Prize 2024
https://news.panasonic.com/jp/topics/206103


Clothes drying dehumidifier F-YEX120B


Freezing Reach-in Showcase
FLD-REP9377LVG (3-Panel)

Environment

We use calculation of the carbon footprint (CFP) as an index for identifying the environmental performance of a product. CFP is a method of quantitative analysis and assessment of the quantity of greenhouse gases (GHGs) released in the various phases of the product life cycle by converting it to CO_2.

Panasonic Group's B2B companies such as Connect, Industry and Energy are increasingly requesting CFP calculation as part of their clients' requests to provide data and to support their clients' sustainability targets. In the B2C business related to consumer living, interest in CFP as a method of promoting each product's environmental performance is growing. In view of these developments, the Panasonic Group is engaged in accurate calculation of CFP vis-à-vis the objective in each business field and is utilizing the data in promoting certain products at exhibitions and fairs. We are also organizing seminars and developing guidelines specific to each business field to achieve an accurate and standardized calculation level across the entire Group.

Initiatives for Eco-conscious 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 intensity 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[*2] 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. In India, full-scale introduction of the CCMEA started in 2023. The CCMEA were carried out in our 27 sites across the world in fiscal 2023, and has been rolled out to other sites. We had continued these activities during the COVID-19 pandemic, combining online meetings taking account of infection status in different regions, and were thus able to reduce risks and improve interactive skills. As the pandemic is settling down, we conduct the CCMEA effectively utilizing both online and offline, e.g. our Group members from Japan participated in the regional on-site audits. 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 Mutual Environmental Audit

*2 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.

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 CO2 emissions, resource recycling, chemical substance management, and biodiversity conservation.

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 materials in order to materialize the targets in supplier collaboration with our Group. In addition to cooperation in ‘reducing environmental impact 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. Working on our own targets to achieve both a better life and a sustainable global environment aimed in the “Panasonic GREEN IMPACT” in January 2022, we will expand our efforts to reduce CO2 emissions throughout the supply chain. In October 2022, 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. In fiscal 2024, we submitted a letter to all of approximately 13,000 suppliers who have business with Panasonic Group across the globe to deepen understanding of our activities of ‘Panasonic GREEN IMPACT’.

In response to more stringent and expanded regulations such as EU RoHS Directive, the Panasonic Group has been engaging in continual environmental quality assurance system audits of our suppliers since 2005 to improve the management level throughout the entire supply chain. In fiscal 2025, we conducted the audits at some 1,000 suppliers and have supported their efforts to upgrade their management levels for chemical substances in products.

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

Estimation and Reduction 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 2025 data is 20.33 Mt, roughly 15 times the GHG emissions of the 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).

To reduce CO_2 emissions with our suppliers, Panasonic Group is actively procuring low-carbon materials for resins, irons/steels, aluminum ingots, such as utilization of recycled resins and recycled irons/steels, and aluminum ingots refined using hydroelectricity. In fiscal 2025, we managed to reduce approximately 67,000 tons of CO_2 emissions.

Scheme to Procure and Supply Aluminum Ingots Produced using Hydroelectricity

The Panasonic Group has managed to stably procure and supply raw materials of aluminum products to be used for air conditioners, showcases, etc., utilizing a centralized purchasing system. From fiscal 2022, we have been procuring aluminum ingots refined using hydroelectricity through the centralized purchasing system and supplying it to aluminum processing manufacturers, which is an example for achieving CO_2 emissions reduction, while maintaining a stable procurement price. This is the first initiative in Japan’s electrical manufacturing industry.

More specifically, we import aluminum produced at overseas aluminum refineries using hydroelectricity, to Japan. Then, we supply the imported aluminum to multiple aluminum rolling/extrusion manufacturers in Japan to process them to aluminum plates, etc. Finally, our group procures the processed aluminum products from the manufacturers to utilize them in our products.

CO_2 emissions of the aluminum ingots refined using hydroelectricity are reduced to one third of the CO_2 emissions compared to those refined using conventional thermal power. Various aluminum products processed from the aluminum ingots become one of our various products in different forms such as air conditioners fin materials, aluminum frames for housing facilities, and lithium-ion battery casings. Since fiscal 2022, we have maintained a consistent supply of more than 8,000 tons of aluminum refined using hydroelectricity in Japan, thereby reduction of CO_2 emissions by 60,000 tons per year has been achieved. Procurement of such aluminum

ingots under our metal supply scheme utilizing a group-wide centralized purchasing system also stabilizes the price of aluminum ingots in the market.

Sharing Achievements through Collaboration with the Panasonic Group

Since fiscal 2010, the Panasonic Group has been working together with our suppliers in ECO-VC Activity[*2] for procurement, aiming to reduce GHG emissions and achieve Recycling-oriented Manufacturing while also streamlining costs. This activity was expanded to China and other regions in Asia where full-fledged operation started in fiscal 2013 and further extended to a global scale in fiscal 2015. On its 15th anniversary in 2024, we renamed the ECO-VC Activity as 'ECOVC' to reposition it as an activity for value creation with our suppliers.

We have stored case examples of ECOVC 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 'ECOVC awards 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. In addition, since fiscal 2024, we have promoted decarbonization and reduction of CO_2 emissions in conjunction with the Panasonic GREEN IMPACT, collaborating with our suppliers. We will continue this ECOVC with our suppliers aiming to achieve CO_2 emissions reduction of 110 million tons from OWN IMPACT by 2050, as described in the "Panasonic GREEN IMPACT".

*2 ECO-VC Activity: Value Creation Activities

Environmental Achievements Made through Proposals

Items	FY2021	FY2022	FY2023	FY2024	FY2025
Number of proposals	430	332	264	236	265
CO_2 reductions derived from proposals	110 kt	50 kt	80 kt	927 kt	55kt
Use of recycled resources derived from proposals	5 t	1,500 t	600 t	37,000 t	13,446t
Reduction in resources used derived from proposals	323 kt	255 kt	40 kt	19 kt	17 kt

Collaboration with Environmental NGOs

Following the announcement of the "Panasonic GREEN IMPACT", we further enhanced collaborative work with environmental NGOs overseas and deepened our CSR efforts in the supply chain.

Particularly in China, where the number of suppliers of our group is large and there are strong demands in the society for suppliers to properly respond to environmental matters, we are continually working together with the suppliers to reduce environmental loads by from requesting corrective actions as items require improvement for the issues found in the audit, and confirming whether the items are improved, aiming at further pursuing responsible procurement activities. Through confirming these CSR and environmental items on site, we will continue to comply with new regulations, social norms, and corporate ethics, and conduct procurement activities that fulfill our social responsibilities such as for human rights, labor, safety and health, and global environmental conservation.

Main activities to date

2016	Started collaboration with a Chinese NGO. Held Panasonic Group briefings on our CSR Procurement Policy and China's environmental regulations for approximately 400 suppliers in Guangzhou, Dalian, and Shanghai, in the same year.
2018	Conducted on-site environmental audits that focused on suppliers' responsiveness to environmental issues, together with CSR audits for approximately 20 suppliers per year.
2020	Continually implemented on-site and online audits for more than 20 suppliers per year.
2023	Reinforced the on-site audits at suppliers sites through the Group-wide Supply Chain Compliance Project.

In addition, we are continually improving suppliers CSR and environmental issues, collaborating with an environmental NGO in China, the Institute of Public & Environmental Affairs (IPE), through periodically sharing information on the latest laws and regulations in working group meetings, as well as requesting the suppliers with records of non-compliance for improvement every month.
In the Suppliers Green Supply Chain Evaluation ranking (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. The Panasonic Group has been ranked as the second best in the CITI (total 40 brands) and as the top in the CATI (total 41 brands) for the household appliances industry in fiscal 2025.

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

Overview of Environmental Impact and Environmental Accounting

Overview of Environmental Impact from Business Operationn

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: 218 manufacturing sites and 74 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 materials of a separated product.

*1 Included renewable energy by deemed certifications such as non-fossil certificates.
*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 “IEA Emissions Factors 2024” issued by the International Energy Agency (IEA) is used for the CO_2 emission factors for electricity purchased from different countries use. The factors for domestically purchased electricity in Japan for fiscal 2025 stated in the “Guidelines for Calculation of Greenhouse Gas Emissions” published by Japan’s Ministry of the Environment.
*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 Figures for Japan.
*6 Included refrigerant leakage in sold product use.
*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 Lighting equipment and lamps, Household air conditioners, commercial air conditioners, household refrigerators, washing and drying machines, ventilation fans, bathroom ventilation dryers, electric water heaters, electric fans, A2W (Hot-Water and Heating Systems with Heat Pump), EcoCute, electronic rice cookers, dish washer and dryers, LCD TVs, Organic EL TVs, microwave ovens, heat exchange systems, blowers, chip mounters, commercial display Cases, hair dryers, IH cooking heaters, dehumidifiers, range hoods, vacuum cleaners, irons, electric thermos pots, projectors, digital Signage, welding machine, welding robot, insertion equipment, printing equipment, Mobile Computer, electric bidet toilet seats, freezers, commercial refrigerators and freezers, absorption freezers, well water pumps, telephones, air purifiers, faxes, humidifiers, digital cameras, headphones, electrically-assisted bicycle, motors for air conditioning, motors for refrigerator, motors for FA application, 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: 0.464 (Japan); 0.280 (Europe); 0.355 (North America); 0.589 (China & Northeast Asia); 0.732 (India & South Asia); 0.379 (Southeast Asia & Oceania); 0.222 (Latin America); and 0.379 (Middle East & Africa).
*13 Hussmann Parent Inc. and its consolidated subsidiaries not included.

Overview of Environmental Impact from Business Operation

INPUT	Suppliers	OUTPUT
Energy: ★4.5 TWh Purchased electricity 3.07 TWh including renewable energy ★0.95 TWh*1 Production of renewable energy in our own sites ★0.11 TWh Town gas 70.0million m³ LNG 10.8 kt LPG 4.4 kt Heavy oil 6.2 Ml Light oil 2.0 Ml Kerosene 1.6 Ml Volatile oil 0.1 Ml Steam 336 TJ Hot water 37 TJ		CO_2: 1.24 Mt*3
		GHGs other than CO_2 from energy use (CO_2-equivalent): 530 kt*13
	Production	Total wastes including revenue-generating waste: 278 kt Landfill: 1.9 kt
Resources Recycled resin:15.2 kt Water: 13.49 million m³ Chemical substances: 196.7 kt*2*13		Water discharged: 10.45 million m³ Release and transfer of chemical substances: 3.654 kt*4*13
Energy: 1.31 MWh*5 Biodiesel fuel: 0.399 kl*5	Logistics	CO_2: global 720 kt domestic ★112 kt
Electricity: 216.3 TWh	Product use	CO_2: 111.16 Mt*6
Collected products: 145 kt*5*7*8 CRT TVs: 3 kt Plasma/LCD TVs: 9 kt Air conditioners: 35 kt Refrigerators/freezers: 51 kt Washing machines/clothes dryers: 44 kt	Recycling	Recycled products: 110 kt*5*7 Metals: 81 kt Glass: 1 kt Other: 27 kt Generated waste: 35 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.

In fiscal 2025, the entire emissions for Scopes 1 to 3 totaled 145.62 million tons. The largest source of emissions per category was from Category 11 under Scope 3, which accounted for 76% of the entire emissions.

Compared with fiscal 2024, fiscal 2025 saw an increase in emissions of 19.1 million tons. The major cause was the proactive expansion of businesses covered under Category 11, causing that category's emissions to increase by 20.13 million tons. Also, facility investment anticipating business growth increased the Category 2 emissions by 480,000 tons. On the other hand, we reduced Scopes 1 and 2 emissions by 150,000 tons, thanks to steady efforts in implementing various energy-saving schemes and further introduction of renewable energy.

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 8.84 (Mt) are due to the influence of CFC
*18 6.06 (Mt) are due to the influence of CFC
*19 7.01 (Mt) are due to the influence of CFC
*20 6.18 (Mt) are due to the influence of CFC

Category		Emissions (kt)	
		FY2024	FY2025
Scope 1[*14]		316	272
Scope 2[*15]		1,207	1,099
Scope 3[*16]	1. Purchased goods and services	21,954	20,324
	2. Capital goods	1,546	2,030
	3. Fuel- and energy-related activities	243	251
	4. Upstream transportation and distribution	741	720
	5. Waste generated in operations	1	1
	6. Business travel	31	30
	7. Employee commuting	107	106
	8. Upstream leased assets	–	–
	9. Downstream transportation and distribution	146	147
	10. Processing of sold products	234	170
	11. Use of sold products	91,027[*17]	★111,151[*19]
	12. End-of-life treatment of sold products	7,860[*18]	7,999[*20]
	13. Downstream leased assets	–	–
	14. Franchises	–	–
	15. Investments	1,108	1,322
	total	124,995	144,246
Scope 1-3 total		126,518	145,616

Numerical values in units of (t) are introduced on the following website.
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 2025

Environmental conservation in factories	
Investments*21	3,241 million yen
Expenses*21*22	61 million yen
Economic benefit*23	394 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.
*23 The economic benefit represent the cost of energy savings achieved through energy conservation, which translates into cost reductions that contribute to climate change mitigation.

Environmental Conservation Benefits for Fiscal 2025 (in physical terms)

Categories	Emission reduction	Reference indicator: environmental impact	
		Fiscal 2024	Fiscal 2025
CO_2 emissions from production activities	130 kt	1.37 Mt	1.24 Mt
Human Environmental Impact	47 kcount	386 kcount	339 kcount
Landfill of waste	- 0.4 kt	1.5 kt	1.9 kt
Water withdrawal	0.38 million m^3	13.87 million m^3	13.49 million m^3

Fiscal 2024 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 2025

Electricity cost reduction from product usage (global)	
Reduced amount of electricity*24	80.6 TWh
Reduced electricity costs*25	2298.0 billion yen

*24 Calculated under the same conditions as when determining the size of contribution in reducing CO_2 emissions through energy-saving products (see page 18).
*25 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 477.8 billion yen for the group-wide total R&D expenses in fiscal 2025 will be invested mostly for promoting “Panasonic GREEN IMPACT”.

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.

Since 2021, progress made in the KPIs established under GIP, as well as issues and social developments, are deliberated on by the Sustainability Management Committee. Decisions on important issues are made swiftly at Group Management Meetings consisting of the Group CEO and the presidents of the operating companies.

This process, under which the PDCA cycle is implemented throughout the Group, was announced in 2022 and is part of Panasonic GREEN IMPACT, our long-term environmental vision.

See page 29 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 2050, 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 41-44 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.

See pages 52-55 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 page 141). The management policy includes identification of environmental risks and group-wide risk management each year, and 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. and operating company. Once a year, the Enterprise Risk Management Committee identifies risks that could affect the entire Group based on changes in the external and internal environment and management's risk awareness. In fiscal 2026, the Panasonic Group addressed significant strategic risks related to environmental issues and climate change.

See page 75 for more details.

Metrics and Targets

The Panasonic Group has set its medium- to long-term targets for reducing greenhouse gas emissions which were 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.

In addition, we set long-term targets and received accreditation for our net-zero emissions targets.

*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, or less than 1.5°C if possible, above pre-industrial levels.

GHG emissions reduction targets (SBT 1.5°C accreditation)

	Targets	Progress rate
Emissions from Panasonic Group business activities (Scopes 1 and 2)	Reduce by 90% by 2030 (compared to FY2020) 2019: 2,311 kt	45%
Emissions from use of Panasonic Group products (Scope 3)	Reduce by 30% by 2030 (compared to FY2020) 2019: 95,040 kt	-*3

*3 Progress rate not calculated due to increase in emissions because of expansion of products subject to calculation (see page 37)

GHG emissions reduction targets (SBT net-zero accreditation)

	Targets	Progress rate
Emissions from Panasonic Group business activities (Scope 1, 2 and 3)	Reduce by 90% by 2050 (compared to FY2020) 2019: 127,039 kt	-*3

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 the automotive battery business for environmentally friendly vehicles that are designed to significantly reduce CO_2 emissions and activities to reduce CO_2 emissions from our air quality and air conditioning business in Europe, we opened demonstration facilities for Panasonic HX at our Japanese sites in 2022 and overseas sites in 2024*4. Panasonic HX is a solution based on our unique AI-based Energy Management System (EMS) that integrates three energy sources—pure hydrogen fuel cell generators, photovoltaic generators and storage batteries—to provide stable, renewable energy and effective energy use.

• Internal carbon pricing

Panasonic Group introduced internal carbon pricing (ICP) in March 2022 for capital investment, with a setting the price of CO_2 emissions at 6,000 yen/t-CO_2.*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.

In order to accelerate our competitiveness in businesses contributing to 'carbon neutrality (decarbonization)' and 'circular economy', Panasonic Corporation, one of our Panasonic Group companies, introduced the ICP scheme where CO_2 emissions reduction in Scope 3 in our entire value chain and avoided CO_2 emissions contribute to society are used as criteria for investment decision, to all Panasonic Corporation in fiscal 2025.

Until now, priority investments have been made in the business of automatic demand response control for refrigerators and part of the Panasonic Factory Refresh business.

• 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 https://news.panasonic.com/global/press/en241203-3

*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. - Commercializing carbon fixation technology development
		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. - Delay in responding to enhancing information disclosure reduces investment.	- Recognition of environmental technologies and products increases business opportunities. - Increasing investment in the financial market by established recognition of avoided emissions.
	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. - Utilization of new hydrogen energy markets.
		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. - Lower prices from reduced production costs increase sales by data optimization.
	Markets	Promoting a circular economy	- Delay in recycling and reuse technologies increases costs. - Resource recycling does not suit consumers' tastes. - Delay in responding to circular economy regulations reduces business opportunities.	- 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. - Entering the plant factory-related businesses adapted to the food crisis.
	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.

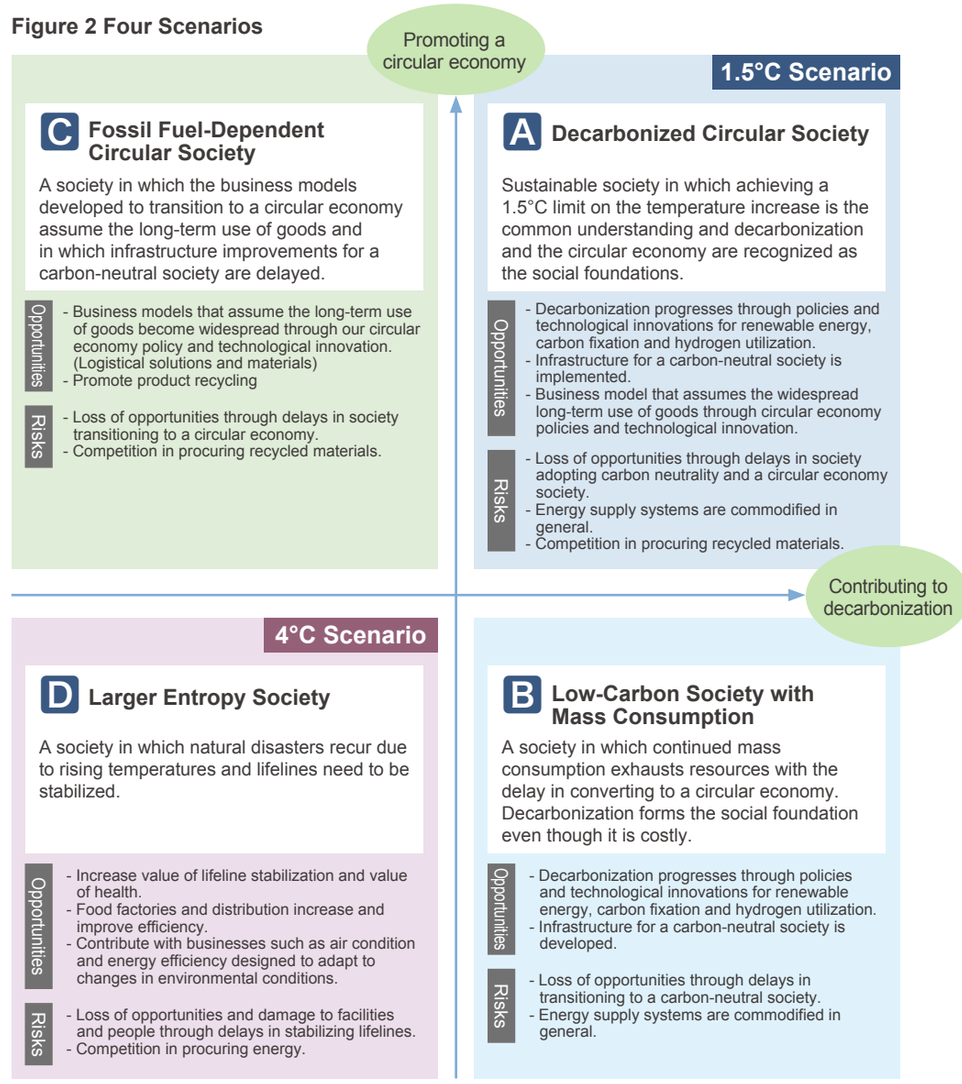
The following figure shows the impact analysis results of climate change risks (Figure 1) regarding the results of analyzed factors based on the identified risks and opportunities and analyzed impact on our businesses.

Figure 1 Analyzing the Impact of Climate Change Risks

Risk categories related to climate change		Strong	Impact on our businesses	Extremely strong
Transitional risks	Markets			● Promoting a circular economy
	Policies/laws and regulations		• Acceleration of carbon pricing	• Progressive shift to electric vehicles → ● Contributing to decarbonization
	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		

From a climate change viewpoint, we identified “Promoting a circular economy” and “Contributing to decarbonization” and their materiality as factors that have a very significant impact on our business. With these two factors as the axes of a matrix, we created four scenarios for 2050 in the following quadrants (Figure 2). We defined the 1.5°C scenario as a society which contributes to decarbonization and promotes a circular economy, and the 4°C scenario as a society in which the contributing to decarbonization is stalled and implementation of a circular economy is delayed.

Figure 2 Four Scenarios



The Decarbonized Circular Society A is equivalent to the 1.5°C scenario. If A doesn't develop a circular economy, it becomes B a Low-Carbon Society with Mass Consumption. If A doesn't develop decarbonization, it becomes C a 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 contributing to decarbonization 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.), sufficient information disclosure

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 six 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 Connect Co., Ltd.
3. Panasonic Energy Co., Ltd.
4. Panasonic Industry Co., Ltd.
5. Panasonic Entertainment & Communication Co., Ltd.
6. Panasonic Housing Solutions Co., Ltd.

For each type of society, we have formulated strategies for our six 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.
The total sales of the operating companies for fiscal 2025 are shown as financial information.

1. Panasonic Corporation

Sales for fiscal 2025: 3,584.2 billion yen

1-1 Living Appliances and Solutions Company

- 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

1-2 Heating & Ventilation A/C Company

- 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

1-3 Cold Chain Solutions Company

- Promote energy conservation offering comprehensive support for our energy monitoring system covering from system installation to operations and maintenance. Our equipment refurbishing service prolongs system usage while contributing to a circular economy. A B C
- Accelerate development of natural refrigerants with lower environmental impact through wider use of CO_2 refrigeration equipment. A B

1-4 Electric Works Company

- 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

1-5 Direct Control (Hydrogen Related Businesses)

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

2. Panasonic Connect Co., Ltd.

Sales for fiscal 2025: 1,333.2 billion yen

- 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

3. Panasonic Industry Co., Ltd.

Sales for fiscal 2025: 1,083,6 billion yen

- Develop and supply products that contribute to reducing power consumption in the information and telecommunications infrastructure, where energy consumption is increasing due to the growing demand for AI. A B
- Develop and supply products that contribute to electrification of vehicles and improvements in power and fuel economy. A B
- Reduce environmental impact through development and provision of products that contribute to product/equipment downsizing, light weight, low energy loss, and longer product life. A B C
- Reduce CO_2 emissions by conserving energy and wider use of renewable energy in manufacturing activities. A B

4. Panasonic Energy Co., Ltd.

Sales for fiscal 2025: 873.2 billion yen

- Increase avoided CO_2 emissions, by increasing the number of electric vehicle users through increasing the capacity of automotive batteries, enhancing our production capacity and introducing battery solutions such as using storage systems to reduce the electrical load at data centers. A B C
- Halve the carbon footprint in fiscal 2031 over the fiscal 2022 level by building Net Zero Factories, procuring lithium ion battery materials locally and establishing circular economy business models. A B C

5. Panasonic Entertainment & Communication Co., Ltd.

Sales for fiscal 2025: 278.0 billion yen

- Reduce CO_2 emissions by introducing renewable energy at our own sites, establishing a factory energy management system, giving buildings heat shielding coatings and by saving energy per product category. A B
- Promote circular economy through enhancement of refurbishing businesses, acceleration for using recycled resin, adoption of eco packaging, and the like. A C

6. Panasonic Housing Solutions Co., Ltd.

Sales for fiscal 2025: 479.5 billion yen

- Reduce CO_2 emissions in our value chain by comprehensive implementation of energy-saving initiatives and electrical power generation. A B
- Enhance our range of products and solutions that contribute to reducing CO_2 emissions in society. A B
- Promote a circular economy to expand the use of recycled and sustainable materials and reduce resource use. A C

The scenario analysis found that either of the businesses in our group can respond to the situation even if any of the 4 scenarios of the societies is achieved. 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˚C world, represented by our society A.

Response to TNFD

TNFD Recommendations[*1]

In the same way as the TCFD recommendations, the TNFD recommendations comprise the four thematic areas of Governance, Strategy, Risk and Impact Management, and Indices and Targets, for corporations to voluntarily identify and disclose business risks and opportunities.

The Panasonic Group recognizes risks and opportunities concerning natural capital as a critical management issue. Based on the TNFD recommendations, we are currently identifying these business risks and opportunities, as well as verifying the resilience of our business strategies. We are also assessing business sustainability using scenario analysis.

*1 In September 2023, the Taskforce on Nature-related Financial Disclosures (TNFD) released a set of disclosure recommendations and guidance for organizations to report and act on evolving nature-related dependencies, impacts, risks, and opportunities.

General Requirements

(1) The approach to materiality
This report assesses and describes “impacts from natural capital on our business activities” and “impacts from our business activities on natural capital” applying a dual materiality approach.

(2) The scope of disclosures
This report adheres to the four pillars of the disclosure recommendations, which are Governance, Strategy, Risk & Impact Management, and Metrics & Targets. The scope of the analysis covers the Panasonic Group’s business activities and those of the upstream and downstream of the supply chains. The analysis includes nature-related impact from all manufacturing sites across the group, and then the business-related dependencies and impacts were analyzed under the electronics sector. The risks and opportunities were identified using the LEAP approach,[*2] recommended by TNFD, and scenario analysis.

(3) The location specificity of nature-related issues
The analysis used data from the areas where we operate.

(4) Integration with other sustainability-related disclosures
The analysis took into account the relation to environmental issues, such as climate change and resource recycling.

(5) Time span
We use three time spans: Short term—up to three years into the future; Medium term—up to 2030; and Long term—up to 2050.

(6) Stakeholder engagement
We hold dialogues with major media outlets coinciding with the publication of annual sustainability data books. We also hold regular meetings between external experts and our management to deepen understanding of natural capital and gain objective perspectives on the Panasonic Group’s efforts.
We are closely engaged with institutional investors to discuss the sustainability strategy that helps to increase our medium- to long-term corporate value. Every company inevitably causes direct and indirect impacts from its business operations. The direct impact is to the company’s operating area and surrounding areas, and the indirect impact is to all stakeholders affected by the direct impact. We are watchful for human rights infringements occurring from these direct and indirect impacts and are aware of the importance of managing and correcting any infringements. The Panasonic Group endorses all human rights-related international rules and models, and values the human rights of anyone who may be affected by our business activities. We put the greatest emphasis on our efforts to fulfill this responsibility. We are keen to understand the status of impact from our businesses on indigenous peoples, local communities, and other stakeholders, and are reinforcing our system to protect their human rights. Please refer to the following section, Governance, for more details.

*2 LEAP approach
TNFD adopted the LEAP approach to comprehensively assess nature-related risks and opportunities. The LEAP approach comprises four phases: Locate the company’s interfaces with nature; Evaluate its dependencies and impacts on nature; Assess its nature-related risks and opportunities; and Prepare and report on material nature-related issues.

Governance

Aiming to build a sustainable society, the Panasonic Group regards issues relating to natural capital—such as biodiversity—as a critical management issue. We manage such issues under groupwide governance using the same system and schemes as we do for TCFD (see page 29). We are working to build a society in harmony with nature, contributing to a nature-positive future by supporting the recovery of natural ecosystems. As a part of this effort, we value the human rights of any stakeholders who could be affected indirectly by nature altered by our businesses and supply chain—especially those who are vulnerable to environmental deterioration, such as indigenous peoples and local communities. Such stakeholders have the right to obtain accurate and appropriate information, the right to effectively participate in decision making concerning their environment (including the right of self-determination and to prevent forced relocation of indigenous peoples and local communities), and the right to receive effective remedies. We understand the importance of such rights, as well as of engagement with them to support and exercise their rights. We are aiming to enhance our capability to address these issues.

Strategy

The Panasonic Group provides products and solutions that contribute to people’s lives and businesses. Such products and services include home appliances, housing facilities, devices and systems for production and distribution sites, and batteries and electronic components that

support transportation systems and social infrastructure. Our businesses largely depend on natural capital, such as water and mineral resources, and biodiversity.

Business management that can bring both business results and natural capital protection is essential to maintaining a sustainable business. With full awareness of this point, we are working to identify and assess nature-related risks in our value chain.

In 2024, we qualitatively evaluated our businesses' relationships with nature and prioritized any issues using the ENCORE[*3] and LEAP approaches. The scope of this assessment covered general product life cycles, including procurement, production, usage, and disposal. The production phase was then analyzed according to the Group companies—Living Appliances and Solutions, Connect, Industry, Energy, and others. Subsequently, these analyses were studied according to the characteristics of major products. We plan to build a more precise assessment system by continuing detailed analysis and improving the assessment procedure.

*3 ENCORE: Exploring Natural Capital Opportunities, Risks and Exposure. A tool developed by the UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) to systematically visualize how businesses impact and depend on natural capital, enabling companies to be aware of their exposure to nature through business operations and material procurement in the supply chain. The tool is recommended by the TNFD Guidance and the Ministry of the Environment.

Dependency Heatmapping

We created a heatmap that shows our value chain's dependencies on ecosystem services, categorized into Very High, High, Medium, and Low (including Very Low and N/A). As a result of ENCORE scoring, many of our business segments showed high dependency on water resources, both surface and underground water.

Ecosystem service dependency heatmap

Process	Segment	Major Products	Provisioning services					Regulating & maintenance services																Cultural services
			Water resources		Other resources			Purification						Waterflow regulation	Climate regulation	Flooding and storm mitigation	Soil retention and quality maintenance			Other regulations				
			Surface water	Underground water	Others	Gene Resources	Animal energy	Environment recovery	Filtering and sedimentation	Atmospheric dilution	Indoor ventilation	Water quality	Sensory nuisances	Water circulation maintenance		Flooding and storm protection	Buffering and attenuation of mass flows	Erosion prevention	Soil quality maintenance	Pollination	Habitat maintenance	Pest control	Disease control	
Procurement		Metals, minerals, plastic, wooden materials, electricity, gas	■	■					■	■	■	■	■	■	■	■		■						
Manufacturing	Home appliance	Refrigerators, microwave ovens, rice cookers, air conditioners, water heat pump system, ventilation, air purifiers, freezing or refrigerating showcases	■	■					■	■	■	■	■	■	■	■		■						
		Washing machines, vacuum cleaners, personal-care products, lighting fixtures, wiring devices, solar photovoltaic systems, fuel cells, compressors, electric-assist bikes, nursing care services	■	■						■					■									
	Connect	Aircraft in-flight entertainment systems													■	■								
		Electronic components-mounting machines, welding equipment, PCs and tablets, installation/operation/maintenance services, supply chain management software	■	■					■	■	■	■	■	■	■	■		■						
	Industry	EV relays, capacitors, motors, PLC, sensors, laser markers, multilayer materials, semiconductor device materials, molding compounds	■	■				■	■	■								■						
	Energy	Cylindrical lithium-ion batteries for in-vehicle use, dry batteries, secondary batteries, storage battery modules	■	■				■	■	■								■						
	Others	TVs, digital cameras, video equipment, audio equipment, kitchen & bathroom fittings, interior products, exteriors	■	■						■														
Use		Use of products	■	■						■														
Disposal		Disposal of products	■	■					■															

■ Very High, ■ High, ■ Medium, ■ Low/Very Low/ NA

Impact Heatmapping

We have also created a heatmap of impacts from our businesses using four categories of Very High, High, Medium and Low (including Very Low and N/A). As a result, many of our business segments showed a high impact for GHG emissions, water usage, land ecosystem usage, waste emissions, soil pollution, and water pollution.

Ecosystem service impact heatmap

Process	Segment	Major Products	Impact on nature											
			Land, fresh water, & marine usage			Climate change	Resource usage and recovery		Contamination and its removal					Invasive foreign species
			Land ecosystem usage	Freshwater ecosystem usage	Marine ecosystem usage	GHG emissions	Water usages	Other resource usage	Wastes	Air pollution other than GHG	Soil pollution	Water pollution	Endocrine disruption	Foreign species introduction
Procurement		Metals, minerals, plastic, wooden materials, electricity, gas												
Manufacturing	Home appliance	Refrigerators, microwave ovens, rice cookers, air conditioners, water heat pump system, ventilation, air purifiers, freezing or refrigerating showcases												
		Washing machines, vacuum cleaners, personal-care products, lighting fixtures, wiring devices, solar photovoltaic systems, fuel cells, compressors, electric-assist bikes, nursing care services												
	Connect	Aircraft in-flight entertainment systems												
		Electronic components-mounting machines, welding equipment, PCs and tablets, installation/ operation/maintenance services, supply chain management software												
	Industry	EV relays, capacitors, motors, PLC, sensors, laser markers, multilayer materials, semiconductor device materials, molding compounds												
	Energy	Cylindrical lithium-ion batteries for in-vehicle use, dry batteries, secondary batteries, storage battery modules												
	Others	TVs, digital cameras, video equipment, audio equipment, kitchen & bathroom fittings, interior products, exteriors												
Use		Use of products												
Disposal		Disposal of products												

Very High, High, Medium, Low/Very Low/ NA

Locating Nature Priority Sites (Locate)

Among all the Panasonic Group's manufacturing sites, we identified Sensitive Locations as defined by TNFD. Combining the analysis tools and database referred to by TNFD, we identified Sensitive Locations according to the score for each manufacturing site calculated for the following areas: Areas Important for Biodiversity; Areas of High Ecological Integrity; Areas Important for Ecosystem Services Provision; and Areas of Physical Risks for Water. As for the physical risks for water, 54% of our entire sites were found to be in sensitive locations. Taking account of the importance of our group businesses, we will continue to identify the Priority Locations as defined by TNFD.

Sensitive locations among all manufacturing sites

Criteria for sensitive locations	Tools	Index	Specific criteria	Summary of results
Criteria for sensitive locations	IBAT	1. WDPA, 2. KBA, 3. Rarity-weighted species richness	Evaluated according to World Database on Protected Areas (WDPAs), Key Biodiversity Areas (KBAs), and Species Diversity Indices	- 8% of all manufacturing sites are in sensitive locations - Including sites in Malaysia, Taiwan, and Singapore
High ecological integrity	1. Newbold, 2. Global Forest Watch	1.Biodiversity intactness index, 2. Tree cover loss	Evaluated for Biodiversity Intactness Index, and Green Cover Depletion	- 13% of all manufacturing sites are in sensitive locations - Including sites in Malaysia, Thailand, and Japan
Important for Ecosystem Services Provision	Land Mark	Land of indigenous peoples and local communities	Evaluated for proximity to land of indigenous peoples and local communities	- 6% of all manufacturing sites are in sensitive locations - Includes sites in India, Mexico, Vietnam, and America
Physical Risks for Water	1. Aqueduct, 2. WRF, 3. Flood risk finder	1. Baseline water stress, 2. Surface water quality index, 3. Flooding depth	Evaluated for water stress, quality of surface water, flooding depth, etc.	- 54% of all manufacturing sites are in sensitive locations - Many sites face water pollution risks. China showed the highest number with 32 sites.

The Locate phase for water resources is described on page 73. The qualitative analysis of the impact on the ecosystem from iron resources is currently being undertaken (for details, see https://holdings.panasonic/global/corporate/sustainability/environment/resources/recycling_oriented_manufacturing.html#iron)

Identifying Risks and Opportunities Based on Scenario Analysis

Identifying Risks and Opportunities

The Panasonic Group is aware of the impact and dependencies of our business activities on natural capital (ecosystem services), and regards our response to related risks and opportunities as priority issues in business management. As a part of such efforts, we ran scenario analyses based on the TNFD recommendations to identify nature-related risks and opportunities. With our eyes set on 2050, we analyzed four scenarios (phases) formed on the two axes of “ecosystem service degradation” and “alignment of market and non-market forces,” as recommended by TNFD. As a result, we adopted the following two scenarios for detailed analysis based on their perceived likelihood and potential scale of impact.

- Nature Positive (NP) Scenario

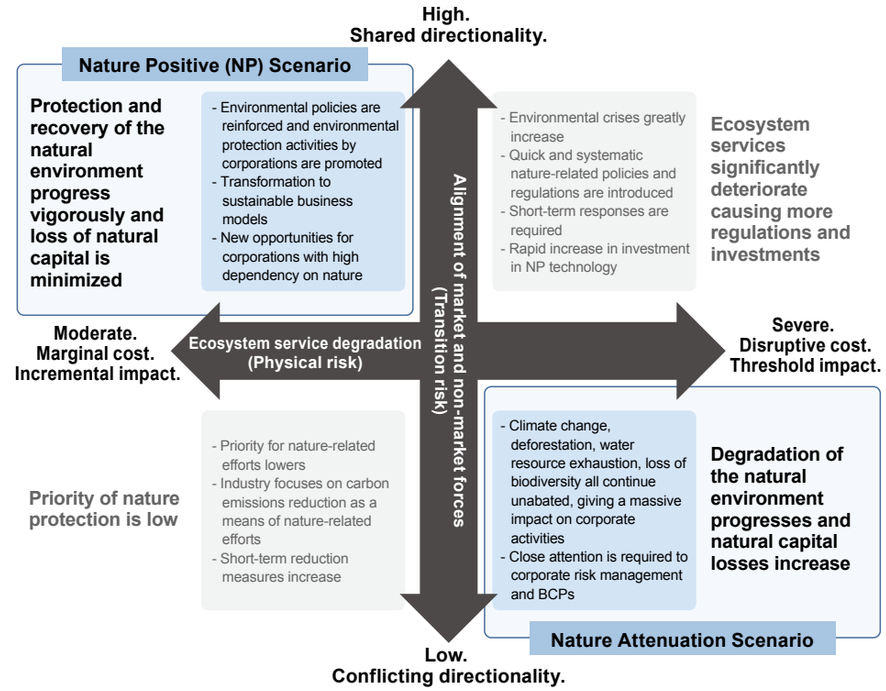
This scenario assumes vigorous progress in nature protection and recovery whereby natural capital would be recovered in the future. This is a scenario based on Vision 2050 of the Kunming-Montreal Global Biodiversity Framework (GBF), which aims at a world living in harmony with nature, or equivalent to a +1.5°C climate change scenario.

- Nature Attenuation Scenario

This scenario assumes a world where natural capital and biodiversity are largely lost due to lack of international cooperation towards nature positive. This is equivalent to a +4°C climate change scenario that describes the accelerated degradation of the natural environment.

Based on these two scenarios, we identified potential issues in the upstream, direct operations, and downstream of the value chain, as well as in the business areas of each operating company. We then assumed the impact from such issues (risks and opportunities) on our finances and businesses. Taking account of the scale of the impacts and their possible frequency, as well as their time span, we made a relative evaluation between the risks and opportunities. Based on the evaluation results, we then devised countermeasures to minimize the risks and maximize the opportunities. These countermeasures were developed from the standpoint of measures already enforced, other measures currently being discussed, and future plans.

Four Scenarios and Assumed Worlds



Scenario Analysis on the Value Chain Upstream

Upstream analysis identified issues related to material procurement, which has a close relationship with nature. In the Nature Positive scenario, where nature protection and recovery progress vigorously, mandatory usage of materials with low environmental impact and tighter material usage restrictions may be enforced. These changes may cause instabilities in material

procurement, stricter pursuit of illegal procurement, lowering of business value due to increase in lawsuit and compensation risks, and damage to our brand image. While in the Nature Attenuation scenario, where nature degradation and social indifference progress, we assume risks such as unstable material procurement due to intensified natural disasters and flooding arise with the lowering natural power of climate regulation and water retention. To respond to such risks, we would need to disperse the upstream sites over different areas, keeping pace with the latest regulation changes, and requiring closer cooperation with suppliers.

Risks, opportunities, and countermeasures (upstream)

Scenario	Possible issues	Risks and opportunities		Risk assessment and opportunity assessment	Time span	Risk countermeasures
NP	Mandatory usage of materials with low environmental impact. Tighter usage restrictions of specific hazardous chemicals and materials.	Risks	Growing instability and difficulties in resource and material procurement.	Medium to large	Short- to mid-term	Distributed procurement from appropriately dispersed suppliers across value chain upstream sites.
		Opportunities	Securing business competence through development of technologies related to procuring materials with low environmental impact.			Offering products and services with low environmental impact through visualization of procurement (monitoring and database DX).
NP	Stricter pursuit of procurement legality. Increase of lawsuits and compensation demands.	Risks	Lowered business value and damage to brand image.	Medium to large	Mid- to long-term	Requesting suppliers to ensure legal material procurement. Replacing product materials with recycled materials.
		Opportunities	Improving reputation and brand image by adopting materials with low environmental impact.			Following the latest global trends, adopting self-regulation stricter than legal requirements. Establishing internal standards and regular revision. Introducing checkup and inspection system.
Nature Attenuation	Intensified natural disasters and flooding due to lowered natural power of climate regulation and water retention.	Risks	Growing instability and difficulty of resource and material procurement. Increasing cost of recovery, repairs, and operations.	Medium to large	Short- to long-term	Distributed procurement from appropriately dispersed suppliers across value chain upstream sites.
		Opportunities	Disaster countermeasures in the value chain upstream sites. Facility investment for more efficient operations.			Offering (energy-saving) products with less CO_2 emissions and/or less water usage, and circular services.

Scenario Analysis of Direct Operations in the Value Chain

Direct operation analyses revealed that there are many issues in manufacturing, where natural materials are used. In the Nature Positive scenario, mandatory usage of materials with low environmental impact and tighter material usage restrictions may be enforced. These changes may cause risks, such as business stagnation and suspension. At the same time, increased demands for products and services with low environmental impact would require us to operate our business to suit such demands and publicly announce our contribution to ecosystems. Also, we would need to convert our business models to recycling-oriented, by creating products and services that provide a positive impact on nature and ecosystems, collecting and recycling used products, and expanding refurbished products. To realize this, we are aware of the necessity of strategic and well-planned resource deployment; facility investment; and development of eco-conscious product design and manufacturing technologies, as well as resource extraction technologies within the recycling process. In the Nature Attenuation scenario, we are concerned about the growing instability of material procurement and business operations due to the increase in natural disasters and flooding caused by deterioration in nature's capability with respect to climate regulation and water retention.

Risks, opportunities, and countermeasures (direct operations)

Scenario	Possible issues	Risks and opportunities		Risk assessment and opportunity assessment	Time span	Risk countermeasures
NP Nature Attenuation	Providing products and services with positive impact on nature and ecosystems. Collecting and recycling used products. Reviewing refurbishment-based business models.	Risks	Delays, suspensions, and stoppages concerning research, development, production, services, and sales.	Medium to large	Short- to mid-term	Following the latest global trends, strategically training people for risk reduction and accident prevention, and making well-planned facility investments.
		Opportunities	Developing and commercializing low environmental impact technologies.			Developing eco-conscious materials. Solutions to visualize ecosystem protection and recovery. Developing recycling-oriented product design and manufacturing technologies, and resource extraction technologies for recycling.
NP	Mandatory usage of materials with low environmental impact. Tighter usage restrictions of specific hazardous chemicals and materials.	Risks	Production difficulties and increased costs due to restrictions on materials with high environmental impact.	Medium to large	Mid- to long-term	Reforming business processes to reduce resource usage, DX, more efficient operations using AI, and cost reduction.
		Opportunities	Developing products and services with low environmental impact throughout their life cycles.			Developing eco-conscious materials. Solutions to visualize ecosystem protection and recovery. Developing recycling-oriented product design and manufacturing technologies, and resource extraction technologies for recycling.
NP	Diversified customer preferences concerning products and services with low environmental impact. Intensified natural disasters and flooding due to lowered natural power of climate regulation and water retention.	Risks	Lowered brand image and trust due to insufficient efforts on ecosystem. Worsened relationships with stakeholders.	Medium	Short- to mid-term	Providing products and services that support and contribute to the ecosystem. Publicly announcing information about this approach. Acting on ecosystem protection and recovery in direct operation sites in the value chain (from procurement to sales).
Nature Attenuation	Intensified natural disasters and flooding due to lowered natural power of climate regulation and water retention.	Risks	Delays, suspensions, and stoppages concerning research, development, production, services, and sales.	Medium to large	Short- to long-term	Moving operation sites from a global viewpoint, such as natural disaster occurrence frequency and resource usage regulations. Dispersed deployment of appropriate sites related to value chains (production, distribution, sales, and maintenance).
		Opportunities	Disaster countermeasures in production, distribution, and sales sites. Facility investment for efficient operations.			Offering (energy-saving) products with less CO_2 emissions and/or less water usage, and circular services.

Scenario Analysis in the Value Chain Downstream

The downstream analysis identified a number of risks related to collection and recycling of used products, and refurbishing. In the Nature Positive scenario, we assumed that a circular economy and recycling-related regulations would be reinforced. We would need to develop and introduce recycling-oriented product design and manufacturing technologies, along with resource extraction technologies. We would also need to establish a system to measure and assess the quantity of used materials and generated wastes in each process of a product life cycle. It would also be necessary to build a closer relationship among partner corporations (joint development and testing, service provision, and forming new partnerships), as well as developing solution technologies to visualize ecosystem protection and recovery.

In the Nature Attenuation scenario, the electronic device and battery business, which uses rare mineral resources as a major material, would face challenges concerning how we can achieve ecosystem protection and a successful business at the same time. For this reason, it is essential to keep pace with the latest regulation trends, establish and maintain internal standards stricter than the legal requirements, and establish a system to carry out regular checkups and inspections. Further, it is important to publicly announce such efforts and results in an appropriate manner.

Risks, opportunities, and countermeasures (downstream)

Scenario	Possible issues	Risks and opportunities		Risk assessment and opportunity assessment	Time span	Risk countermeasures
NP Nature Attenuation	Collecting and recycling used products. Revising business models to allow refurbishing.	Risks	Increase in design costs (materials and disassembly). Value chain reform costs.	Medium to large	Short- to mid-term	Promoting corporate collaboration: joint development and testing, service provision, partnerships, and corporate ecosystems.
		Opportunities	Developing and commercializing low environmental impact technologies.			Developing eco-conscious materials. Solutions to visualize ecosystem protection and recovery. Developing recycling-oriented product design and manufacturing technologies, and resource extraction technologies for recycling.
NP	Increased and reinforced natural capital-related (recycling) regulations.	Risks	Complications and cost increase in product development in order to be compliant with reinforced regulations.	Medium to large	Mid- to long-term	Achieving better product development efficiency and cost reduction by developing and introducing recycling-oriented design, manufacturing, and resource separation technologies.
		Opportunities	Developing products and services with low environmental impact throughout their life cycles.			Establishing systems to measure and assess quantity of used materials and generated wastes in each process of the product life cycle.
Nature Attenuation	Achieving a successful business and ecosystem protection in the electronic device and battery business, which uses rare mineral resources as a major material.	Risks	Risks of reputational damage, lawsuits, and boycotts, due to using materials with high ecosystem destruction risks or little consideration given to environmental or human rights due diligence.	Medium to large	Mid- to long-term	Following the latest global trends, adopting self-regulation stricter than the legal requirements. Establishing internal standards and regular revision. Introducing a checkup and inspection system.
		Opportunities	Announcing our environmental impact reduction through collecting, recycling, and refurbishing used products.			Appropriately announcing that our products and services support and contribute to ecosystems.

Risk and Impact Management

The Panasonic Group regards issues related to natural capital, including biodiversity, as a critical management issue, just as we do for climate change issues. We are working to alleviate impacts from identified risks and enhance opportunities by integrating them within the groupwide risk management system, as we do for TCFD (see page 75).

Metrics and Targets

Under Panasonic GREEN IMPACT, our long-term environmental vision, the Panasonic Group has set out targets that aim to reduce risks and expand opportunities related to natural capital protection (resource-related numerical targets and qualitative goals concerning biodiversity and water). We are working hard to achieve these targets and goals to reduce environmental impact across our value chain (see page 16). We will continue our efforts leading to natural capital protection through our global environmental activities and by setting new indices and targets in our business activities.

Climate Change Materiality

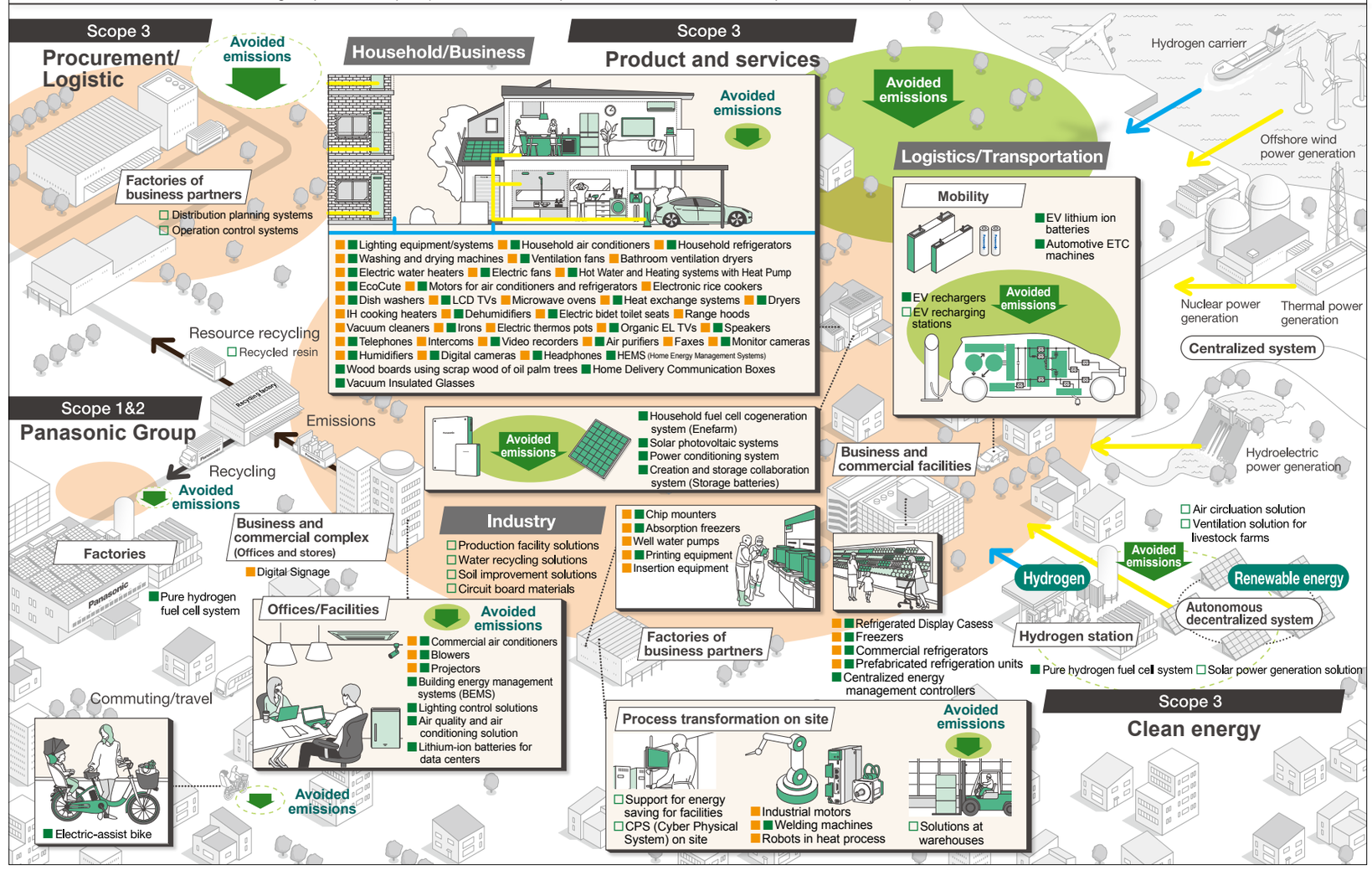
Our Businesses' Contribution to Carbon Neutrality

(From FY2025 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 16-18 because of sub categorization for calculation in businesses such as those for heat exchange systems, electric fans, microwave ovens, and display cases.

Reducing CO_2 Emissions in Factories

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

To achieve Panasonic GREEN IMPACT, Panasonic Group has been working on toward making net zero 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 net zero factories to 37, aiming to reduce 260,000 tons of CO_2 emissions. In the Net Zero Factory Promotion Taskforce we started up in September 2021. The taskforce aims to create and provide Group-wide measures to accelerate the creation of net zero 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. During this fiscal year, we held seminars to introduce internal excellent examples and the latest information on energy saving and energy recycling to Group members. 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 net zero factories mean 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 (energy certificates and carbon credits). 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."
https://news.panasonic.com/global/stories/2021/90376.html

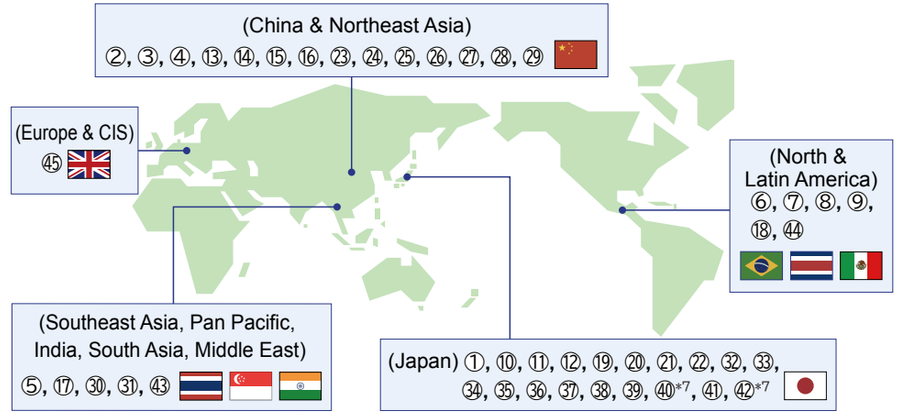
Increasing the number of net zero factories

After realizing the group's first net zero factory in fiscal 2019, Panasonic Group has realized 9 net zero factories in 5 regions[*3] by fiscal 2022. Since then, it has entered the phase to increase the number of net zero factories: to 31 factories in fiscal 2023; 44 factories in fiscal 2024, in fiscal 2025 total 45 factories[*4] - 19 factories in Japan, 14 factories in the China and Northeast Asia region, 5 factories in the Southeast Asia, Pacific, India, South Asia, Middle East, and Africa regions, 6 factories in the North America and Latin America regions, and 1 factory in Europe and CIS. This has exceeded the GIP2024 target of 'a total of 37 factories achieving net zero CO_2 emissions'. (Excluding the 12 factories achieved in fiscal 2024 at Panasonic Automotive Systems Corporation, which was deconsolidated in December 2024)

Nishikinohama Factory, Panasonic Energy Co., Ltd. has achieved net zero CO_2 emissions[*5] since fiscal 2024 when it started operation of photovoltaic panels installed over the entire rooftop for maximum use of renewable energy, aiming at manufacturing in harmony with the environment. For introducing a 2 MW-class photovoltaic power generation system, a new method that does not require significant remodeling works of the transformer substation in the factory was invented and introduced, which contributed to achievement of significant reduction in the construction costs and the construction period.[*6] The factory will further accelerate efficient and clean manufacturing by implementing energy management for the entire factory through installation of pure hydrogen fuel cell generators and energy storage systems for.

Photovoltaic power generation systems at Nishikinohama Factory, Panasonic Energy

Global map of net zero factories



*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, 45 factories have realized net zero factories.
Up to fiscal 2022:① Panasonic Eco Technology Center Co., Ltd., ② Panasonic Energy (Wuxi) Co., Ltd., ③

Panasonic Energy (Suzhou) Co., Ltd., ④ Panasonic Manufacturing (Beijing) Co., Ltd., ⑤ Panasonic Energy (Thailand) Co., Ltd., ⑥⑦⑧ Panasonic Do Brazil (Includes 3 Factories (San Jose, Manaus, Extrema)), ⑨ Panasonic Centroamericana S.A.
Fiscal 2023: ⑩ Panasonic Energy Co., Ltd. (Sumoto Factory), ⑪ Panasonic Energy Higashiura Co., Ltd., ⑫ Panasonic Energy Nandan Co., Ltd., ⑬ Panasonic Electronic Devices (Jiangmen) Co., Ltd., ⑭ Panasonic Industrial Devices (Tianjin) Co., Ltd., ⑮ Panasonic Industrial Devices Materials (Guangzhou) Co., Ltd., ⑯ Panasonic Industrial Devices SUNX Suzhou Co., Ltd., ⑰ Panasonic Energy India Co., Ltd., ⑱ Panasonic Energy Mexico S.A. de C.V.,
Fiscal 2024: ⑲ Panasonic Industry Co., Ltd. (Motomiya), ⑳ Panasonic Energy Co., Ltd. (Suminoe Factory), ㉑ Panasonic Energy Co., Ltd. (Tokushima Factory), ㉒ Panasonic Energy Co., Ltd. (Nishikinohama Factory), ㉓ Panasonic Motor (Zhuhai) Co., Ltd., ㉔ Panasonic Motor (Hangzhou) Co., Ltd., ㉕ Panasonic Industrial Devices Taiko (Shenzhen) Co., Ltd., ㉖ Panasonic Industrial Devices (Qingdao) Co.,Ltd., ㉗ Panasonic Manufacturing (Xiamen) Co., Ltd., ㉘ Panasonic Industrial Devices Materials (Suzhou) Co., Ltd., ㉙ Panasonic Industrial Devices Materials (Shanghai) Co., Ltd., ㉚ Panasonic Industrial Devices Singapore Pte. Ltd., ㉛ Panasonic Carbon India Co., Ltd.
Fiscal 2024: ㉜ Panasonic Corporation Electric Works Company Niigata Factory, ㉝ Panasonic Corporation Electric Works Company Tsu Factory, ㉞ Panasonic Solar Amorton Co., Ltd., ㉟ Panasonic Electric Works Electrical Construction Materials Mie Co., Ltd. Headquarter Factory, ㊱ Panasonic Electric Works Electrical Construction Materials Mie Co., Ltd. Anotsudai Factory, ㊲ Panasonic Lighting Devices Kumihama Co., Ltd., ㊳ Panasonic Switchgear Systems Co., Ltd., ㊴ Panasonic Energy Co., Ltd. (Wakayama Factory), ㊵ Panasonic Energy Co., Ltd. (Moriguchi Factory), ㊶ Panasonic Energy Kaizuka Co., Ltd., ㊷ Panasonic XC KADOMA, ㊸ Panasonic Manufacturing (Thailand) Co., Ltd., ㊹ Panasonic Industrial Devices Mexicana S.A. de C.V., ㊺ Panasonic Manufacturing UK Ltd.

*5 Press Release November 20, 2023
https://news.panasonic.com/global/press/en231120-2

*6 Press Release February 1, 2024
https://news.panasonic.com/jp/topics/205544

*7 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[*8] in fiscal 2025 marked 101 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.

Panasonic Heating & Ventilation A/C Company introduced a photovoltaic power generation system with an output capacity of 5.2 MW at the Panasonic Appliances Air-Conditioning Malaysia Sdn Bhd. (PAPAMY) factory in Malaysia. This system has the largest capacity in the Panasonic Group, with a projected annual power generation of approx. 5,900 MWh/year and CO_2 emission reductions estimated at roughly 3,912 tons per year. With this development, renewable energy is estimated to account for roughly 20% of the total power consumption at PAPAMY's air-conditioning factory and offices.[*9]

Photovoltaic power generation systems at the Panasonic Appliances Air-Conditioning Malaysia Sdn Bhd.

Photovoltaic power generation systems at Kobe Factory, Panasonic Connect Co., Ltd.

Panasonic Connect Co., Ltd. introduced a photovoltaic power generation system based on the on-site power purchase agreement (PPA) model used by the Kobe Plant of Panasonic's Mobile Solutions Division to supplement its eco-conscious and sustainable energy use. This is the first time for Panasonic Connect to introduce photovoltaic power generation based on on-site PPA, except for its overseas sites. The projected annual power generation is approx. 811,000 MWh/year, with CO_2 emission reductions estimated at roughly 400 tons per year. This will result in roughly 15% of power use at the plant being replaced with renewable energy.[*10]

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

An onshore wind power generation plant for the Panasonic Group.

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 energy certificates and credits to offset CO_2 emissions from fossil fuel. This effort contributed to converting factories in Japan, China, and Southeast Asia to net zero 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 for Panasonic Energy Co., Ltd., in February 2023. In fiscal 2024, operation of power stations with a capacity of approx. 11,500 kW started for Panasonic Automotive Systems Co., Ltd. and Panasonic Industry Co., Ltd. In fiscal 2025, an additional power generation plant with a capacity of roughly 18,000 kW came into operation as a startup power supply for Panasonic Living Appliance and Solutions Company. In the same fiscal year, full scale supplies of power from an onshore wind power generation plant started for Panasonic Energy Company and Panasonic Industry Co., Ltd. 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.
https://news.panasonic.com/jp/topics/204036.html

In August 2019, Panasonic Group joined “RE100”[*11], 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 2025 was 32.5%.

*8 The amount from photovoltaic energy, wind power, and so on are included. The amount from heat pumps is excluded.

*9 Press release on December 30, 2024
https://news.panasonic.com/jp/press/jn241206-1

*10 Press release on March 28, 2024
https://news.panasonic.com/jp/topics/205628

*11 Press release on August 30, 2019.
Panasonic Joins RE100 Aiming for Business Operations with 100% Renewable Energy
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)[*12], which visualizes and analyzes energy consumption. An example of factory energy-saving support service is on the following website.

https://www.panasonic.com/global/corporate/sustainability/eco/co2/service.html

Panasonic Corporation is conducting a demonstration experiment of the energy solution (Panasonic HX)[*13] using hydrogen fuel cells in Kusatsu Factory, Shiga. Panasonic Manufacturing United Kingdom (PMUK) in the United Kingdom plans to start a demonstration of power supply and demand operation in 2025[*14] to use 100% renewable energy for energy consumed in business activities by in-house power generation using pure hydrogen fuel cells and photovoltaic cells. For the demonstration at PMUK, in addition to the existing solar panels (372kW), 21 pure hydrogen fuel cells of 5 kW type (total output: 105 kW) and storage batteries (1 MWh) will be newly installed, and the power supply and demand operation in Cardiff, UK will be monitored according to the changes in weather and fluctuations in electrical power demand, with the aim of operation to supply necessary electricity with 100% renewable energy for the Microwave Oven manufacturing plant. By using pure hydrogen fuel cells, we will not only reduce installation space and secure a stable power source, but also further improve energy efficiency by using heat generated during hydrogen power generation for heating and hot water supply. Through the demonstration of energy solutions at PMUK, we will develop solutions that best suit the regional characteristics and build relationships with local partners and business customers related to the hydrogen business.

PMUK Energy Solution

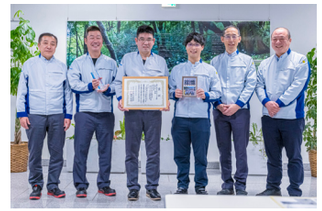
*12 METAGEJI is a coined word created by the Panasonic Group which refers to visualizing energy consumption and implementing measurable reduction measures by adopting measurement instruments, such as meters and gauges.

*13 Panasonic HX
https://re100-gx.panasonic.com/

*14 Press Release (December 3, 2024)
https://news.panasonic.com/jp/press/jn241203-2

Activities at Factories

Panasonic Energy Kaizuka Co., Ltd., which achieved net zero CO_2 emission in fiscal 2025, produces lithium-ion batteries (LIBs) used in EVs. The company has been working across organizational divisions to reduce its CO_2 emissions in line with Panasonic GREEN IMPACT, while improving productivity to respond to the increasing market demands for EVs in recent years. A Carbon Neutrality Promotion Committee, initiated by the Facility Management Division that manages facilities such as power generators, was jointly launched at three sites: the Panasonic Energy Suminoe Factory, Wakayama Factory, and Kaizuka Factory. This committee, whose participants include professionals in the fields of factory and production technologies, has been promoting production with minimum energy. Concretely, to reduce energy consumption in basic units by increasing product efficiency, they used scientific methods to established efficient drying conditions in the manufacturing process for electrode materials, which had been a bottleneck in improving efficiency in the production of electrode substrates, allowing the manufacturing speed to be increased. This method can be transferred to overseas factories such as in the U.S., where LIBs are produced on a large scale, and it is planned to introduce it on other sites from fiscal 2025. We also reduced the standby energy consumption of the charging and discharging devices used during testing by reviewing the operating procedures and eliminating unnecessary processes. To increase the ratio of renewable energy used inside and outside our factory premises, we have started to introduce photovoltaic power stations to our factory premises, purchasing photovoltaic electricity sourced from outside the factory through an offsite PPA. In fiscal 2025, we started to purchase wind power electricity through an offsite PPA.



Members from Panasonic Energy Kaizuka

Activities to provide supports for energy-saving in the China region

The long-term state policy announced by the Chinese government includes carbon peak out and carbon neutrality, focusing on further reductions to CO_2 emissions. With its many business sites in China, the Panasonic Group introduced a three-year energy-saving support initiative in the country in fiscal 2023 designed to achieve efficient energy-savings across the entire region in line with China's long-term state policy.

In fiscal 2025 we are lowering CO_2 emissions at our model sites by carrying out energy-saving assessments in collaboration with experts from inside and outside the Group and developing human resources to introduce independence in support of energy conservation in each region. We select and actively communicate best practices gained from the energy saving diagnoses, and provide a scheme that links facility manufacturers and our sites to solve technical issues. These efforts support each site in utilizing information comprehensively for its own energy saving activities. We are also working on visualizing our energy-saving activities and how to disseminate the information effectively, improving the infrastructure for energy efficiency by installing portable measurement equipment and providing energy efficiency analysis tools, etc. In working to establish net zero factories, we continue with our rapid and low cost energy-saving measures to improve the level of energy saving in China's regions.

Diagnosis of energy saving diagnosis in China region

Fiscal 2025 Results

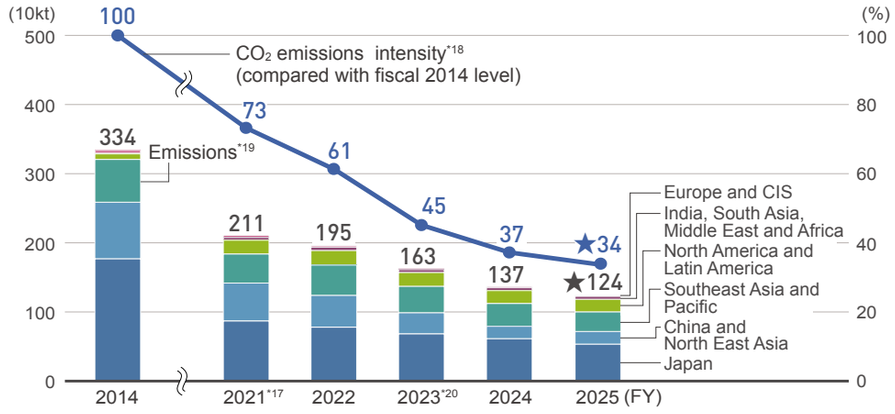
These efforts in fiscal 2025 resulted in 4.5 TWh[*15] of the energy used in business activities, and the amount of CO_2 emissions was 1.24 Mt. The fiscal 2025 investment to reduce the amount of energy used and CO_2 emissions by the efforts was 3.2 billion yen.[*16]

*15 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.

*16 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.

*17 Includes Panasonic Energy Corporation of North America since fiscal 2021.

CO_2 Emission in Business Activities and CO_2 Emission (by region) Per Intensity



*18 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.

*19 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, the IEA Emissions factors 2022 were used for FY2023, the IEA Emissions factors 2023 were used for FY2024, and the IEA Emissions factors 2024 were used for FY2025. The factors for domestically purchased electricity in Japan for fiscal 2025 stated in the "Guidelines for Calculation of Greenhouse Gas Emissions" published by Japan's Ministry of the Environment.

*20 Includes non-manufacturing sites after FY2023

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

[Unit: kt]

			FY2023	FY2024	FY2025
Scope 2 Energy sources[*22]			1,433	1,207	★1,099
Scope 1	CO_2 from energy sources		224	216	★220
	CO_2 from non-energy		183	101	★53
	(non-Energy Sources)	*CO_2*	*1*	*1*	*1*
		HFC	*180*	*97*	*50*
		SF_6	*2*	*2*	*2*
		NF_3 and others	*1*	*1*	*1*
Carbon offset by credit[*23]			-26	-57	-79
Total			1,812	1,465	1,291

*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.

*22 Electricity certificates such as Non-Fossil Certificates (NFC), International RECs (I-REC) and Green Electricity Certificates (GEC) are used.

*23 Carbon offset by credit based on the certification system such as J-Credits, Verified Carbon Standard (VCS), and Clean Development Mechanism (CDM) are used.

Resources Materiality

Promotion of Circular Economy

Alongside changes in customer lifestyles, there is 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. In compliance with the Circular Economy Group Policy (see page 14), the Panasonic Group is 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.

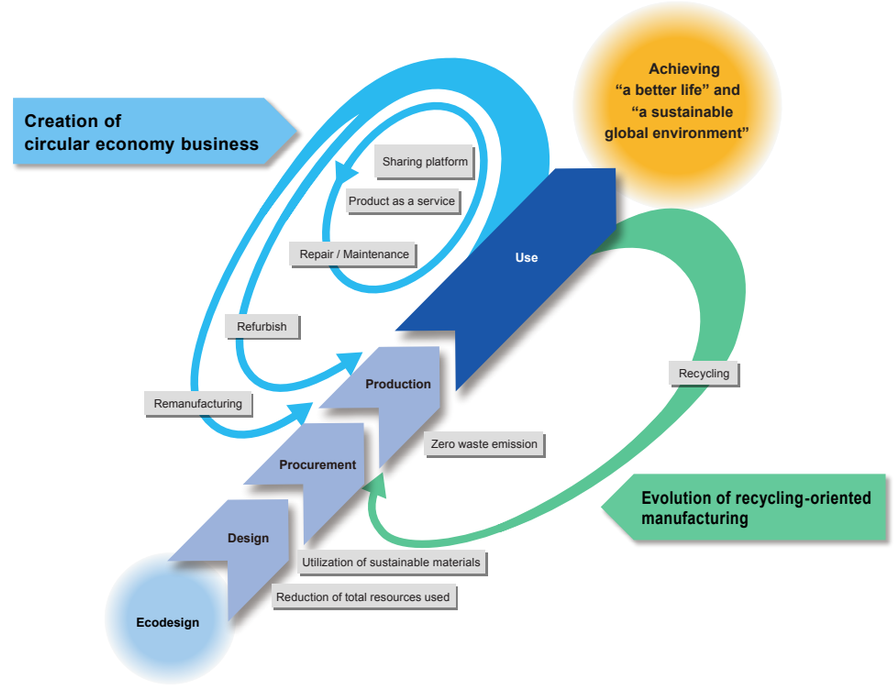
In order to realize the new value of using only product functionalities instead of using or owning the whole product, we will strive to create circular economy businesses. These include a “Sharing service”, where multiple users use the same individual product, a “Product as a service” where services 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 have worked towards achieving the resource-related targets listed in GREEN IMPACT PLAN (GIP) 2024.

We are using the above concept in the transition to circular economy which include the development of new businesses and establishment of circular economy business models. Our Concept for Actions towards a Circular Economy comprises several elements. We broke down these elements according to the six major circular economy businesses based on the insights gained through actually running these businesses, and we re-established these elements as a practical business framework. As a result, we have managed to start 15 circular economy businesses by fiscal 2025. This exceeded the GREEN IMPACT PLAN (GIP) 2024 target, which

aimed to establish at least 13 new circular economy business models by that year.

As for recycled resin, its cumulative usage since fiscal 2023 reached 45,000 tons in fiscal 2025. However, this did not reach the target figure of 90,000 tons. The use of recycled resin did not spread quickly enough to meet the target due to a number of reasons, such as complications in producing resin parts that satisfy different characteristics suitable for different usages, difficulties in securing a stable supply, insufficient adaptability in production sites to use recycled resin, and a lack of recycling technologies. We plan to accelerate our efforts to address these problems and steadily increase the use of recycled resin. Still, our factory waste recycling rate in fiscal 2025 resulted in 99.2%, maintaining an above 99% level.

We will further concentrate our efforts to achieve our resource-related targets stated in GIP2024+1. In concrete, we plan to increase our circular economy businesses to 16. We also aim to increase the usage of recycled resin to at least 25,000 tons within fiscal 2026 to cover the unattained GIP2024 target.

We established the Global Circular Economy Project in April 2020, led by Panasonic Europe, with the aim to accelerate conversion of the Group's business into a circular economy model. In 2023, the project was reorganized into a new system due to the increasing necessity of applying the principles of a circular economy throughout our business management, driven by a deepening understanding of such principles. Understanding of the principles of a circular economy penetrated through our businesses and established an important foundation to formulate the Circular Economy Group Policy in November 2023, as well as to integrate the Circular Economy business into Panasonic GREEN IMPACT.

Creation of Circular Economy Business

We strive to promote the efficient use of resources and to maximize customer value. We are offering a washing machine sharing service as a part of the circular economy businesses. This new service is called LAUNDROOM and it is the first of its kind in the industry designed to realize the sharing of utility facilities in shared rental accommodation in Japan[*1]. The service uses one of our drum-type washer dryers that boasts excellent energy and water-saving capabilities, as well as providing an IoT function that enables users to view the washing machine operating status and to receive a notification upon completion of washing operations. Also, a designated repair contact will quickly respond to unexpected issues. Attention to detailed usability has evolved the service into a total solution that makes using a washing machine in a rental property shared by multiple households more comfortable and convenient.

Thus, we are working to create businesses based on a circular economy model. One of the business models created is "product as a service" for our display refrigerators and freezers as S-cubo Cs. Instead of selling them to supermarkets and other food retailers, we offer "food refrigeration" as a service based on a monthly charge in Japan. We also newly started the S-cubo Monitoring Service, which comprehensively manages refrigerating and freezing equipment in stores. The service remotely monitors the equipment, saving energy consumption through optimization of equipment settings and detection of early signs of failure. Combined with physical services, such as equipment maintenance and early replacement advice, we provide total support for commercial refrigerating and freezing equipment. 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.

On April 10, 2024, we launched a new business offering Panasonic Factory Refresh—certified and guaranteed refurbished products—through both sales and subscription-based services. We refurbish home appliances, such as washing machines, refrigerators, and TVs, and other products across a total of 13 categories, collected after use, to a reusable state for reselling[*2]. Those products that satisfy the high quality standards set by the Panasonic Group are then made available for sale. For example, TVs are inspected to ensure they do not carry any scratches, damage, or missing parts in the main body and accessories that could cause a malfunction. They are also thoroughly cleaned, and the image quality is checked. Any failed parts are replaced, and all the products are tested for product safety. To meet the Group standards, the display output is adjusted, and performance tests are conducted. Only after all these processes have been completed, the products are finally put on sale for customers.

Modular products can be regarded as a circular economy business as they reduce input resources by streamlining the components for efficient resource utilization.

In June 2022, we launched a modular personal care system[*3] for the European and North American markets. The initial system comprises a single main unit and five different detachable heads, including trimmers for beards, hair, body hair, and nose hair; a shaver; and a tooth brush. Users can purchase the necessary care parts individually. With the battery and motor being integrated into a single body, the system flexibly adapts to various personal care and grooming needs at home or when traveling for leisure or business.

Utilizing a standard design to fit the same main unit and power adapter reduced the product weight by approximately 60% compared to conventional products, thereby saving resources. In recognition of our contribution to environmental impact reduction through streamlined system design, we received the Gold Award 2023 under the iF Design Award, sponsored by iF International Forum Design. Since then, the product has continued to be featured in various media and received high evaluation including awards.

Environment

In September 2024, a further four different heads were introduced in the European and U.S. markets. With these new heads, the product now offers whole-body care, including haircutting with a professional blade, precise beard trimming, eyebrow shaping, facial brushing, and removing hard skin from feet.

In the U.S. market, where approximately 7 million tons of e-waste are produced every year, we have a recycling program that allows users to purchase the modular personal care system at a special price by returning their old electronic personal care devices. Collected personal care devices are recycled to contribute to resource circulation. We started sales of the system in the Middle East in September 2023, and in Australia in April 2024, further contributing to reducing environmental impact globally.

Our TOUGHBOOK, a notebook PC with a robust casing, also uses a modular design allowing flexible enhancement of the required functions through chargeable options. For example, companies can adopt an IC card authorization system for PC usage without replacing their current TOUGHBOOKs—by simply adding optional non-contact IC card readers[*4]. This modular design not only offers the flexibility for future functional enhancement but also prolongs product life. In case of failure, only the affected component needs to be replaced. This reduces waste and loss, which in turn contributes to reducing environmental impact.

As another subscription model, we started a service for our rental housing, “noiful,” in January 2022 in Japan. Noiful[*5] 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, perform simple repair and replacement, and clean the appliance 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 leads to 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 into houses more easily, which could 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.

Products that are made using recycled resources are regarded as a part of our circular economy business for their effective utilization of resources. In October 2024, we launched a drum-type washer dryer with a heat pump, the NA-LX129D series. Around 20% of their components are made of recycled resin, including a frame base that supports the main body, a cover for the heat pump unit, and the fan casing that circulates air between the washer drum and the heat pump unit. The frame base in particular was designed by combining computer-aided engineering (CAE) and actual machine testing to ensure its reliability to support the entire weight of the machine and withstand the vibration from spinning. The product proved that recycled resin could sufficiently deliver the robustness and quality required by a washing machine.

In June 2022, we began installing collection boxes for used dry batteries at 31 local 7-Eleven stores in Thailand, in cooperation with CP ALL Plc., the operator of 7-Eleven. In March 2024, we established a scheme to recycle the collected used dry batteries manufactured by us, in partnership with UMC Metals Ltd., a Thai steelmaker. This initiative allows us to melt our dry batteries, which do not contain environmentally harmful substances, and recover reusable materials, thereby contributing to efficient resource utilization. As of June 2024, we have achieved a total of 1,000 collection box locations at 7-Eleven stores.

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 two more circular economy businesses were added last fiscal in addition to our thirteen existing ones. As a result, we have established 15 new circular economy businesses related to our GIP2024, exceeding our target of 13 business models. 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 and used dry batteries recycling
11	Maintenance service for air ventilation systems in road tunnels
12	Refurbishment of washing machines, refrigerators, TVs, etc.
13	Vacuum cleaners made with recycled resin
14	Modular design of personal care products and corporate-use PCs
15	Washing machine sharing service

*1 See https://news.panasonic.com/jp/press/jn241112-1
*2 See https://news.panasonic.com/jp/press/jn250217-1
*3 See https://shop.panasonic.com/pages/multishape
*4 See https://news.panasonic.com/jp/press/jn240620-1
*5 See https://news.panasonic.com/jp/press/jn220119-1

Evolution of Recycling-Oriented Manufacturing

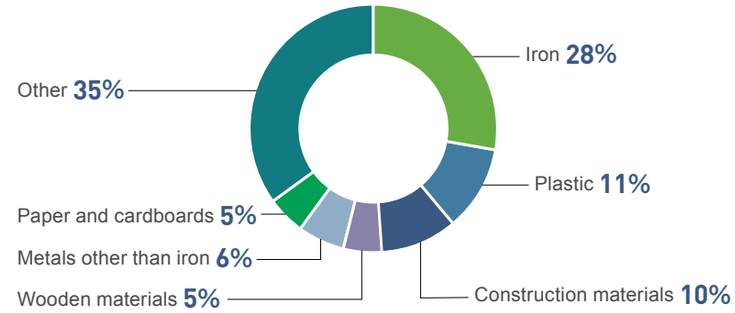
We use many kinds of resources, including iron (28% of total resources used) and plastic (11% of total resources used), because of our wide range of products and businesses, from home appliances, components such as semiconductors and batteries, housing, and B2B solutions. In recycling-oriented manufacturing, 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 the use of recycled resource use by identifying the volume of each type of resource used across the Panasonic Group. For example, the case of recycled resin, we used approx. 15,000 tons of recycled resin in our products in fiscal 2025 bringing the total usage since fiscal 2023 to 45,000 tons. This was achieved by producing resin that has characteristics suitable for its usage purposes, securing stable supply, establishing adaptability in production sites to use the recycled resin, and developing recycling technologies. However, the above efforts did not meet the required level, and therefore we could not attain the GIP2024 target. We plan to accelerate our efforts to address these issues to steadily increase use of recycled resin. Moreover, we are promoting the development of plant-based resin with lower environmental impact and its application for the products.

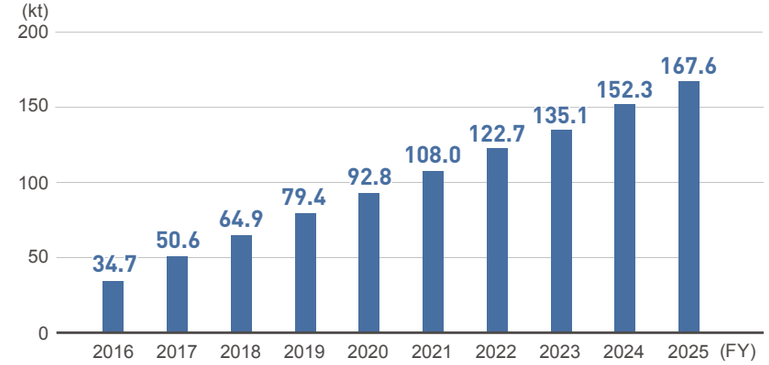
As for the factory waste recycling rate*6, we had traditionally set different targets for Japan and countries outside Japan according to the relevant local infrastructures. However, given increased awareness of the importance of zero waste emission activities, we have set a globally standardized target since fiscal 2011 and are taking steps to improve the standard level of waste recycling across the entire Group. The factory waste recycling rate in fiscal 2024 was 99.2% compared to our target of more than 99%, achieving the target (see page 16). We will continue to implement measures to achieve the zero waste emissions.

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

Breakdown of Total Resources Used in Fiscal 2025 (by category)



Results of Recycled Resin Usage (Cumulative total from fiscal 2016)



Reduction in Resources Used

To minimize the use of resources for production, we continuously look to reducing the weight of our products. Through the Product Environmental Assessment (see page 32), 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.

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. Examples of “Products to Products” and inventions to streamline and automate the process of recovering resources from used products are introduced in the following website.

https://holdings.panasonic/global/corporate/sustainability/environment/resources/recycling_oriented_manufacturing.html

Our Approach to Resources Recycling
https://holdings.panasonic/global/corporate/sustainability/environment/resources-recycling.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 factories—Panasonic Eco Technology Center Co., Ltd. (PETEC), and Panasonic Resource Recycling Factory Kato (PRRFK) of the Living Appliances and Solutions 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 95%.

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 Panasonic Resource Recycling Factory Kato to be further purified and processed to recover their chemical properties. Panasonic Resource Recycling Factory Kato (PRRFK) is a manufacturing and development site that promotes the 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. Due to 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 Group, we plan to find recycled plastic suppliers based on the recycled plastic development and quality assessment techniques cultivated in our Panasonic Resource Recycling Factory Kato.

Development and Use of New Sustainable Materials

Cellulose fiber is made from natural resources such as pulp and wood chips and is drawing social attention as a material with low environmental impact. In fiscal 2016, we commenced research and development into cellulose fiber aiming to reduce the use of fossil-based resin. In fiscal 2019, we successfully produced an easy-to-use molding material that is as flexible as conventional resin while reducing the use of fossil-based plastic by mixing plant-based cellulose fiber at a high concentration level into the resin. We further increased the cellulose fiber concentration level, and released these materials under the brand name, “kinari.” In 2022, we started mass production and sales of kinari55-PP, a resin made with 55% cellulose fiber[*7]. Then in 2024, kinari70-PP, a resin with 70% cellulose fiber followed[*8]. Within the same year, we commenced sample sales of kinari90, which is 90% biomass resin made by combining cellulose fiber and 90% or greater biomass polyethylene produced from sugarcane bagasse (pulp left after the juice is extracted)[*9] .

Our additional focus is on fully-biodegradable molding materials. We produced a molding material that can be biodegradable in soil by combining cellulose and plant-based (e.g. polylactic acid) resins in fiscal 2023[*10, *11]. Aiming at further reduction of environmental contamination risks

from our products when they are released into the natural environment in part or as a whole, we successfully produced a material that is marine biodegradable in fiscal 2025. This is known to be difficult due to the lower concentration of microorganisms in the sea compared with soil[*11]. These molding materials are certified by the Japan Bioplastic Association as a biodegradable biomass plastic and a marine-degradable biomass plastic.

Further, we are working to increase the strength of the cellulose fiber molding materials to expand our kinari applications to be an alternative to fossil-based resin. We produced a material that demonstrates a strength equivalent to PBT-GF30% (polybutylene terephthalate with 30% glass fiber) at 80°C utilizing our newly developed plastics engineering compounding technology. We have also successfully developed cellulose-fiber molding materials with less density[*12].

Left: Robust cellulose fiber molding material
Right: Car interior parts made with robust cellulose fiber molding materials

Relating to “kinari” production, we are reinforcing relationships with local communities to utilize their regional resources under collaboration. Among these collaborative projects, we concluded an agreement with Fukuchiyama City, Kyoto Prefecture, to use their timber from forest thinning. We also jointly commercialized our eco-friendly tableware using this timber. On September 4, 2023, all 23 municipal primary schools and junior high schools in Fukuchiyama City started using some 6,700 sets of this tableware for their school lunches. At the same time, all these schools started an environmental education program in which we cooperated by providing the program contents. Another collaboration with a local company took place in Okinawa Prefecture. Together with Food Reborn Co., Ltd., in 2024 we developed a kinari tumbler utilizing pulp from Okinawan pineapple leaves[*13, *14].

Such efforts relating to our kinari resin have earned a high social reputation and resulted in a number of awards, including the MEXT Minister’s Prize under the FY2021 50th Japan Industrial Grand Prize held by Nikkan Kogyo Shimbun, Ltd., and the Contribution Prize under the 57th Ichimura Industrial Awards, hosted by the Ichimura Foundation for New Technology in April 2025[*15].

In the area of housing materials, we exclusively developed a 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 approach. This product can reduce the consumption of natural materials and also contributes to preserving biodiversity (see page 70).

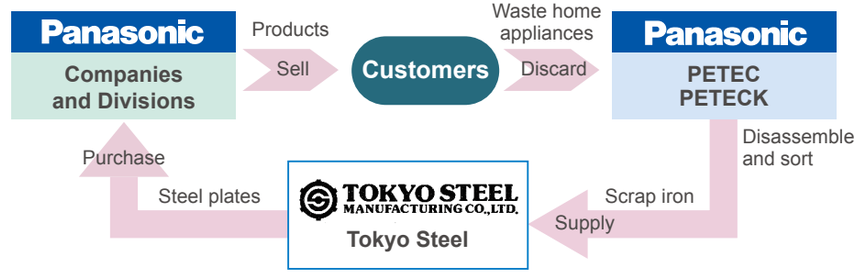
We intend to develop more new products with this technology, focusing also on developing new recyclable resources.

*7 See https://news.panasonic.com/jp/press/jn190708-1
*8 See https://news.panasonic.com/jp/press/jn210204-1
*9 See https://news.panasonic.com/jp/press/jn220318-2
*10 See https://news.panasonic.com/jp/press/jn221206-1
*11 See https://news.panasonic.com/jp/press/jn250108-8
*12 See https://news.panasonic.com/jp/press/jn250515-2
*13 See https://news.panasonic.com/jp/press/jn230825-2
*14 See https://www.city.fukuchiyama.lg.jp/site/kyouiku/59063.html
*15 See https://news.panasonic.com/jp/press/jn250421-2

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.

Self-recycling Scheme for Electric Steel Plates



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[*16]. We procure the recycled steel plates and utilize them in products. Discussions with Tokyo Steel commenced, and we have worked together since then to improve

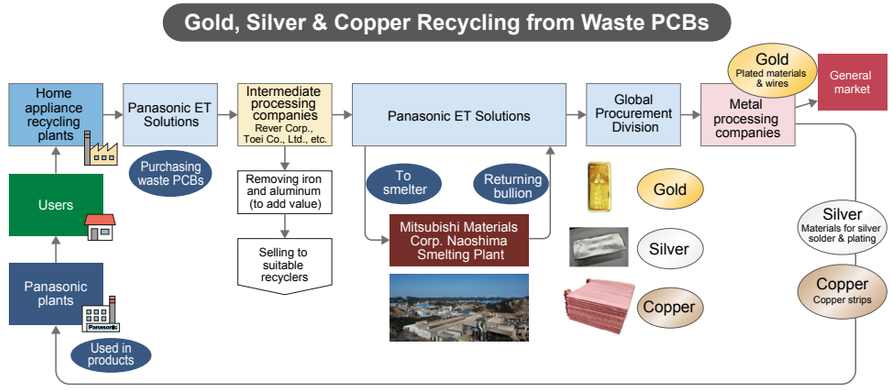
the quality of recycled iron to a level sufficient for production use, as well as developing the technology to improve the applicability of the recycled iron. From this we identified the optimum application of the electrical steel plates, and refined its specific features (e.g. shape, strength, and weldability) to meet application-specific requirements. The use of thin electrical steel plates in our products was first made possible. Through this close collaboration, we materialized this recycling scheme, 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 2025, it reached over 1,600 tons per year, and the recycled steel is being used in our Group products, including washing machines and ceiling materials for housing.

Beyond used products, we also recycle waste generated from factories. In Niigata Plant, we supply iron scrap generated during production to an electric arc furnace manufacture and utilize the iron recycled by the manufacturer in some of the products made in the plant[*17]. This trial of making iron from scrap supplied by our plant and then utilizing the recycled iron in the same plant is the first of its kind within the Panasonic Group. We are also running a similar scheme for resin.

*16 Steel produced from scrap iron melted and refined in an electric arc furnace.
*17 See https://www2.panasonic.biz/jp/lighting/facilities/baselight/id/environment/

Gold, Silver, and Copper Recycling from Waste PCBs

The Panasonic Group is running the Product-Material-Product (PMP) Loop scheme together with Mitsubishi Materials Corporation. In this scheme, gold, silver, and copper are extracted from waste printed circuit boards (PCBs) formerly installed in our home appliances, and reused within and outside the Panasonic Group[*18].



The scheme works as follows: One of our group companies, Panasonic ET Solutions Co., Ltd. (PETS), recovers waste PCBs from home appliance recycling plants and repair sites across Japan, and commissions initial waste processing to our recycling partner companies. The recycling companies remove the iron and aluminum during shredding and smelting to improve the quality of waste PCB materials. The processed PCBs are then passed to Mitsubishi Materials. Mitsubishi Materials extracts gold, silver, and copper from the waste PCBs through smelting and returns the materials to PETS. The recovered gold, silver, and copper are made into gold plating solution, copper wire, etc. to be utilized in our products again. Total amounts of recovered metals from the waste PCBs through the PMP Loop scheme to date have reached 1.1 tons of gold, 33 tons of silver, and 8,100 tons of copper[*19].

*18 See https://news.panasonic.com/jp/press/jn250117-4
*19 Based on the research of our Group and Mitsubishi Materials Corporation as of December 2024.

Zero Waste Emissions—Improving Factory Waste Recycling Rate

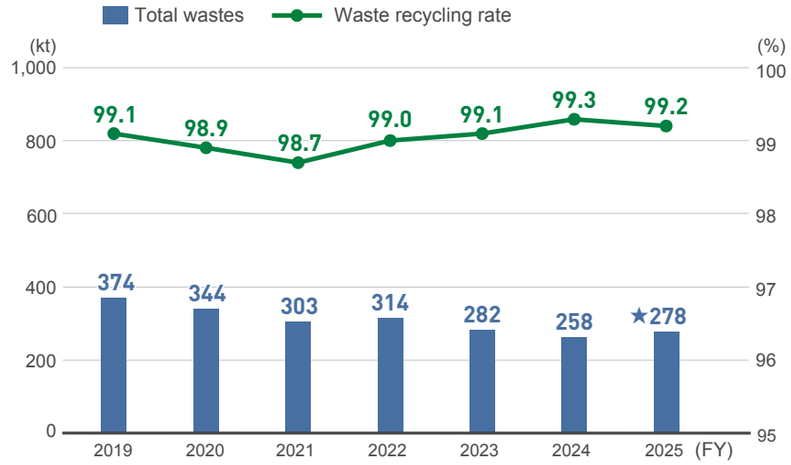
From the viewpoint of effective usage of resources, we believe that generation of waste and revenue-generating waste at factories must be minimized, even if such waste could be sold as valuable commodities. Based on this belief, we identify the amount of generated waste (including both revenue-generating 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[*20] goal by reducing the amount of landfill to nearly zero. As a result of various activities, the factory waste recycling rate in fiscal 2025 was 99.2%, achieving the 99% target in our GIP 2024. In addition to the waste plastic recycling, we will introduce more recycling activities which aim to maintain and improve the factory waste recycling rate.

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.

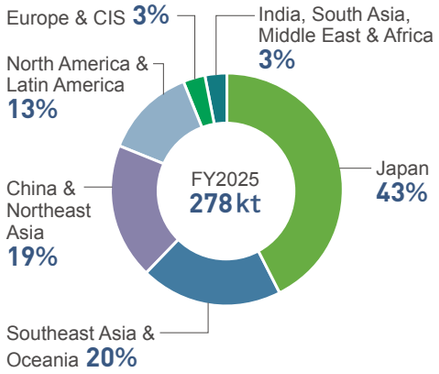
Because waste recycling rates in our overseas factories lag behind those in Japan, we have worked to improve the average level of recycling activities by sharing information within and between regions outside Japan. Specifically, in addition to accelerating the information sharing on waste recycling 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[*21] prepared by each region, following our long-standing approach toward CO_2 reduction activities.

*20 Definition by the Panasonic Group: Recycling rate of 99% or higher. Recycling rate = Amount of resources recycled/(amount of resources recycled +amount of landfill).
*21 A chart-format summary of comparisons between “before and after” implementation of waste reduction and recycling measures.

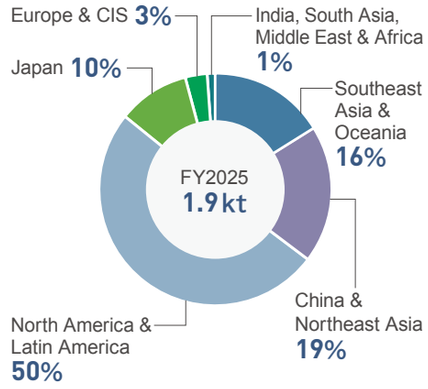
Amount and Recycling Rate of Total Wastes Including Revenue-generating Waste



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 2025 (by category)

(kt)

Items	Total wastes	Recycled	Landfill
Metal scrap	122	120	0.03
Paper scrap	30	29	0.1
Plastics	33	32	0.6
Acids	17	10	0.09
Sludge	9	8	0.6
Wood	25	24	0.03
Glass/ceramics	3	3	0.06
Oil	10	9	0.04
Alkalis	18	16	0.03
Other *22	10	9	0.2
Total	278	262	1.9

*22 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.

FY2024 Results

Japan Processed approx.	145.3 kt of four kinds of used home appliances
USA Collected approx.	110 t of used electronic products

Product Recycling Initiatives in Japan

In response to the Home Appliance Recycling Law of 2001, which covers four specified kinds of home appliances[*23], 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 319 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)[*24] 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 2024, we recycled approx. 145.3. kt of the four specified used home appliances.

Automatic Dismantling System for Used Appliances

Although the statutory recycling rate[*25] 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.

To address the challenges facing the home appliance recycling industry, our group has begun to develop technologies to mechanize dismantling operations that require much manual labor.

We have begun to develop technologies to mechanize dismantling operations that require much manual labor. In the future, we have developed the Automatic Dismantling System for Dismantled Home Appliances, focusing on air conditioner outdoor units, which are expected to increase in the amount collected.

While maintaining the quality of disassembly for each part, the process from the cover of the outdoor unit to the removal of the compressor, which takes the most time in the disassembly process, is automated. To automate the process from the cover of an outdoor unit to the removal of a compressor. This enables more stable and continuous recycling of home appliances.

As for PETEC, it promotes high grade single-plastic recycling using plastic recognition equipment.

See page 60 for more details.

*23 Air conditioners, TVs, refrigerators/freezers, and washing machines/clothes dryers.
*24 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.
*25 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, Organic EL and plasma TVs, 70% for refrigerators and freezers, and 82% for washing machines and clothes dryers.

Overview of Recycling of Specified Used Home Appliances (Japan)
https://holdings.panasonic/global/corporate/sustainability/environment/resources/recovery/recycling.html

Panasonic Eco Technology Center Co., Ltd. (PETEC)
https://panasonic.net/eco/petec/

Efforts in the Europe / CIS Region

WEEE Directive and Circular Economy

◇WEEE (Waste Electrical and Electronic Equipment)

The WEEE Directive 2012/19/EU is a piece of European Union legislation aimed at reducing the environmental impact of electrical and electronic waste. It promotes the reuse, recycling, and recovery of such waste and places responsibility for disposal on producers. Panasonic has proactively developed solutions to all these requirements. Panasonic has a very diverse product range in Europe. To manage our WEEE compliance across the EU, it has been our policy to register directly with appropriate recycling schemes in countries where we have legal company presence.

◇Circular Economy

Circular Economy is the key driving factor for future waste legislations in Europe.

Recycled content becomes increasingly important in Europe and will be more and more included into national laws and tender processes. If products don’t meet certain Circular Economy criteria, the recycling fees will increase. If products are easy to recycle, contain recycled material, easy to repair, etc., the recycling fees will decrease. Panasonic is considering how to prepare our business for such new recycled material requirements.

◇European Climate Goals

Europe’s Green Deal and Circular Economy Action Plan have also placed immense pressure on companies to reduce waste, lower emissions, and use resources more efficiently.

For Panasonic, this isn't just a compliance issue - it is an opportunity.

◇Looking Ahead

Panasonic’s journey into the circular economy has proven that a multinational company can adapt to an age where sustainability isn't a side goal but a central strategy.

With evolving EU legislation, including mandatory recycled content targets and right-to-repair laws, Panasonic is poised to expand its circular practices even further.

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 1.7 billion lbs. (approximately 771 kt) since its inception in 2007.

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 400 companies, and collected more than 260 M pounds (118 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. EPRA collected 0.137 kt’s of electronics in Ontario.

Efforts in China

In China, we are engaged in activities to clarify the scope of 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 conducting an assessment of the development of the Plan on Promoting Extended Producer Responsibility promulgated by the government in January 2017, and 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,as well as the planned replacement of consumer products starting in 2024.

Efforts in Southeast Asia and Oceania

Vietnam

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," which took effect since January 10,

2022 and requires producers/ importers to contribute financially for waste treatment of primary batteries from January 1, 2022. Panasonic Sales Vietnam (PSV) has actively engaged in compliance efforts since, including timely financial contributions to support waste treatment for primary batteries and operational adjustments to meet evolving environmental regulations.

On January 06, 2025, the Government issued “Decree No. 05/2025/NĐ-CP,” which further details and supplements provisions related to extended producer responsibility (EPR) under the Law on Environmental Protection. This Decree expands requirements for producers and importers to contribute financially or self-manage e-waste recycling for rechargeable batteries and other electronic products. The recycling cost norm (Fs) for a unit weight of in-scope product or packaging has also been released under “Circular No. 07/2025/TT-BTNMT,” which took effect since February 28, 2025.

Between April 2024 and March 2025, PSV successfully collected a cumulative total of over 13,100 kg of e-waste, which was sent to licensed vendors for recycling and treatment. This achievement reflects PSV's ongoing commitment to ensure compliance with environmental regulations and to promote sustainable practices in electronic product lifecycle management.

PSV has also taken action to submit the necessary product import and financial contribution declarations to the Vietnamese government as required under “Decree No. 05/2025/NĐ-CP”. PSV will continue to work closely with the government to support the implementation of an effective waste treatment and e-waste recycling scheme in Vietnam.

Australia

The National Television and Computer Recycling Scheme (NTCRS) was established in Australia in 2011. Effective 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 E-cycle Solutions, a co-regulatory arrangement approved by the Australian government to fulfill its obligation under the national scheme, since May 2021. Between January 2024 and December 2024, 20 tons of e-waste were recycled.

Since April 2021, PAU has also joined the Battery Stewardship Council (BSC) as a full member. As part of the obligations as a member, PAU has also been contributing to recycling costs for batteries imported, including 68 tons of batteries imported between January to December 2024.

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 4 (July 2024 - June 2025), 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 8,416 tons of regulated e-waste were collected by the PRS operator, of which LHAs comprised of a total of 90% by weight between January to December 2024.

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 updated e-waste recycling law has been implemented by the Ministry of Environment, Forests and Climate Change (MoEFCC) from the 1st of April 2023, with Extended Producer Responsibility (EPR) targets based on end-of-life (EoL) and the metal extraction post recycling of the respective e-waste.

The updated amended rules were introduced with an intent to focus and enhance recycling capabilities.

Further amendments to the e-waste (Management) rules 2023 defined the percentage of metals to be extracted from the collected e-waste in Metric ton and the compliance requirement needs the mentioned key metals like Mild steel, Copper, Aluminum and Gold to be extracted, post recycling of e-waste as per the percentage defined.

Further the Extended Producer Responsibility laws with respect to Plastic waste and Battery waste are also having clauses to ensure recyclable content being there as per the percentage defined and increasing Year on Year.

Panasonic India has two robust initiatives to ensure customer connect for e-waste and consumer awareness in compliance with the e-waste law.

- The "I Recycle" program already established by Panasonic India (PI), helps pass on the information to the existing customers who approach Panasonic Service centre for servicing requirement.
- The Panasonic Harit Umang program has been sensitizing the youth from past six years, engaging them on responsible and safe disposal of e- waste, plastic and battery waste to

ensure and enable scientific recycling for the future circular economy and making a GREEN IMPACT

Panasonic India also chairs the Sustainability and environment committee at the Industry association “Consumer Electronics and Appliances Manufacturers Association (CEAMA)”, where we undertake activities of analysis of current recycling activities in India as well as a long-term plan for waste problem solutions.

We are also actively engaged in different active associations including the Federation of Indian Chambers of Commerce and Industry (FICCI) 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), Panasonic collaborated in the establishment of a reverse logistics system (a system to collect used products), and promotes efficient collection and treatment of used products.

The target for 2023 was reached by collecting and treating 46.8 tons which represents 100% of tonnage goal in accordance with sectorial agreement. In 2024, the target was 90.5 tons, and it was fully accomplished by the ABREE association. For 2025, the target is17% of the tons placed on the market. As of April 2025, 20.02k tons have been collected and treated, which represents 27% of achievement so far.

Other Countries in Latin America

Countries such as Peru, Colombia, Mexico, Chile, Ecuador, Panama, El Salvador, Nicaragua, and Costa Rica are moving toward global standards for e-waste management. Peru and Colombia have enacted detailed WEEE laws, while others like Chile are still developing regulations.

Industry-led programs and government-approved recycling plans are active in Mexico and Colombia. Costa Rica stands out with diverse initiatives public campaigns, urban mining, and circular economy projects promoting responsible e-waste handling.

We continue to support policy development through collaboration with governments, industry groups, and pilot recycling efforts.

Biodiversity Conservation

Ways of Thinking about Biodiversity

Our social lives and business activities are based on various benefit provided by the natural capital (NCP: Nature's contributions to people). 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.

Twenty-three targets designed to achieve the 2030 Nature Positive Initiative goals were announced at the Kunming-Montreal Global Biodiversity Framework (GBF).

As part of our biodiversity conservation under the GREEN IMPACT PLAN 2024+1 (GIP 2024+1), we will continue working on reducing the impact of business activities on the ecosystem and restoring it to a nature positive state.

Three Targets in GIP2024+1

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

Promoting awareness in the Group and actions related to the TNFD

In fiscal 2025, we organized the Nature Positive Working Group under the Sustainable Management Promotion Consortium to promote greater understanding and awareness of biodiversity and the Nature Positive initiative. In August 2024, we organized a lecture featuring a specialist guest speaker, followed by a panel discussion with Group CTO Tatsuo Ogawa. In addition, monthly workshops are held to report on internal activities related to biodiversity and the Nature Positive initiative and to share the latest developments in the area with employees throughout the Group, including R&D divisions and various operating companies.

At the same time, a LEAP analysis of the Taskforce on Nature-related Financial Disclosures (TNFD) is being conducted, examining the contact points between business activities and natural capital, including biodiversity and water and analyzing various scenarios for dependency and influence and risk and opportunities. See Page 45 for the TNFD.

The Green Impact Plan that is reviewed and revised every three years is equivalent to the Biodiversity Action Plan (BAP) 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 Worldwide 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 2025 are as follows.

Green Procurement Guidelines for Wood Consulted and Formulated with WWF

Total procurement of timber and wood materials	193 thousand m^3

Category 1	**Timber and wood materials with priority procurement** • Those certified by a third party that they do not destroy forests with high conservation value • Those certified by a third party that the supplier conducts sustainable forest management • Recycled wood materials	Category 1	65.3%	(Difference from the previous fiscal year) -11.2 point
Category 2	**Timber and wood materials acceptable for procurement** • Those confirmed as being legally logged • Those certified by an industry organization or equivalent that the logging is legal	Category 2	34.7%	(Difference from the previous fiscal year) +11.2 point
Category 3	**Timber and wood materials to be avoided for procurement** • Those that are not confirmed to be legally logged	Category 3	0%	- Zero since fiscal 2015

"Green Procurement Guidelines for Wood"
https://holdings.panasonic/content/dam/holdings/global/en/corporate/about/procurement/green/pdf/green_wood_E.pdf

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

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 dragonflies 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 an external accredited body

Panasonic Corporation's Living Appliances and Solution 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'.

Starting in October 2024, we have been conducting an academic study and joint research on biodiversity conservation in the Forest of Coexistence in collaboration with Kyoto University and Osaka Sangyo University. Presently, we are studying and researching the forest growth process to understand the impact over a wide area including the surrounding environment.

In December 2024, a research exchange was held between the Kyoto University Field Science Education and Research Center and Panasonic Holdings. At the meeting, we exchanged opinions on integrating Panasonic's technologies with knowledge and information in the field of ecology to further contribute to biodiversity and to discover research themes that will lead to new business developments.

We gave three presentations on our collaborative research on the Forest of Coexistence at the 72nd Annual Meeting of the Ecological Society of Japan held in March 2025. We are moving forward with activities that foster an understanding of ecosystems in the Sustainable Forest that serve as urban green space.

[Related link]
https://news.panasonic.com/jp/press/jn231012-1

<External certifications and awards>
- Acquired three stars under the Shiga Biodiversity Action Certification Program (2018)*2
- Acquired ABINC certification (March 2018); the first certification renewal (February 2021) and the second certification renewal (February 2024)
- 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.

<Participation in international activities 30by30 Alliance for Biodiversity>

In March 2022, we joined the 30by30 Alliance for Biodiversity which is a global efforts and initiated by Japan's Ministry of the Environment (MoE), to conserve at least 30% of own land as natural environmental area, and at least 30% of own ocean by 2030, as we believed our natural symbiosis woods 'Forest of Coexistence' would contribute to the 30by30.

In October 2023, our 'Forest of Coexistence' was officially certified as 'Nationally Certified Sustainably Managed Natural Sites' by the MoE. It is currently listed in the international database as an OECM(*3).

News release by the MoE on October 6, 2023.
Certification Results for 'Natural symbiosis site' (Shizen Kyosei Site) in the first half of fiscal 2024
https://www.env.go.jp/press/111067.html

International Database
Explore the World's Protected Areas
https://www.protectedplanet.net/country/JPN

*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.

"Nationally Certified Sustainably Managed Natural Sites" certification logo mark

Biodiversity Conservation Ecological Network Concept
https://www.panasonic.com/global/about/sustainability/environment/ecology/kusatsu_factory.html

ABINC Certification

Three-star rating in Shiga Biodiversity Action Certification Program
SHIGA PREF. BIODIVERSITY

LAS's Forest of Coexistence

Initiatives for Products and Services

The Group develops and sells products and services that lead to biodiversity conservation and nature positive future.

For further details of products, please visit the following website.

https://holdings.panasonic/jp/corporate/sustainability/environment/biodiversity.html#biodiversity_04

Conservation of Biodiversity through Collaboration with and Support for NGOs, NPOs and Venture Corporation

Introduction of MSC-ASC certified sustainable seafood at employee canteens

The Panasonic Group has been involved in marine protection activities*4 for some 20 years through collaboration with WWF Japan. Main activity at present is continual supply of MSC and ASC-certified*5 sustainable seafood*6 to employees' cafeterias that started for the first time in Japan at Panasonic headquarters in March 2018. For now, the situation remains difficult for the activity, e.g., some cafeterias had started serving sustainable seafood forced to stop serving the sustainable seafood due to the decreased number of employees using cafeterias as the number of employees working from home increased, and impact of price hike. As difficulties continued, sustainable

Cumulative total of sites offering the menu exceeded 50

Fried oysters using Japan's first ASC-certified oysters from Togura in Minamisanriku, which the Group also supported.

seafood was introduced to the Panasonic Group sites this year, making an accumulated total of 57 sites. We are also promoting new initiatives such as providing MSC-certified clams to employees' cafeterias, starting with the Yellow Sea Ecoregion Support Project[*7]. As for our continued support for other companies adoption of sustainable seafood into their cafeterias, the running total of the cafeterias of partner companies using sustainable seafood has exceeded 50, making more than 100 when combined with our group's accumulated total. In addition to corporate cafeterias, Yokohama City University COOP has obtained the MSCASC certification with the Panasonic Group's support and corporation, and started serving the sustainable seafood at the university cafeteria for the first time in Japan's university in 2022. 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 cafeterias, conducting awareness-raising activities periodically and continuously for employees and the next generation about sustainable seafood and the IUU fishing issues[*8] , and facilitating transformation of behaviors of our employees and the public at large as consumers through communication via media, and the like, we contribute to 'SDG 14: Life below Water' and promotes to make the topic of biodiversity mainstream.

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

*4 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).
*5 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.
*6 Seafood that has been certified sustainable production with MSC and ASC certification and managed under CoC certification[*9]
*7 To conserve the nature of the Yellow Sea, a global diversity treasure, WWF Japan launched the "Yellow Sea Ecoregion Conservation Program" in April 2002, and in September 2007 the "Yellow Sea Ecoregion Support Project" started with the support of then Panasonic Corporation.
*8 IUU fishing issues: Fishing that is illegal, unreported and unregulated. It is one of the international issues that threaten the effectiveness of resources management.
*9 CoC is the acronym for Chain of Custody. Certification on securing management and traceability in processing, distribution, and marketing.

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

"Choose to protect ocean!" Spreading sustainable seafood...
https://holdings.panasonic/global/corporate/sustainability/citizenship/sustainable_seafood.html

Tackling social issues through collaboration with venture businesses



Seaweed cultivation by Sea Vegetable



Serving cultivated seaweed to employees' cafeterias

Panasonic Holdings Corporation (PHD) and SEA VEGETABLE COMPANY have concluded a joint demonstration agreement aimed at resolving social issues such as biodiversity conservation, the food supply problem and CO_2 reduction through seaweed cultivation. This project combines PHD's robotics and IoT technologies with the seaweed cultivation technology at SEA VEGETABLE for a collaborative review of its feasibility, aimed at reducing the environmental impact and stabilizing food supplies. Starting from November 26, 2024, PHD began offering seaweed cultivated by SEA VEGETABLE at their employee cafeteria. PHD is also engaging in activities designed to communicate to employees the current state of biodiversity and the problems found in the marine industry, as well as promoting behavioral changes and a greater understanding of the Nature Positive initiative.

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.

Since its foundation in October 2010, PERJ has been working with a variety of stakeholders[*15]


Activities at Yodo River


Unitopia Sasayama Satoyama Revitalization Activity

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. In our work to contribute to a sustainable global environment and society, we will continue activities that lead to the conservation of biodiversity and satoyama focusing on 'forests', 'greenery areas' and 'water'.

<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)

In October 2024, Japan's Ministry of the Environment certified the Unitopia Sasayama Satoyama Revitalization Area, which volunteers have been working to restore since 2012, as the "Nationally Certified Sustainably Managed Natural Sites." (This is the second such designation the Panasonic Group has received, following certification of the Sustainable Forest on the Kusatsu site.) The Woodland Revitalization Activity is managed for biodiversity conservation, utilizing the woodland environment located inside the corporate recreation area. The principal features of the area that led to certification are the presence of diverse biota, including rare species, its use as a venue for environmental education and installation of a monitoring system.

News article on certification of the "Nationally Certified Sustainably Managed Natural Sites."
https://news.panasonic.com/jp/topics/205980

We will continue working together with local communities on activities that lead to the conservation of biodiversity and satoyama with a focus on forests, greenery areas and water, as well as nature education activities, that contribute to the creation of a sustainable global environment and social development.

*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.

Panasonic ECO RELAY Japan (PERJ)
https://www.panasonic.com/jp/corporate/sustainability/citizenship/environment/perj.html

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

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 participates 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 23 targets for 2030 of the Kunming-Montreal Global Biodiversity Framework (GBF) adopted at COP15 (UN Biodiversity Conference), TNFD, and SBTN through study meetings. We feed these domestic and global policies back into Panasonic Group businesses and assess opportunities and risks.

<Membership and Participation>
- TNFD Forum member
- Keidanren Committee on Nature Conservation
- 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 has been a member of 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 (see page 14) 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+1 as one of the continuing efforts.

For promoting these activities, the Panasonic Group have established a structure for the promotion of environmental management, including water management (see page 29). We are continually working to develop our environmental sustainability management by implementing the PCDA management cycle. We have also created an environmental risk management organization to identify environmental risks each fiscal year and continue to reduce them. This organization promotes risk management across the Group and is working on ways to implement rapid action when an environmental risk emerges (see Page 75).

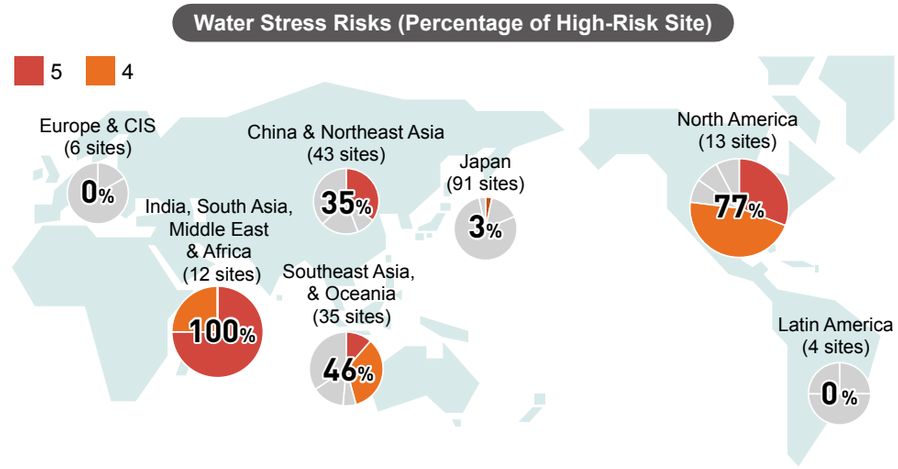
LEAP analysis of water resources based on the TNFD Framework

Although our Group had already implemented a water risk assessment by fiscal 2018, we have started to reassess the risks in view of evolving assessment standards and changes in the business environment. We are presently working on identifying and assessing risks related to water resources and their impact, in compliance with the Taskforce on Nature-related Financial Disclosures (TNFD) Framework. As part of this effort, we are conducting systematic risk assessment based on the LEAP Approach* at all of our manufacturing sites.

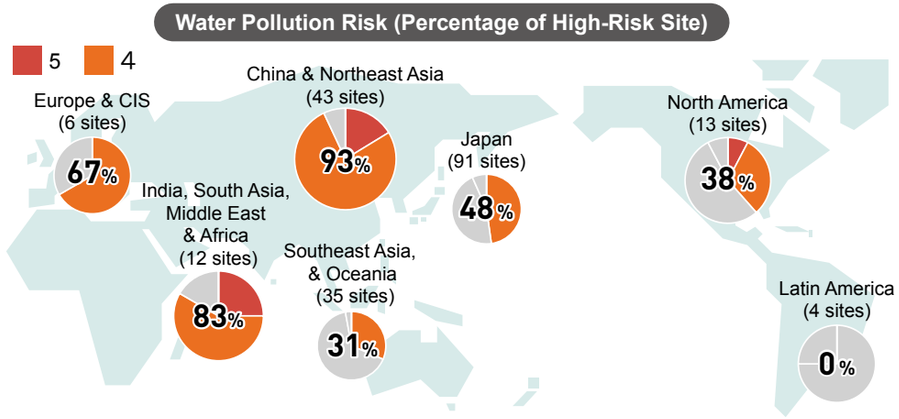
The first phase of the process is "Locate," which defines the relationship between our site's location and natural capital. Specifically, we use the water risk assessment tool Aqueduct from Water Resources Institute (WRI) and Water Risk Filter from the World Wide Fund for Nature (WWF) to assess the position of each of our manufacturing site vis-à-vis the natural environment and have conducted assessments of water stress and water quality contamination risks. As a result, we have been able to identify sites where water resources face high levels of physical risk. On some of these high-risk sites, aggressive action is already underway to reduce the physical risks. These cases are presented on our website.

In the subsequent "Evaluate" phase, a detailed review is conducted of sites that are identified as having a high dependence on water collection (type, usage, water withdrawal, etc.) and the impact caused by effluent discharge (discharge method, discharge destination, proximity to protected areas, etc.). This study enables us to evaluate each site's dependence on water resources and its impact on the natural environment. The "Assess" phase is designed to identify clearly the projected risks and opportunities based on the assessment results. At the "Prepare" phase, we decide how to apply our findings to defining effective targets and developing countermeasures.

* LEAP approach
TNFD adopted the LEAP approach to comprehensively assess nature-related risks and opportunities. The LEAP approach comprises four phases: Locate the company's interfaces with nature; Evaluate its dependencies and impacts on nature; Assess its nature-related risks and opportunities; and Prepare and report on material nature-related issues.



*Excluding the factories within Panasonic Automotive Systems Corporation, which was deconsolidated in December 2024



*Excluding the factories within Panasonic Automotive Systems Corporation, which was deconsolidated in December 2024

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.

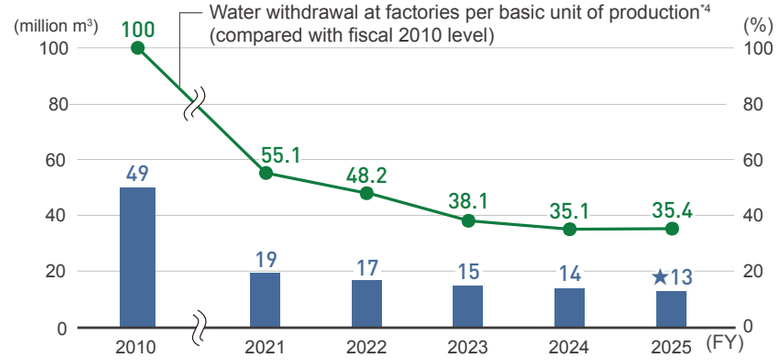
https://www.panasonic.com/global/corporate/sustainability/eco/water.html

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 withdrawal*1 at factories in fiscal 2025 resulted in 13.49 million m^3, which is reduced by 2.7% versus the fiscal 2024. The water withdrawal at our factories per basic unit of production*2 deteriorated year-on-year due to the structural reform. Our use of recycled water*3 in fiscal 2025 was 1.4 million m^3, accounting for 10.4% of the total amount of water withdrawal. The amount of discharged water in fiscal 2023, 2024 and 2025 resulted in 11.78 million m^3, 10.60 million m^3, 10.45 million m^3 respectively.

*1 Change from "Water consumption" to "Water withdrawal" in reference to GRI standards
*2 Water withdrawal at factories per basic unit of production = Water withdrawal at factories/Production volume.
*3 The calculation excludes the water circulating for a single purpose (e.g., water in a cooling tower).

Water Withdrawal in Production Activities and Water Withdrawal Per Basic Unit



*4 Then-SANYO Electric and Panasonic Liquid Crystal Display not included in fiscal 2010

FY2025 Breakdown of Water Use (by region)

(10 thousand m^3)

Region	Water Withdrawal				Discharged			Consumption
		Municipal water/ industrial water	Ground-water	Rivers/ lakes		Sewer systems	Water-ways	
Japan	740	290	451	0	629	151	478	111
China & Northeast Asia	276	275	1	0	199	166	32	77
South East Asia, & Oceania	245	221	24	0	158	97	60	87
North America & Latin America	53	38	14	0	44	41	3	9
Europe & CIS	9	8	1	0	7	7	0	1
India, South Asia, Middle East & Africa	26	2	24	0	8	8	0	18
Total	1,349	834	514	0	1,045	471	574	304

Panasonic Industry Co., Ltd. (52 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 1.7 % in water withdrawal (5.32 million m^3) in fiscal 2025, thanks to their focused efforts to reduce water withdrawal. The achievement rate for reducing the amount of water withdrawal per basic unit by using recycled water in factories, etc., was 103%.

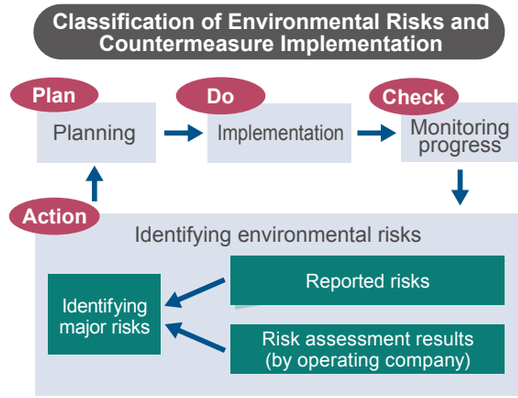
The Panasonic Group will continue our efforts to conserve water resources.

Pollution

Environmental Risk Management

Groupwide 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 page 141), we promote identification of environmental risks and group-wide risk management each year, and 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 no violations of environment-related regulations across the world in fiscal 2025. 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 2025

Region	Environmental pollution					Other	Total
	Air	Water quality	Noise	Odor	Waste	Permission / Approval	
Global (including Japan)	0	0	0	0	0	0	0
(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 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. However, we analyzing the factors that lead past violations related to the restricted substances in our products in a few years, the restricted substance content was derived from an upper stream supplier (a supplier in higher-tier) who has not directly contacted with Panasonic Group in the supply chain. Due to the difficulty of clearly understanding the state of quality control at suppliers in higher-tier, we believe strengthening the quality control system (audit system and training of the suppliers in higher-tier) at a supplier who directly contracted with the Group (Primary suppliers) is important to eliminate such violations. Therefore, our Quality, Environment, and Procurement Divisions will work to ensure further product compliance management and take recurrence measures, taking lead in collaboration with other relevant divisions for providing support to our primary suppliers.

Measures Against Soil and Groundwater Contamination

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 anticontamination 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 2025

Region	Number of sites that completed remedial measures	Number of sites currently taking remedial measures
Global (including Japan)	2	38
Japan	(1)	(34)

Measures Against Air Pollution

Panasonic Group is also working on responses to air pollution. Besides the efforts making in factories 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 (NOx) and particulate matters (PM) 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.

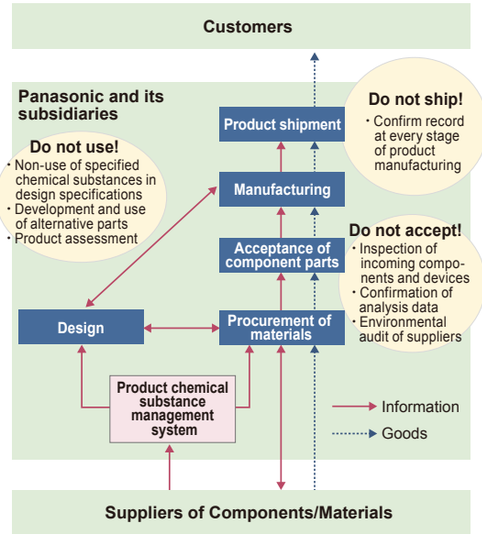
https://www.panasonic.com/global/corporate/sustainability/eco/governance/risk.html

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], 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

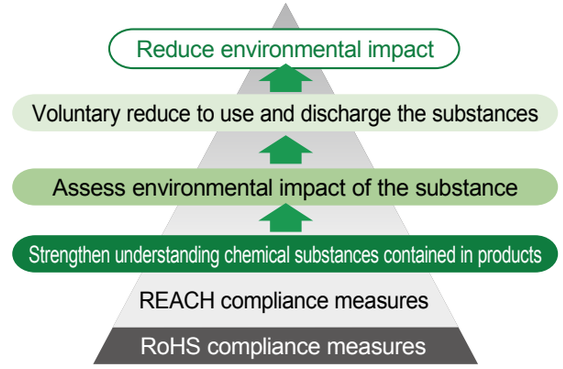


Specified Chemical Substance Management System

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 by 2020. Although the subsequent discussion was delayed as the conference could not be held due to the COVID-19 pandemic, in the fifth International Conference on Chemicals Management (ICCM5) held in in Germany September 2023, a new international framework that succeeds the activities up to 2020 was discussed; concerning appropriate chemical management, a new international frame work for voluntary and diverse actors to be involved was formulated. Panasonic Group has been supporting the precautionary approach proposed in the Rio Declaration at the Earth Summit in 1992, and has continued its efforts for appropriate chemical management on a global scale even after 2020 that is the final target year of the WSSD framework. Furthermore, in order to continue implementation of product manufacturing 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 determined chemical management (see page 16) as one of our continuing issues, and we are constantly working to reduce environmental loads of 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 adverse environmental impact originated by our group products as much as possible by (1) trying to understand 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 of the substances. We will continue to implement appropriate chemical management of such chemical substances while monitoring global environmental trends.

*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 phthalates (DEHP, BBP, DBP, and DIBP) (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 EU RoHS Directive.
The EU End of Life Vehicles Directive details restrictions for vehicles and the EU Battery Directive (amended and promulgated as EU Battery Regulation in July 2023) 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.

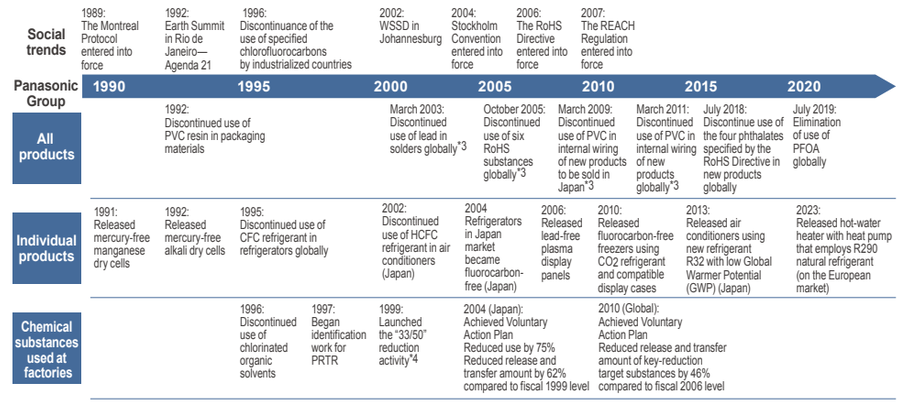
Note: the laws, regulations and the substances subject to the above table are chemical substances specified as Class I Specified Chemical Substances under the Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc., the EU RoHS Directive, Annex XVII of the EU REACH Regulation, etc. For more details, see the chapter 6 'Specified Managed Substances' in the Chemical Substances Management Rank Guidelines (For Products).
As for the hazardous substances whose manufacturing is prohibited under the Japan's Industrial Safety and Health Act, they are managed in accordance with the Specified Managed Substances in the Chemical Substances Management Rank Guidelines (For Factories)

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



*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 targets set at the WSSD and the new framework adopted by ICCM5, 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 500 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, 'chemSHERPA' (a new scheme for information communication for chemical substances in products) was proposed in 2015. Because the format adopted for chemSHERPA complies with IEC62474, the international standard on material declaration (a declaration of specific information about composition of the materials and chemical substances in the product) for the electrical and electronic machinery industry and their products, 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, our Group 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, the Panasonic Group completed conversion from JAMP format to chemSHERPA by June 2018.

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 defacto 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 adopting our group's electric components to speedily and effectively understand the 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.

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 below.

Information on the Content of Specified 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 opened the webpage to provide our information based on the Act on the Preventing Environmental Pollution of Mercury, in May 2017.

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

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 2011, 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.

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

Other than described above, we continue to conduct a Product Safety Assessment as a part of our responses to the U.S. State of California's Proposition 65 that aims to protect the state's citizens from chemical substances. Specifically, we conducted an exposure assessment experiment on diisononyl phthalate (DINP) in 2016, and on a brominated flame retardant (TBBPA: Tetrabromobisphenol A) in 2017, then created an exposure assessment tool based on the experiment results. As a result of the assessment, we confirmed that our products do not adversely affect users of our group products, i.e., customers. We are utilizing the exposure assessment tool to confirm product safety and to respond to relevant regulations.

Reduction in Use and Discharge of Chemical Substances

Fluorocarbons (CFC) used as refrigerants and insulating materials for freezers and air conditioners have properties that are known to cause ozone layer depletion and global warming. The Panasonic Group has developed a refrigerant based on CO_2 that has an extremely low effect on ozone depletion and global warming, and has been selling a home water heater that uses this low CO_2 refrigerant since 2001. Although this refrigerant can be used for heating up to a certain temperature, it cannot be used in large commercial refrigerators and freezers because of its low cooling efficiency. However, with the support of the New Energy and Industrial Technology Development Organization (NEDO), the Panasonic Group developed a refrigeration system that uses this CO_2 refrigerant, and has been delivering CFC-free freezers and refrigeration showcases that use this CO_2 refrigerant to supermarkets and convenience stores since 2010. Their use has expanded to warehouses and food factories, and we have shipped a total of 25,000 units in the domestic market. In addition, overseas shipments have increased significantly over the past few years, and we started production at our overseas sites last fiscal year to expand market opportunities globally.

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.

In May 2023, we started manufacturing air-to-water heat pumps that utilizes R290 natural refrigerant (propane) for residential use, which has extremely low Global Warming Potential (GWP), as the first Japanese manufacture. In this fiscal year, we introduced new products, and lineup expansion of our product is underway.

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, CWHZ180YA

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

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.

PDF List of Our PVC-free Products
https://holdings.panasonic/jp/corporate/sustainability/pdf/eco_pvclist2025.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 RoHS Directive 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, 2018. We have classified other phthalates as Level 3 Prohibited Substances, and are promoting 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).

Organic fluorine compounds

It is believed that there are more than 10,000 types of organic fluorine compounds known as per- and polyfluoroalkyl substances (PFAS). Of these substances, per/polyfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), perfluorohexane sulfonic acid (PFHxS) identified to be toxic, along with perfluorocarboxylic acids with a carbon chain length of 9 to 14 (C9-C14 PFCA) have been designated banned substances in the Chemical Substances Management Rank Guidelines (For Products), and their presence in Group products has been prohibited. In view of the deliberations under way in the EU, the United States and other countries regarding the regulation of other PFAS substances, we request our customers to disclose information that will allow us to assess the presence of such substances in Group products.

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.

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

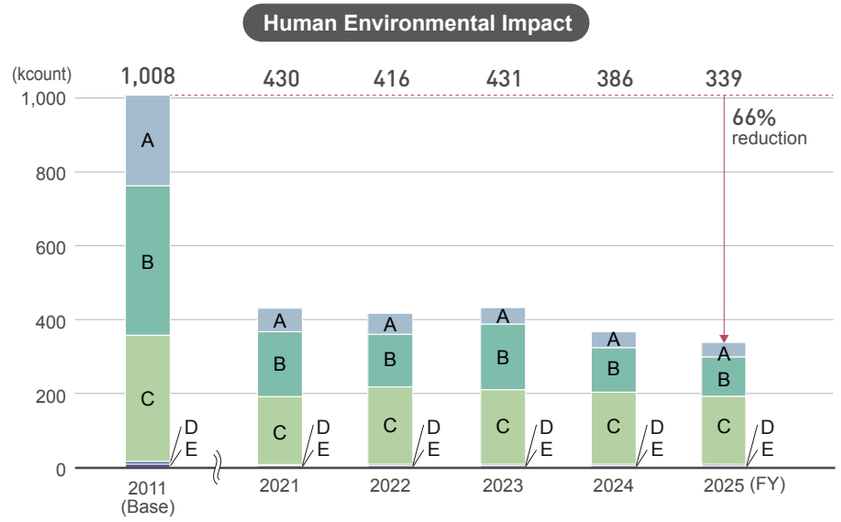
*8 Human Environmental Impact = Hazardousness factor x Release and transfer amount

Further, we maintain our compliance in different countries by obtaining the latest information about the various chemical regulations enforced in each country through our overseas sites (former 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

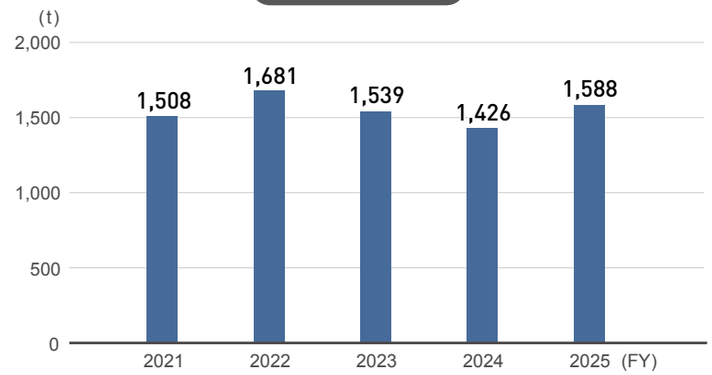
*9 In addition to carcinogenicity, hazards to human health include genetic mutation, reproductive toxicity, and acute toxicity. In addition to ozone depleting substances, hazards to/substances with impact on the environment include ecological toxicity, substances that impact global warming, and substances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



In fiscal 2025, we were able to reduce Human Environmental Impact by 66% compared with fiscal 2011. We will continue to implement our activities to minimize emissions of the substances with high environmental loads from our production activities.

Environment

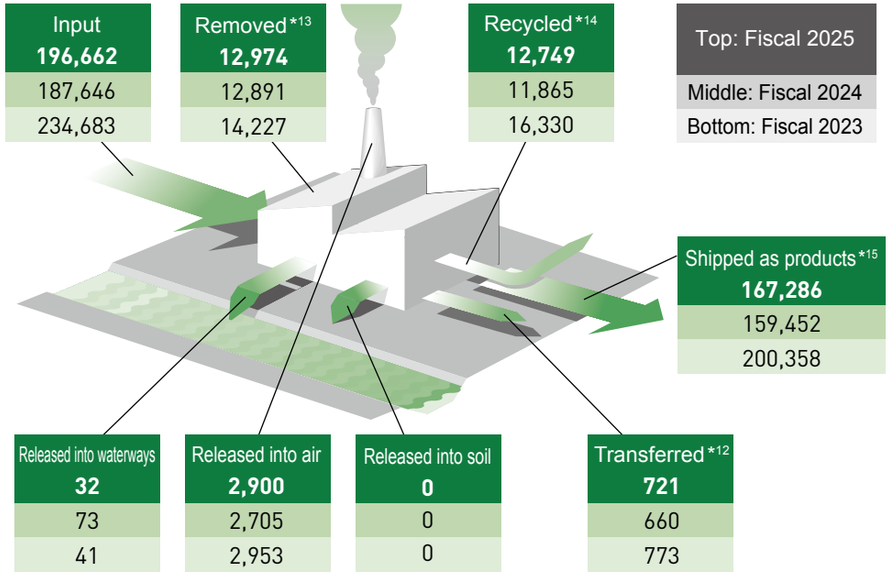
VOC*10 Emissions



*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.

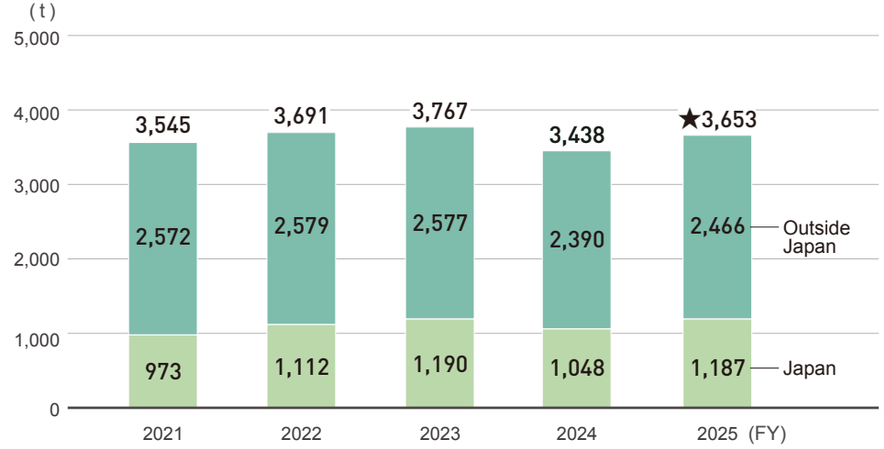
*12 Includes substances transferred as waste, as well as those discharged into the sewage system. Recycled amount which is free of charge or accompanies treatment cost under the Waste Management Law is included in “Recycled.” (Different from the transferred amount reported under the PRTR Law.)

*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.

Other Initiatives

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 • Panasonic Center Osaka opened • Eco & Ud HOUSE opened	• 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

Environment

Era	Year	Panasonic Group	World	Japan
	2005	• 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
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 • Panasonic ECO RELAY Japan (PERJ) launched.	• 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

Era	Year	Panasonic Group	World	Japan
	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)
	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"	• 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

Environment

Era	Year	Panasonic Group	World	Japan
	2014		• 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”	
	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
	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 net zero 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 net zero 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 CO_2 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 net 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)’.
	2023	• Group CEO talked in a seminar at the Japan Pavilion in COP28 (Dubai), about significance of the avoided emissions and necessity of its global standardization. • Sustainable Forest in the Kusatsu site was certified as “Shizen Kyosei Site” by Japan’s MoE. • Panasonic Group Circular Economy (CE) Policy was formulated.	• Importance of recognition of the avoided emissions is mentioned explicitly in the respective outcome documents of G7 Ministers’ Meeting on Climate, Energy, and Environment in the G7 summits in Sapporo and Hiroshima. • TNFD published its final recommendations such as information disclosure on biodiversity. • ISSB published its final sustainability disclosure standards.	• Japan’s MoE launched Decokatsu (National Movement for New and Valuable Lifestyles leading to Decarbonization). • Japan’s MoE started to certifying sites where biodiversity has been conserved by private sector’s initiatives, etc., as “Shizen Kyosei Site”.
	2024	• In the opening keynote address at CES 2025, the Group CEO announced the Panasonic Group's commitment to a sustainable global environment. • Received certification of our net-zero target from the Science-based Target initiative (SBTi). • At the World Business Council for Sustainable Development (WBCSD) held during New York Climate Week, the Group CEO promoted the circular economy model.	• The new climate finance targets were established at COP 29 (Azerbaijan) • At Biodiversity COP 16 (Colombia), TNFD announced its guidance for nature transition plans. • European Commission enforces Eco-Design for Sustainable Product Regulation (ESPR).	• With the country’s new NDC (Nationally Determined Contributions), the Japan's government submitted to the United Nations its target for reducing greenhouse gases by 60% by FY 2035 and 73% by FY 2040 compared to the FY 2013 level. • Japan's Cabinet Office approved the Sixth Basic Environmental Plan that envisions "Circular and Symbiotic Society". • SSBJ announced final version of its Sustainability Disclosure Standards.

Environmental Data

■Energy

*See Page 36

		FY2023	FY2024	FY2025
Energy		4.7 TWh	4.5 TWh	4.5 TWh
	Purchased electricity	3.23 TWh	3.08 TWh	3.07 TWh
	including renewable energy	0.47 TWh	0.72 TWh	0.95 TWh
	Installation of renewable energy facilities in our own sites	0.06 TWh	0.07 TWh	0.11 TWh
	Town gas	71 million m^3	68 million m^3	70 million m^3
	LNG	8.8 kt	9.9 kt	10.8 kt
	LPG	5.6 kt	4.5 kt	4.4 kt
	Heavy oil	6.9 Ml	7.0 Ml	6.2 Ml
	Light Oil	2.0 Ml	1.9 Ml	2.0 Ml
	Kerosene	1.8 Ml	1.6 Ml	1.6 Ml
	Volatile	0.1 Ml	0.1 Ml	0.1 Ml
	Steam	434 TJ	373 TJ	336 TJ
	Hot Water	49 TJ	37 TJ	37 TJ

■CO_2 Emission in Business Activities

*See Page 55

		FY2023	FY2024	FY2025
CO_2 Emission in Business Activities		1.63 million ton	1.37 million ton	1.24 million ton
	Japan	0.69 million ton	0.60 million ton	0.53 million ton
	China and North East Asia	0.30 million ton	0.19 million ton	0.18 million ton
	Southeast Asia and Pacific	0.38 million ton	0.33 million ton	0.28 million ton
	North America and Latin America	0.20 million ton	0.19 million ton	0.18 million ton
	India, South Asia, Middle East and Africa	0.04 million ton	0.04 million ton	0.04 million ton
	Europe and CIS	0.01 million ton	0.01 million ton	0.01 million ton

■Breakdown of Total GHG Emissions (CO_2-equivalent) in Business Activities

*See Page 55

		FY2023	FY2024	FY2025
Scope 1				
	CO_2 from energy sources	224 kt	216 kt	220 kt
	CO_2 from non-energy	183 kt	101 kt	53 kt
	CO_2	1 kt	1 kt	1 kt
	HFC	180 kt	97 kt	50 kt
	SF_6	2 kt	2 kt	2 kt
	NF^3 and others	1 kt	1 kt	1 kt
Scope 2 Energy sources		1,433 kt	1,207 kt	1,099 kt
Carbon offset by credit		-26 kt	-57 kt	-79 kt
Total		1,812 kt	1,465 kt	1,291 kt

■GHGs (by Scope)

*See Page 37

		FY2023	FY2024	FY2025
Scope 1		406 kt	316 kt	272 kt
Scope 2		1,433 kt	1,207 kt	1,099 kt
Scope 3		127,371 kt	124,995 kt	144,246 kt
	1. Purchased goods and services	21,543 kt	21,954 kt	20,324 kt
	2. Capital goods	880 kt	1,546 kt	2,030 kt
	3. Fuel- and energy-related activities	212 kt	243 kt	251 kt
	4. Upstream transportation and distribution	887 kt	741 kt	720 kt
	5. Waste generated in operations	0.1 kt	1 kt	1 kt
	6. Business travel	32 kt	31 kt	30 kt
	7. Employee commuting	111 kt	107 kt	106 kt
	8. Upstream leased assets	—	—	—
	9. Downstream transportation and distribution	61 kt	146 kt	147 kt
	10. Processing of sold products	153 kt	234 kt	170 kt
	11. Use of sold products	95,029 kt	91,027 kt	111,151 kt
	12. End-of-life treatment of sold products	7,537 kt	7,860 kt	7,999 kt
	13. Downstream leased assets	—	—	—
	14. Franchises	—	—	—
	15. Investments	928 kt	1,108 kt	1,322 kt
total		129,209 kt	126,518 kt	145,616 kt

■GHG emissions reduction targets (SBT 1.5°C accreditation) Progres rate

*See Page 39

	FY2023	FY2024	FY2025
Emissions from Panasonic Group business activities (Scope 1 and 2)	23 %	38 %	45 %
Emissions from use of Panasonic Group products (Scope 3)	— *2	— *2	— *2

*2 Progress rate not calculated due to increase in emissions because of expansion of products subject to calculation

■RE100 Progress rate

*See Page 54

	FY2023	FY2024	FY2025
RE100 Progress rate	15.6 %	24.3 %	32.5 %

■Logistics

*See Page 36 and https://holdings.panasonic/global/corporate/sustainability/environment/logistics.html

		FY2023	FY2024	FY2025
Energy		1.50 TWh	1.32 TWh	1.31 TWh
Biodiesel fuel		9.89 kl	1.27 kl	0.399 kl
CO_2 Emission: global		887 kt	741 kt	720 kt
	International transportation	246 kt	215 kt	205 kt
	intra-region outside Japan	518 kt	411 kt	403 kt
	Japan	123 kt	115 kt	112 kt
Transportation Amount by Transportation Method (Japan)		850 million tons-kilometers	770 million tons-kilometers	750 million tons-kilometers
	Air	0.3 million tons-kilometers	0.2 million tons-kilometers	0.2 million tons-kilometers
	Truck	793 million tons-kilometers	713 million tons-kilometers	676 million tons-kilometers
	Ship	57 million tons-kilometers	51 million tons-kilometers	59 million tons-kilometers
	Railroad	6 million tons-kilometers	5 million tons-kilometers	15 million tons-kilometers

Environment

■Resources

*See Page 36, 63

	FY2023	FY2024	FY2025
Recycled resin	12.4 kt	17.2 kt	15.2 kt
Total wastes including revenue-generating waste	282 kt	258 kt	278 kt
Landfill	2.3 kt	1.5 kt	1.9 kt
Factory waste recycling ratio	99.1 %	99.3 %	99.2 %

■Recycling

*See Page 36

		FY2023	FY2024	FY2025
Collected products		162 kt	151 kt	145 kt
Recycled products		123 kt	113 kt	110 kt
	Metals	89 kt	83 kt	81 kt
	Glass	2 kt	1 kt	1 kt
	Other	32 kt	28 kt	27 kt
Generated waste		39 kt	37 kt	35 kt

■Water

*See Page 74

		FY2023	FY2024	FY2025
Water Withdrawal		15.27 million m^3	13.87 million m^3	13.49 million m^3
	Municipal water/industrial water	9.60 million m^3	8.62 million m^3	8.34 million m^3
	Groundwater	5.67 million m^3	5.24 million m^3	5.14 million m^3
	Rivers/lakes	0 million m^3	0 million m^3	0 million m^3
recycled water		1.55 million m^3	1.39 million m^3	1.40 million m^3
Water discharged		11.78 million m^3	10.60 million m^3	10.45 million m^3
	Sewer systems	5.39 million m^3	4.90 million m^3	4.71 million m^3
	Waterways	6.39 million m^3	5.70 million m^3	5.74 million m^3

■Chemical substances

*See Page 82-83

		FY2023	FY2024	FY2025
Input		234,683 t	187,646 t	196,662 t
Release		2,994 t	2,778 t	2,932 t
	Released into waterways	41 t	73 t	32 t
	Released into air	2,953 t	2,705 t	2,900 t
	including VOC emissions	1,539 t	1,426 t	1,588 t
	Released into soil	0 t	0 t	0 t
Transfer		773 t	660 t	721 t
Recycled		16,330 t	11,865 t	12,749 t
Shipped as products		200,358 t	159,452 t	167,286 t
Removed		14,227 t	12,891 t	12,973 t
Human Environmental Impact		431 kcount	386 kcount	339 kcount

■Environmental Accounting

*See Page 38

		FY2023	FY2024	FY2025
Environmental conservation in factories				
	Investments	6,590 million yen	3,791 million yen	3,241 million yen
	Expenses	155 million yen	128 million yen	61million yen
	Economic benefit	1,655 million yen	907 million yen	394 million yen
Environmental Conservation Benefits (in physical terms)				
	CO2 emissions from production activities	320 kt	260 kt	130 kt
	Human Environmental Impact	▲15 kcount	45 kcount	47 kcount
	Landfill of waste	0.6 kt	0.8 kt	▲0.4 kt
	Water consumption	1.97 million m^3	1.47 million m^3	0.388 million m^3
Economic Effects for Customers (Electricity cost reduction from product usage)				
	Reduced amount of electricity	30.9 TWh	46.7 TWh	80.6 TWh
	Reduced electricity costs	783.5 billion yen	1256.7 billion yen	2298.0 billion yen

■Number of the ISO 14001 Certification

*See Page 30

		FY2023	FY2024	FY2025
Number of certifications obtained		149	144	133
	Manufacturing	128	123	113
	Non-manufacturing	21	21	20

■Case of Violations of Laws and Ordinances

*See Page 75

		FY2023	FY2024	FY2025
Environmental pollution		3 (0)	4 (0)	0 (0)
	Air	2 (0)	2 (0)	0 (0)
	Water quality	0 (0)	0 (0)	0 (0)
	Noise	0 (0)	0 (0)	0 (0)
	Odor	0 (0)	0 (0)	0 (0)
	Waste	0 (0)	2 (0)	0 (0)
Other	Permission /Approval	1 (0)	0 (0)	0 (0)

■Soil and Groundwater Pollution Surveys and Remedial Measures

*See Page 76

	FY2023	FY2024	FY2025
Number of sites that completed remedial measures	1 (1)	4 (4)	2 (1)
Number of sites currently taking remedial measures	42 (37)	40 (35)	38 (34)