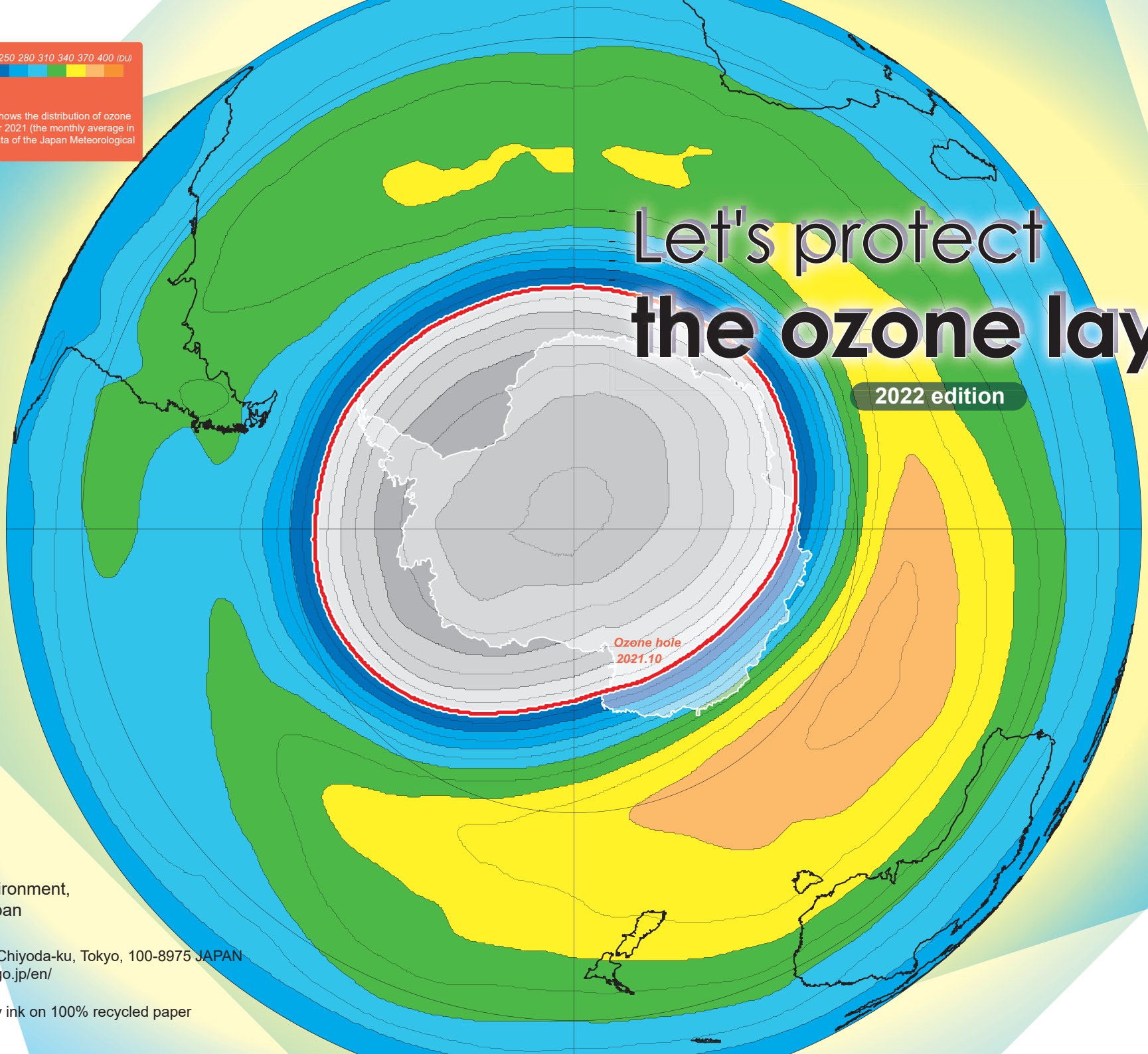

Let's protect the ozone layer

2022 edition

Ozone hole

The illustration on the cover shows the distribution of ozone above the Antarctic in October 2021 (the monthly average in Dobson Unit) based on the data of the Japan Meteorological Agency.

Ministry of the Environment,
Government of Japan

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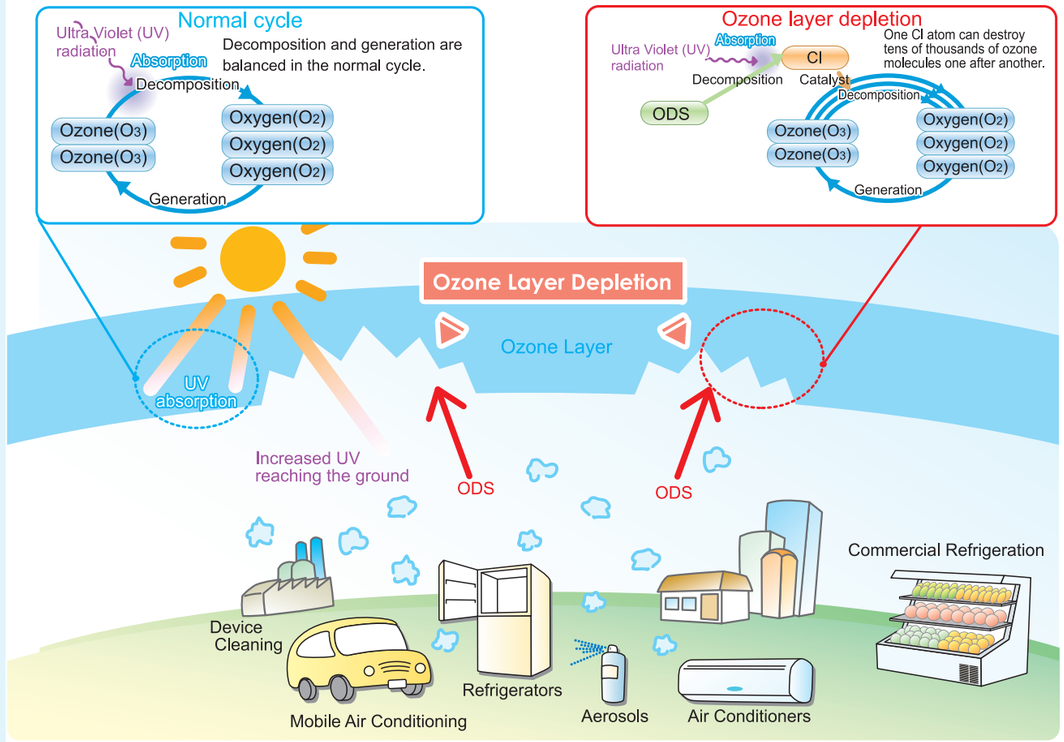
Ministry of the Environment
JAPAN

The Ozone Layer & The Ozone Hole

The ozone layer is a protective shield up in the air that absorbs harmful ultraviolet(UV) rays, which can cause various negative impacts on human health and ecosystems. However, in 1980s, scientists discovered severe ozone depletion over Antarctica, commonly known as “the ozone hole”. Soon it was found that the man-made chemicals, ozone depleting substances (ODS), caused the ozone hole.



Negative impacts of excessive UV-B on human health

Acute (symptoms immediately appear)

Sunburn
Red inflammation of the skin that appears a few hours after UV exposure

Suntan
Browning of the skin that appears a few days after UV exposure

Snow blindness
Inflammation of the iris of the eye that occurs when the eye is exposed to UV in places such as skiing grounds and marine beaches. The white of the eye congests, accompanied by pain. The symptom is remedied in 1-2 days.

Suppressions of the immune system

Chronic (symptoms gradually appear)

Skin
- Wrinkle, Freckle, Senile plaque
- Benign tumor
- Precancerous lesion
- Solar keratosis
- Skin cancer

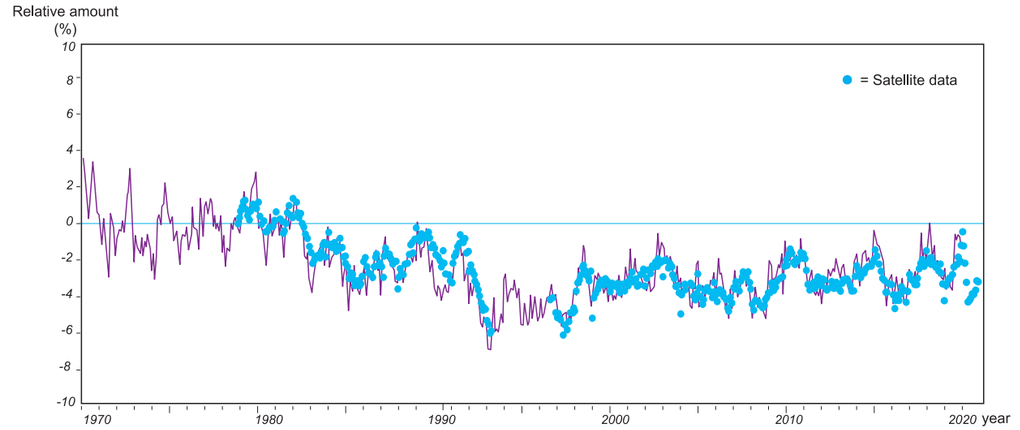
Eye

Cataract
A disease caused by UV exposure, etc. in which the crystalline lens of the eye gradually gets cloudy. The vision weakened by cataracts cannot be corrected with glasses and severe cases need surgical operation.

Pterygium
A disease in which the abnormal growth caused by UV in the tissue of the white (conjunctiva) of the eye gradually develops towards the iris (cornea). It can be removed by surgical operations but may recur.

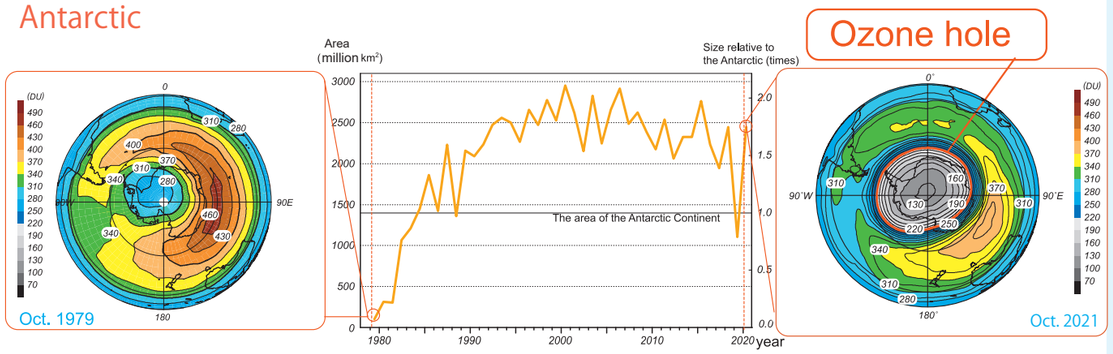
The amount of the ozone in the ozone layer decreased and the ozone hole rapidly grew in area from 1980 through the early 1990s.
Although it picked up slightly from the late 1990s, the amount of the ozone in the ozone layer continues to be smaller than before.
In 2021 ozone hole was larger than the average size for the past 10 years.

Global



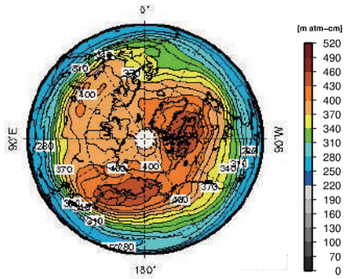
Time series in global mean total ozone
Source: Japan Meteorological Agency

Antarctic



Changes in annual maximum of the ozone hole area (center) and the total ozone maps over the Antarctic region in October (left and right)
Based on the data provided by Japan Meteorological Agency

Arctic

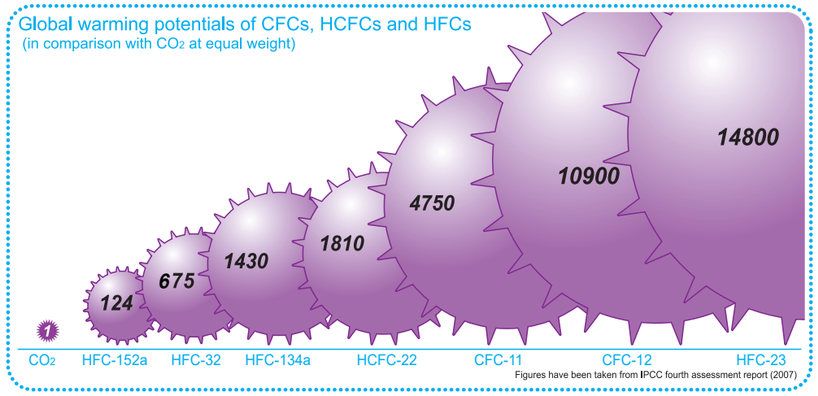


Mar. 2021
Source: Japan Meteorological Agency

Above the Arctic, annual ozone depletion is more variable than the Antarctic depending on meteorological conditions.
In the Northern Hemisphere, one of the largest ozone depletions on record was observed in 2020, but no significant ozone depletion occured in 2021.

Ozone Depleting Substances & Climate Change

Ozone depleting substances (ODS) such as CFCs and HCFCs are also greenhouse gases.
Therefore, the phase-out of ODS under the Montreal Protocol has contributed and will continue to contribute to the mitigation of climate change.
While the ozone-friendly HFCs are used as alternatives to CFCs and HCFCs, they are powerful greenhouse gasses.
HCFCs, and HFCs are still used in our daily life.
In fighting climate change, it is urgent and crucial to reduce the emissions into the atmosphere.



	Type	Ozone Depleting Potential	Global Warming Potential	Use
Ozone depleting substances	CFC	CFC-11 (1.0) CFC-12 (1.0)	CFC-11 (4,750) CFC-12 (10,900)	Refrigerants Foam blowing agents
	Halon	Halon-1211 (3.0) Halon-1301 (10.0) Halon-2402 (6)	Halon-1211 (1,890) Halon-1301 (7,140) Halon-2402 (1,640)	Fire extinguishings
	HCFC	HCFC-22 (0.055) HCFC-141b (0.11)	HCFC-22 (1,810) HCFC-141b (725)	Refrigerants Foaming agents Cleaning agents
Other fluorinated gases	HFC	0	HFC-23 (14,800) HFC-32 (675) HFC-134a (1,430) R-404A(3,920)	Refrigerants Foaming agents Cleaning agents

＊HBFC and Bromochloromethanes are not used in Japan.

Source (GWP) : IPCC fourth assessment report (2007)

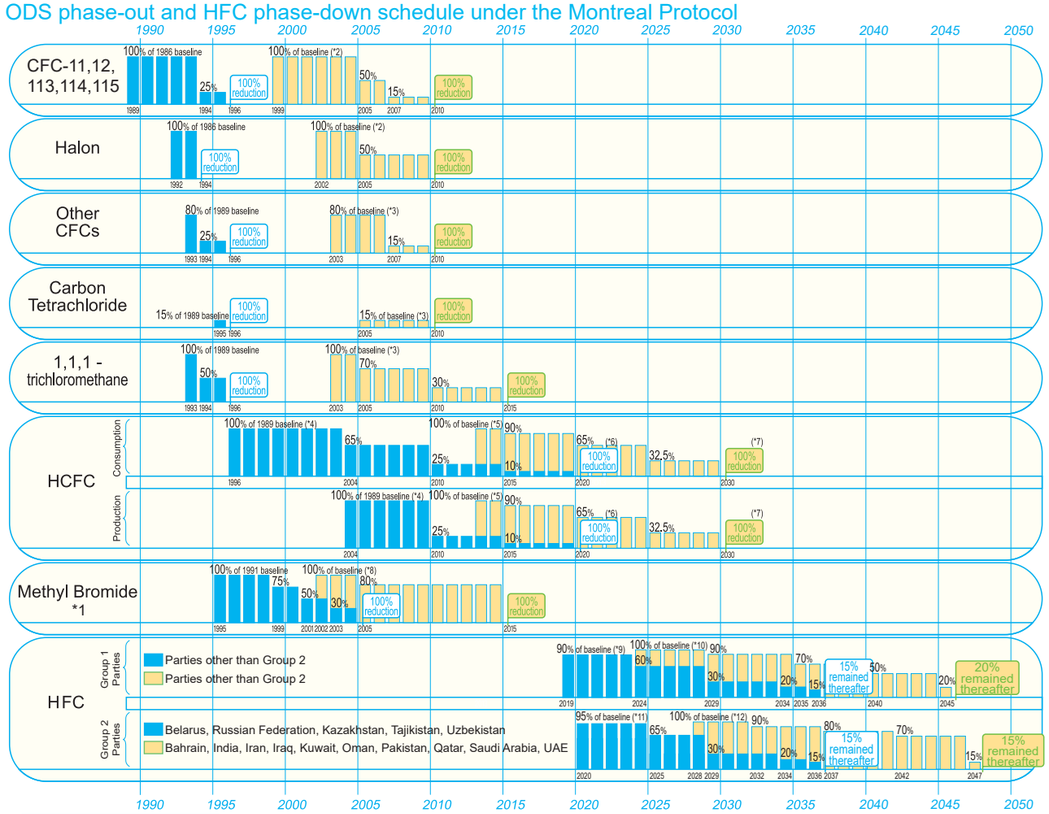
Global Efforts & Japan's Commitment

The global community has agreed to phase out ozone depleting substances such as CFCs and HCFCs under the Montreal Protocol on Substances that Deplete the Ozone Layer in 1987.

In 2016 the Parties adopted the Kigali Amendment to phase down HFCs in order to reduce the use of high global warming potential HFCs, and the Kigali Amendment entered into force in January 2019.

Japan accepted the Kigali Amendment in December 2018 and has been in full compliance since then.

ODS phase-out and HFC phase-down schedule under the Montreal Protocol



Production and consumption (= production + import - export) are to be phased out by substance group according to specific schedules.

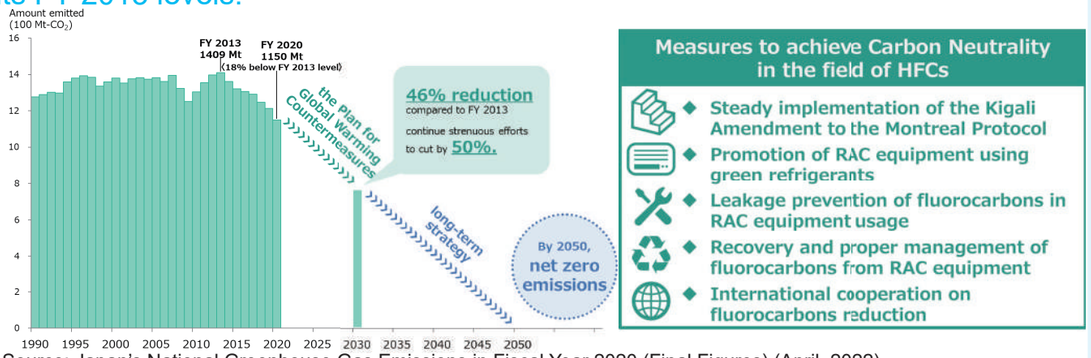
*1) Methyl bromide used for quarantine and pre-shipment is exempted from control.
*2) Baseline = the average of production and consumption from 1995 to 1997 or 0.3 kg per capita, whichever is lower.
*3) Baseline = the average of production and consumption from 1998 to 2000 or 0.2 kg per capita, whichever is lower.
*4) Consumption baseline = HCFC consumption in 1989 + CFC consumption in 1989 x 2.8 %
Production baseline = the average of HCFC production and consumption in 1989 + the average of CFC production and consumption of 1989 x 2.8%
*5) Baseline = the average of production or consumption of 2009 and 2010.
*6) Production and consumption only for servicing of existing refrigeration and air-conditioning equipment are allowed until 2030, provided that such
production and consumption do not exceed 0.5 % of the baseline.
*7) Production and consumption only for servicing of existing refrigeration and air-conditioning equipment are allowed until 2040, provided that such
production and consumption do not exceed 2.5 % of the baseline.
*8) Baseline for methyl bromide = the average of production and consumption from 1995 to 1998.
*9) Baseline = the average of HFC production and consumption from 2011 to 2013 + the baseline of HCFC production and consumption x 15% (CO_2 eq.)
*10) Baseline = the average of HFC production and consumption from 2020 to 2022 + the baseline of HCFC production and consump tion x 65%(CO_2 eq.)
*11) Baseline = the average of HFC production and consumption from 2011 to 2013 + the baseline of HCFC production and consump tion x 25% (CO_2 eq.)
*12) Baseline = the average of HFC production and consumption from 2024 to 2026 + the baseline of HCFC production and consump tion x 65% (CO_2 eq.)

**Each Party may produce the controlled substances for basic domestic needs in developing countries beyond the controlled level and essential or critical uses such as laboratory and analytical uses are exempted from control. For the HFC phase down, a high ambient temperature exemption shall be available to Parties with high ambient temperature conditions.

Japan's Commitment

Japan's Commitment to Net-Zero by 2050

In October 2021, the Japan's Long-Term Strategy under the Paris Agreement was formulated. Japan's NDC and the Plan for Global Warming Countermeasures were also revised. Japan aims to reduce its greenhouse gas emissions by 46% in fiscal year(FY) 2030 from its FY 2013 levels, setting an ambitious target which is aligned with the long-term goal of achieving net-zero by 2050. For HFCs, Japan aims to reduce its emissions by 55 percent in FY 2030 from its FY 2013 levels.



Source: Japan's National Greenhouse Gas Emissions in Fiscal Year 2020 (Final Figures) (April, 2022)

International cooperation

The Ministry of the Environment of Japan(MOEJ) has been working through the Multilateral Fund for the Implementation of the Montreal Protocol, including the HPMP refrigeration servicing sector of China and Mongolia, and the HPMP foam manufacturing sector of Mongolia.

The study tour on the refrigeration and air-conditioning servicing sector in Japan by Mongolia. Tokyo etc., Japan. October 2017.

The Train-the-Trainer Workshop on handling of flammable refrigerant based split air-conditioners and heat pumps in Mongolia. June 2018.

Participation in Network Meetings

Japan has been committed not only to achieving its own obligations under the Montreal Protocol but also to assisting other countries, particularly those in Asia and the Pacific region, based on its experience in policy enforcement and technical development.

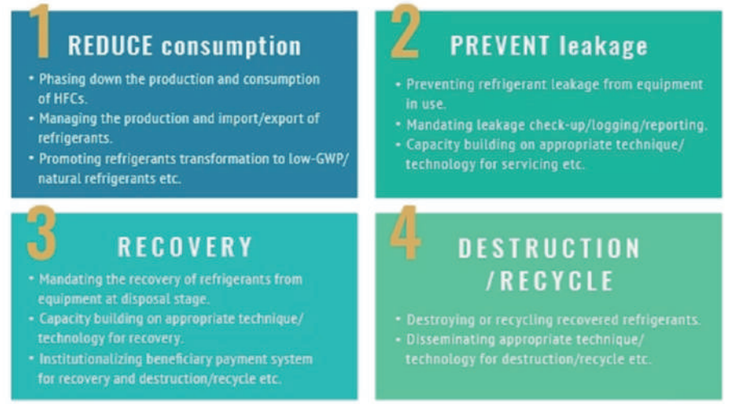
Joint Meeting of the South Asia, Southeast Asia and Pacific Island Countries Networks of National Ozone Officers, Bangkok, Thailand, July 2022

Joint Meeting of the South Asia, Southeast Asia and Pacific Island Countries Networks of National Ozone Officers, Bangkok, Thailand, July 2022

The Initiative on Fluorocarbons Life Cycle Management

Promoting the Life Cycle Management of Fluorocarbons approach

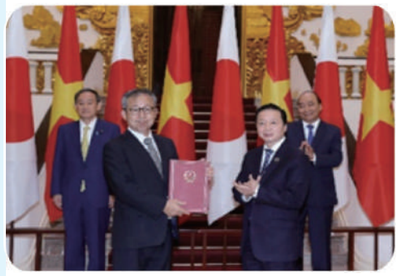
Besides the commitment to the Kigali Amendment, addressing the existing Fluorocarbons bank can reduce more greenhouse gases emissions. Japan has actively promoted the Life Cycle Management of Fluorocarbons approach through the Initiative on Fluorocarbons Life Cycle Management (IFL).



Source: Ministry of the Environment, Japan

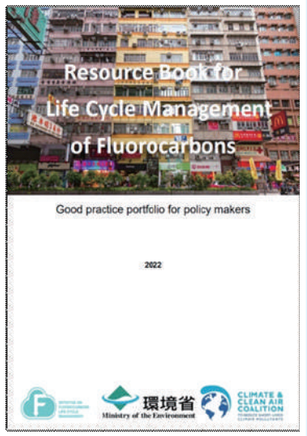
International Cooperation under the IFL

The IFL and its partners strive to facilitate concrete actions, innovations and collaborations among governments, private sectors and international organizations. Capacity building training, policy advice and resource book, and F-gas destruction project are some of the IFL's achievements so far.



Support on legislation, policy, and capacity development

F-gas destruction demonstration projects trough JCM

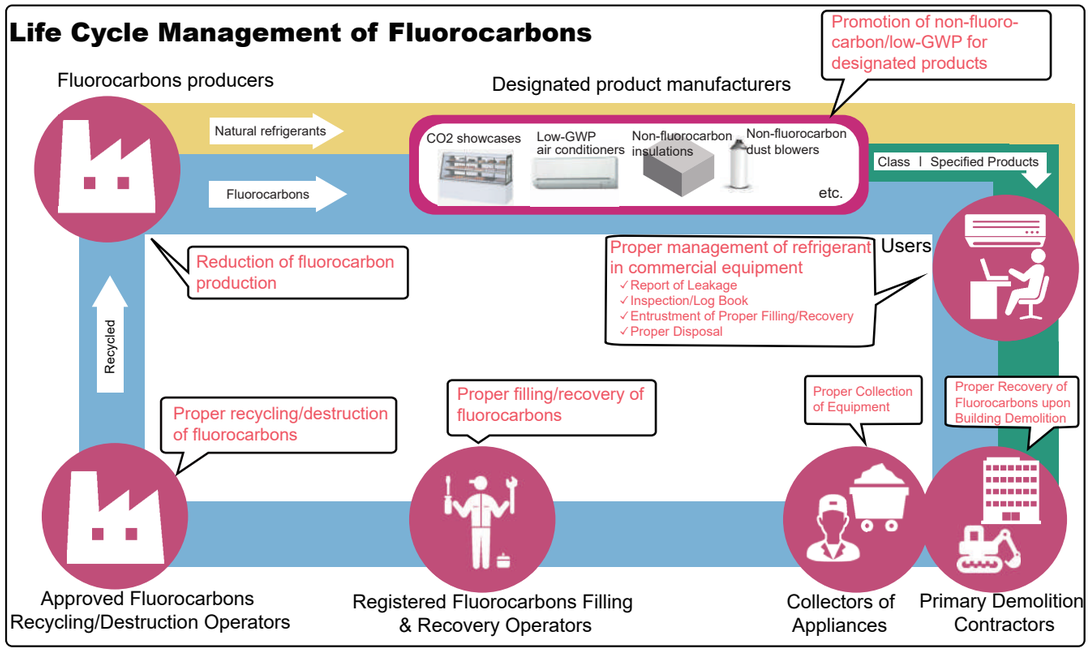


The resource book shares good practices around the world

Japan's legal framework on fluorocarbon management

In Japan, CFCs, HCFCs, and HFCs have been recovered from commercial refrigerators and air conditioners at the time of maintenance and disposal of equipment since 2001, which are mandated by the law. The recovered refrigerants are recycled or destroyed in order to prevent fluorocarbons from being released into the air.

In 2015 and 2019, the "Act on Rational Use and Proper Management of Fluorocarbons" was amended and strengthened to implement comprehensive measures throughout the life cycle of fluorocarbons.



Specified products are commercial refrigerators and air conditioners containing fluorocarbon refrigerants.

■ Major responsibilities of stakeholders

Fluorocarbons Producers

Manufacturers and importers of CFCs, HCFCs, and HFCs must be received permission and assigned quota systems. Moreover, they must rationally use fluorocarbons, including the production of alternatives following the criteria established by the government.

Designated Product Manufacturers

Manufacturers and importers of designated product must strive to reduce environmental impact due to fluorocarbons in accordance with the evaluation criteria established by the national government.

The target GWP value of the designated products is set by category and periodically reviewed taking into consideration the lowest GWP refrigerant (the top runner) among the designated products in the market in Japan, taking into account safety, energy efficiency, affordability, etc.

Manufactures and importers of the designated products are required to meet the target GWP value by the target year of the corresponding category. The compliance with the target value is measured for each category based on the volume weighted average GWP of all the refrigerants, blowing agents, or propellant gases contained in all the products that are shipped by each company in each year, not on the basis of individual products.

Sections(Types) of designated Products	Currently Used Main Refrigerants and GWPs	Target GWPs	Target Years
Residential Air Conditioners(Excluding Through-the-Wall Types)	R410A(2090),R32(675)	750	2018
Stores/Shop/Office Air Conditioners			
(i)Those with Legal Freezing Capacity of Less Than 3 tons, Excluding Floor Type	R410A(2090),R32(675)	750	2020
(ii)Those with Legal Freezing Capacity of 3 tons or more, Excluding (iii) and Floor Type	R410A(2090)	750	2023
(iii)Those Central Air Conditioners Using Centrifugal Chillers	R134a(1430),R245fa(1030)	100	2025
(iv)Multi air conditioners for buildings (Limited to those involving new installation and renewal of refrigerant piping sets, excluding simultaneous cold/heat operation types and those for cold climates.)	R410A(2090)	750	2025
Automotive Air Conditioners (Limited only to Those Listed as Passenger Vehicles (Excluding Automobils with 11 or More Passengers))	R134a(1430)	150	2023
Condensing Units and Stationary Type Freezer Refrigerator Units (Excluding Condensing Units with Rated Output of 1.5kW or Less)	R404A(3920),R410A(2090), R407C(1170),CO2(1)	1500	2025
Central System Freezer Refrigerator Equipment (Limited to Those Shipped for Newly Installed Freezer Refrigerators with Freezing Capacity of 50,000 ㎥ or More)	R404A(3920),NH3(1)	100	2019
Refrigerator or Freezer using Rigid Polyurethane Foams	HFC-245fa(1030), HFC-365mfc(795)	100	2024
Vending machines with refrigerating or freezing function (only products with rigid polyurethane foam for heat insulation)		100	2024
Rigid polyurethane foam stock solution		100	2020
Rigid polyurethane foam stock solution (except for products used for housing)		100	2024
Insulating Material Using Rigid Polyurethane Foams (Limited to Those Used for House Building Material and Formed at Building Sites)		100	2024
Sprayer Exclusively Filled with Propellants (Excluding Uses That Require Non-flammability)	HFC-134a(1430), HFC-152a(124),DME(1)	10	2019

Source: Ministry of Economy, Trade and Industry, Japan

Users/ Maintenance Operators/ Disposal Operators

Users of specified products must report the calculated leakage amount to the government if there is leakage of 1,000t-CO_2 eq or more.

When filling or recovering them, users must entrust registered operators to fill/rocover. When disposing them, users must submit a certificate of recovery to recycling/destruction operators. (See p.9 for details)

Primary Demolition Contractors and Collectors of Appliances

Demolition contractors must confirm presence/absence of the specified products upon the building demolition.

Collectors of the appliances must not collect the appliances without the certificate of fluorocarbons recovery. (See p.9 for details)

Registered Fluorocarbons Filling/ Recovery Operators

Fluorocarbons filling/recovery operators must be registered to local governments and they must comply with the criteria in filling or recovering fluorocarbons. If they do not recycle recovered fluorocarbons by themselves, they must deliver fluorocarbons to an approved fluorocarbon recycling operator or an approved fluorocarbon destruction operator.

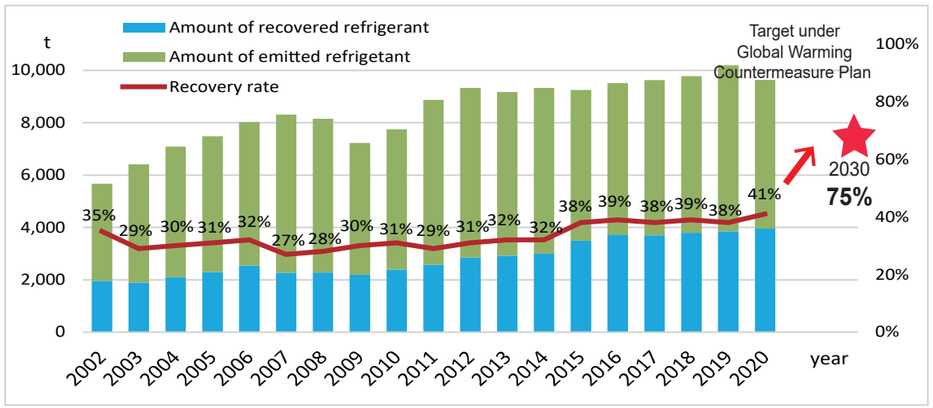
Approved Fluorocarbons Recycling/ Destruction Operators

Fluorocarbons recycling/destruction operators must be approved by the government upon their operation. They must recycle or destroy delivered fluorocarbons in accordance with the standards for the recycling/destruction of fluorocarbons.

Strengthening of Recovery, Recycling & Destruction of Fluorocarbons

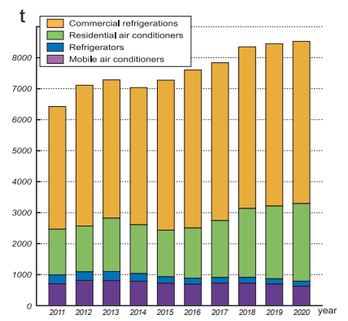
In Japan, the regulations on fluorocarbons prohibit intentional emissions of fluorocarbons contained in equipment at the time of disposal. The gases must be recovered from equipment such as home appliances, cars and commercial equipment, and the recovered gases are required to be recycled or destroyed.
The recovery rate of fluorocarbons remains around 40%. To achieve 75% recovery rate by 2030, the regulation was strengthened to ensure the recovery of fluorocarbons at the disposal of equipment.

Recovery of refrigerant from super-market cold showcase
Source: Refrigerants Recycling Promotion and Technology Center, Japan

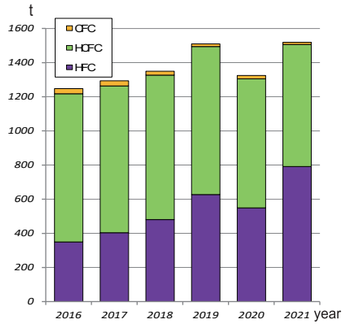


Source: Ministry of the Environment, Japan

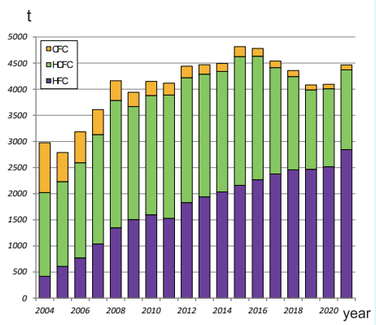
■The Amounts of Recovered, Recycled, and Destroyed Refrigerants in Japan



Amount of recovered refrigerant in Japan
Source: Ministry of the Environment, Japan



Amount of recycled refrigerant in Japan
Source: Ministry of the Environment, Japan



Amount of destroyed refrigerant in Japan
Source: Ministry of the Environment, Japan

End-of-Life
Household refrigerators, A/C and heat-pump

Will be recovered under “Home Appliance Recycling Law”

Request the shop from which you bought the end-of-life product or the shop from which you buy a new product to take back the end-of-life product

Pay for collection, transportation and recycling when handing over the end-of-life product

*Price for collection and transportation differs between shops.
*Recycling fee differs between product manufacturers.

After you have paid the recycling fee, request the shop to issue a home appliance recycling ticket

You can monitor the status of recycling on the Internet with the ID number on the ticket.

Fluorocarbons → Recovered for recycling or destruction

Iron, aluminum, etc. → Recycled as resources

End-of-Life
Automobiles

Will be recovered under “End-of-life Vehicle Recycling Law”

Hand over the end-of-life vehicle to collection operators registered with local governments. (Car dealers or servicing workshops)

Pay recycling fee

*Recycling fee differs between car manufacturers.

When and to whom to pay

*Purchase of a new car	When purchasing	To the car dealer
*For already owned cars	Before next periodical inspection	To Transport Bureau or servicing workshops
When you discard a car before next automobile inspection	When discarding	To the collection operator

*Once the payment has been made at the time of purchase or periodical inspection, no more payment is required at the time of discarding the vehicle

Fluorocarbons → Recovered for recycling or destruction

Iron, aluminum, etc. → Recycled as resources

End-of-Life
Commercial refrigerators, A/C and heat-pump

Amended “Act on Rational Use and Proper Management of Fluorocarbons” enforced in 2020, aiming to ensure the recovery of fluorocarbons during disposal of equipment.

Person undertaking disposal

User(disposer)
・Failing to collect fluorocarbons at the time of disposal will result in direct penalties.

User and those entrusted with the disposal
・They must confirm that fluorocarbons recovery has been completed based on the collection certificate from the recovery operator, and submit the copy of the certificate to the collector of appliances.

Recovery operator

HFC → Fluorocarbons

Collection certificate

Collection certificate

Person undertaking collection

・When the collection of fluorocarbons cannot be confirmed, collection of the equipment itself is prohibited.

Equipment

Source: Ministry of the Environment, Japan