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# The Kigali amendment and Policy for fluorocarbons in Japan

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# Outline of presentation

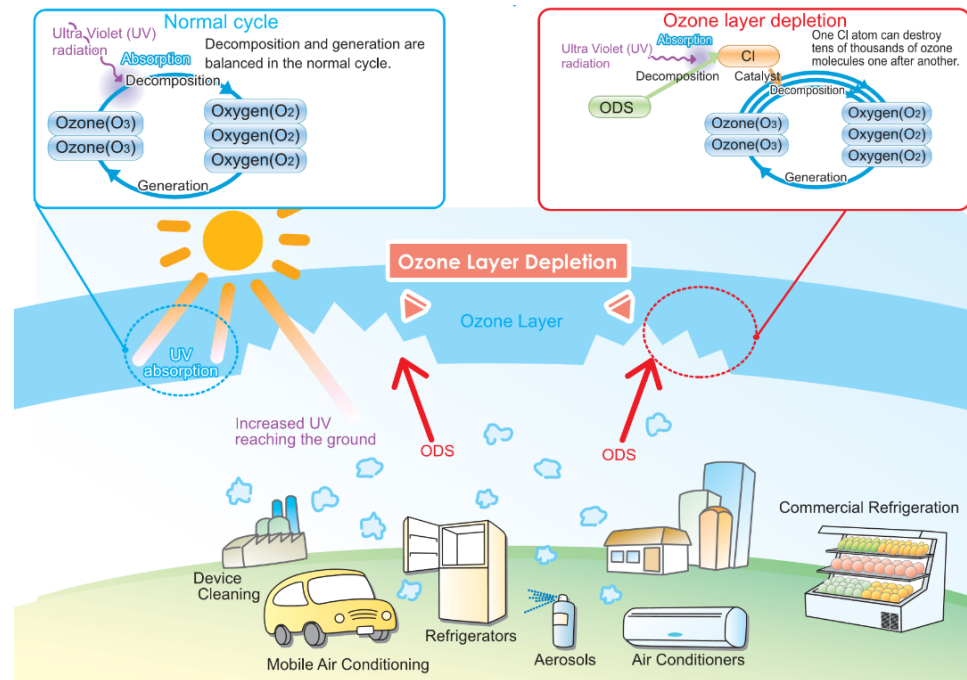
- ◆ the Protection of Ozone Layer  
(the Montreal Protocol)
- ◆ the Kigali Amendment
- ◆ Act on Rational Use and Proper Management  
of Fluorocarbons

# the Protection of Ozone Layer(the Montreal Protocol)

The ozone layer is a protective shield up in the air that absorbs harmful ultraviolet rays (UV-B), which can cause various negative impacts on human health and ecosystems. However, it has been destroyed by man-made chemicals called Ozone Depleting Substances (ODS) so much that there is a “hole” in the ozone layer (known as ozone hole).

In order to protect the ozone layer, the global community has agreed to phase out ozone-depleting substances under the Vienna Convention for the Protection of the Ozone Layer (1985) and the Montreal Protocol on Substances that Deplete the Ozone Layer (1987).

With 197 countries working together, both developed and developing countries, the Montreal Protocol is a global environmental treaty of universal ratification.



## Negative impacts of excessive UV 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.

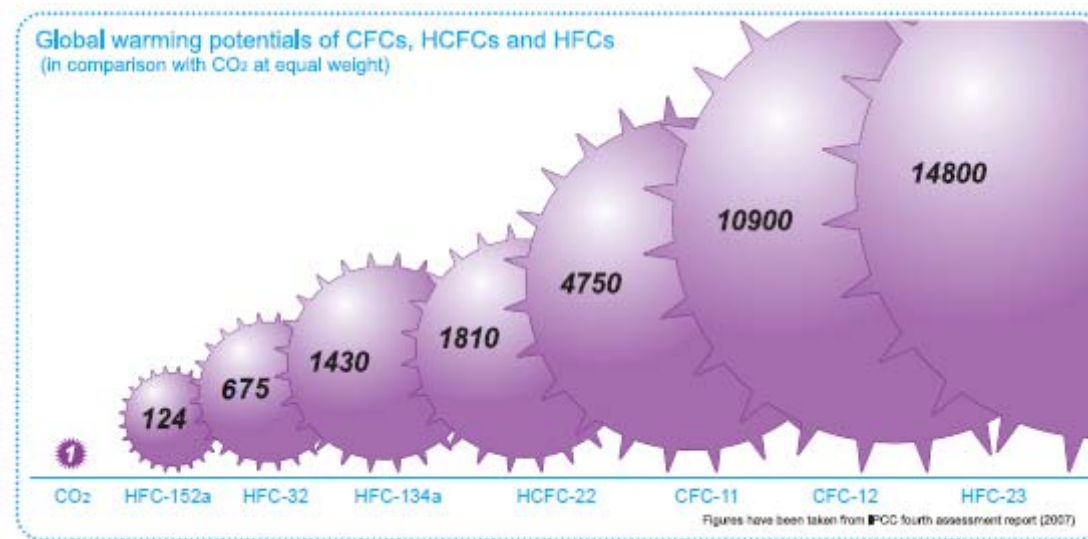
#### Pterygium

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.

# ODS(CFCs and HCFCs) are also greenhouse gases

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. In addition, HFCs that are ozone friendly and therefore used as alternatives to CFCs and HCFCs are also greenhouse gases.

CFCs, HCFCs, and HFCs are still used in our daily life. Therefore, it is important to control the emissions into the atmosphere for the prevention of climate change.



“Let’s protect the ozone layer 2016 edition”,MOEJ

# the Kigali Amendment

In terms of global warming countermeasures, the phase-down of HFCs under the Montreal Protocol has been under negotiation by the Parties since 2009.

In Oct. 2016, at the 28th Meeting of the Parties (MOP 28) to the Montreal Protocol, the Parties adopted the amendment (called the Kigali Amendment) to phase down HFCs in order to reduce the use of high global warming potential HFCs.

Phase-down schedule is shown in the table below.

	Developing countries Group 1 <sup>※1</sup>	Developing countries Group 2 <sup>※2</sup>	Developed countries <sup>※3</sup>
Baseline Years	2020-2022	2024-2026	2011-2013
Baseline Calculation (HFC + HCFC)	Average production /consumption of HFCs in 2020, 2021, and 2022 plus 65% of HCFC baseline production/consumption	Average production /consumption of HFCs in 2024, 2025, and 2026 plus 65% of HCFC baseline production/consumption	Average production /consumption of HFCs in 2011, 2012 & 2013 plus 15% of HCFC baseline production/consumption
Freeze	2024	2028 <sup>※4</sup>	-
Reduction steps <sup>※5</sup>	2029 : ▲10% 2035 : ▲30% 2040 : ▲50% 2045 : ▲80%	2032 : ▲10% 2037 : ▲20% 2042 : ▲30% 2047 : ▲85%	2019 : ▲10% 2024 : ▲40% 2029 : ▲70% 2034 : ▲80% 2036 : ▲85%

※ 1 : Developing countries other than Group 2

※ 2 : India, Pakistan, Iran, Iraq, and Gulf countries

※ 3 : For Belarus, the Russian Federation, Kazakhstan, Tajikistan and Uzbekistan 25% HCFC component of baseline and different initial two steps (1) 5% reduction in 2020 and (2) 35% reduction in 2025

※ 4 : Technology review four to five years before 2028 to consider the compliance deferral of two years from the freeze of 2028

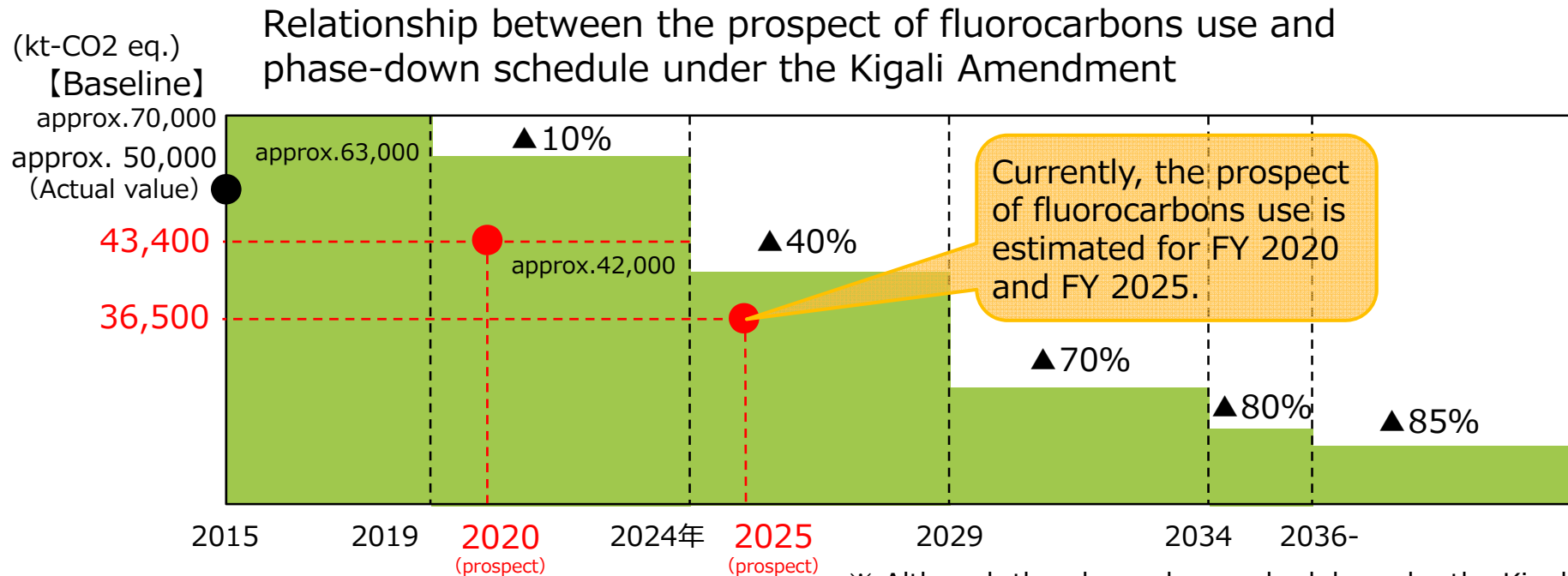
※ 5 : Technology review in 2022 and every five years

# the Kigali Amendment

## Japan's policy based on the Kigali Amendment

In accordance with domestic law, manufacturers of fluorocarbons formulate “rationalization plans for use” in order to systematically rationalize the use of other fluorocarbons by promoting countermeasures such as the production of alternative substances for fluorocarbons while taking into account the prospect of fluorocarbons use estimated by the government.

Current “rationalization plans for use” formulated by these manufactures show reduction targets of fluorocarbons consumption for FY2020.



Source: MOE and METI, WG on measures to deal with Fluorocarbons (2017.4.11)

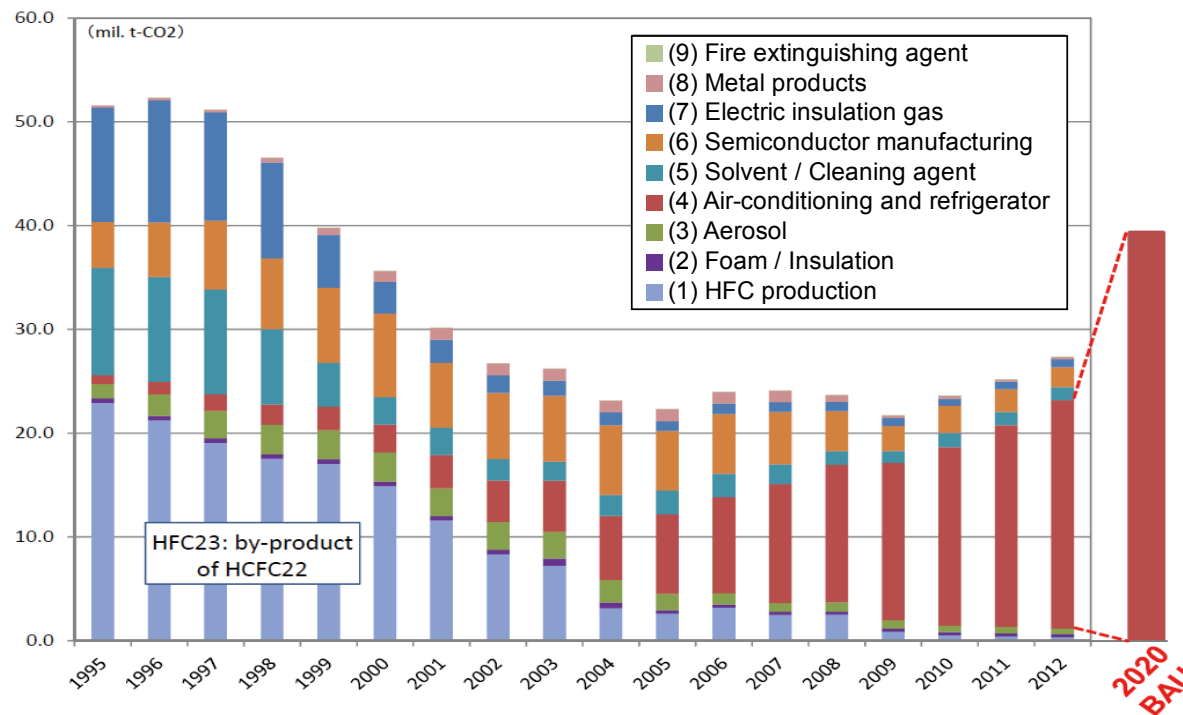
※ Although the phase-down schedule under the Kigali Amendment is CY basis, the prospect is FY basis.

- Comprehensive measures throughout the life cycle of fluorocarbons
  - HFCs emissions have been increasing
  - Leakage from RAC\* equipment in use is more than expected
  - Comprehensive measures throughout the life cycle of fluorocarbons
- Outline of the “Act on Rational Use and Proper Management of Fluorocarbons”
  - Life cycle of fluorocarbons
  - Major responsibilities of stakeholders

\* Refrigeration and Air Conditioning

# HFCs emissions have been increasing

- In Japan, since 2001 under the “Law concerning the Recovery and Destruction of Fluorocarbons”, CFCs, HCFCs and HFCs have been recovered from commercial RAC equipment at the time of maintenance and disposal of equipment and have been recycled or destroyed.
- However, HFCs emissions have been increasing rapidly and are expected to double in 2020 as compared to the emissions in 2011 from RAC equipment.

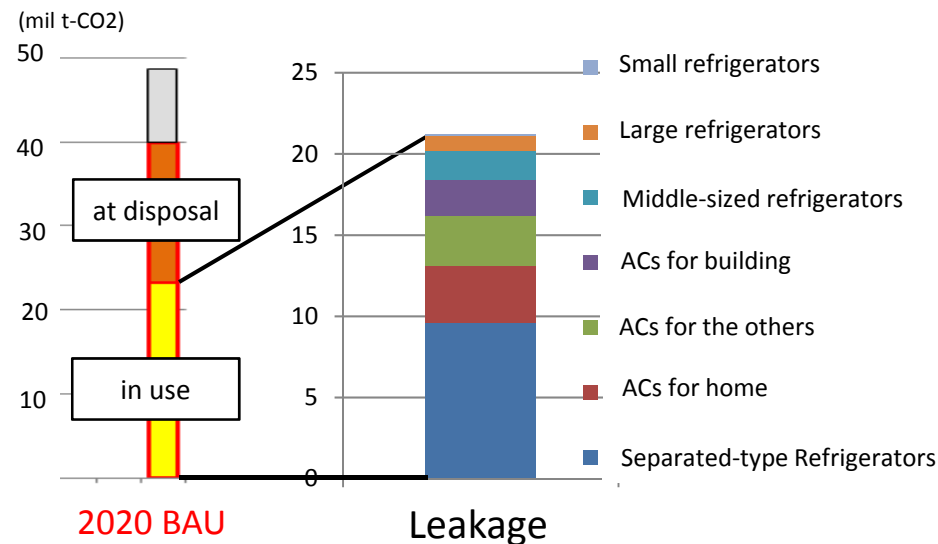


Estimated fluorocarbon emissions from RAC equipment in 2020



# Leakage from RAC equipment in use is more than expected

- The recovery rate of fluorocarbons from end-of-life commercial RAC equipment remained low (about 30%).
- It was found out that refrigerant leakage from the equipment in use is going to be much more than expected due to poor maintenance and aging, etc. of the equipment.



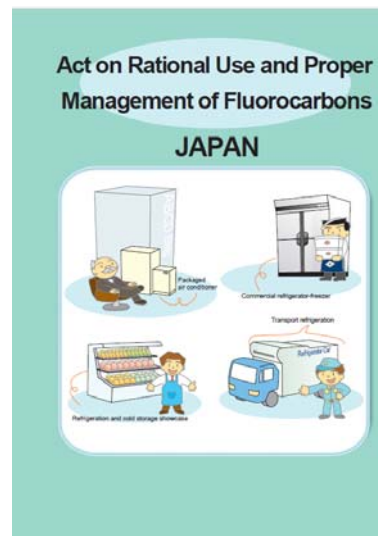
Estimated fluorocarbon emissions and leakages by sector in 2020 (BAU)

# Comprehensive measures throughout the life cycle of fluorocarbons

- The government of Japan decided to amend and strengthen the “Law concerning the Recovery and Destruction of Fluorocarbons” in order to implement comprehensive measures throughout the life cycle of fluorocarbons.
- The amended law has come into force on 1 April 2015 as the **“Act on Rational Use and Proper Management of Fluorocarbons”**.

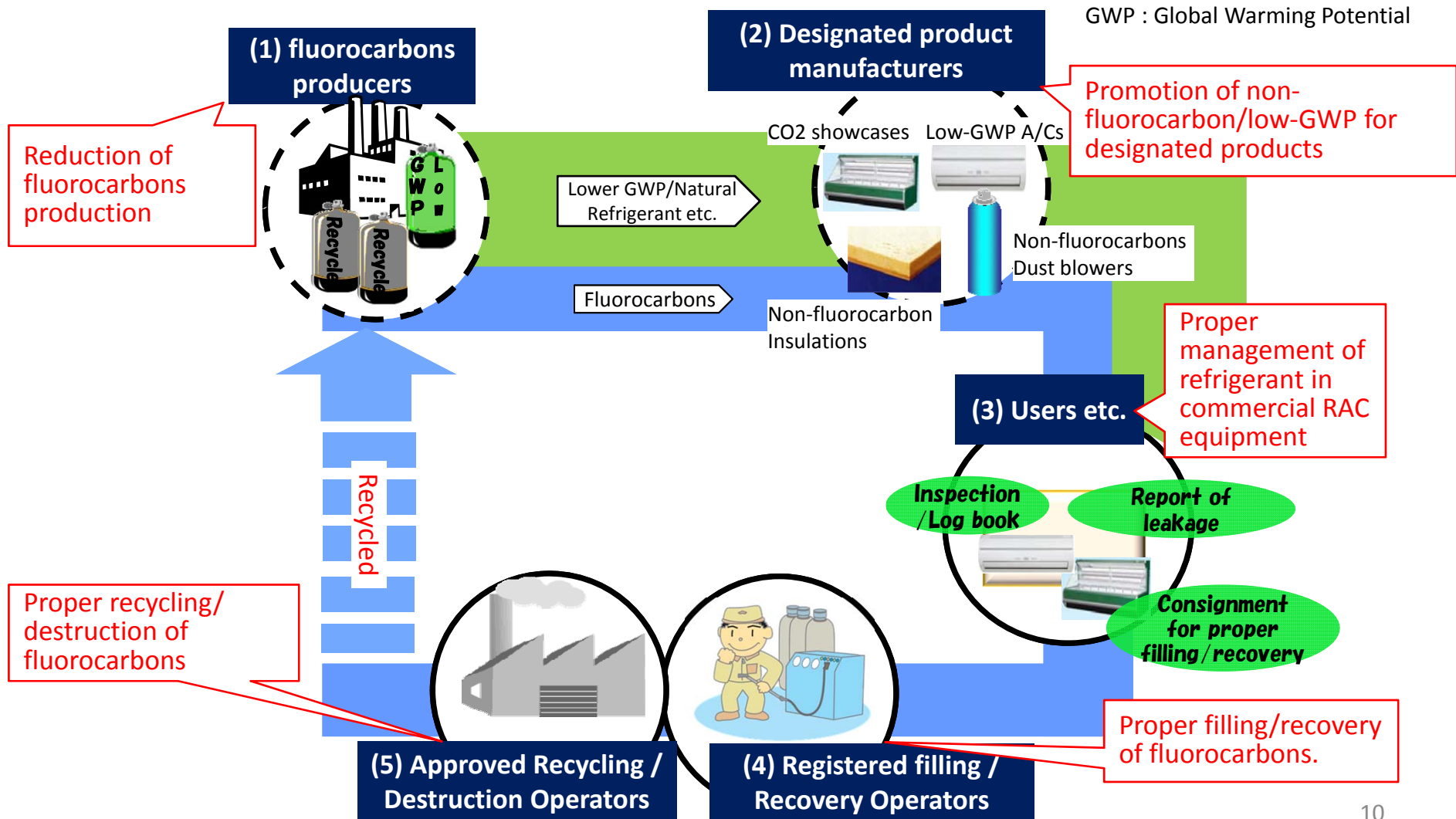
the guidebook →

URL <http://www.env.go.jp/en/earth/ozone/laws/ozone4.pdf>



# Life cycle of fluorocarbons

- The “Act on Rational Use and Proper Management of Fluorocarbons” intended for entire life cycle of fluorocarbons .



# Major responsibilities of stakeholders

## (1) Fluorocarbons producers

Producers and importers of fluorocarbons must make the rational use of fluorocarbons, including the production of alternatives for fluorocarbons.

## (2) Designated product manufacturers

Manufacturers and importers of designated product must strive to reduce environmental impact due to fluorocarbons.

## (3) Users etc. of specified products

Users of specified products

- carry out inspection of the equipment.
- must report calculated leakage amount of fluorocarbons.
- must consign filling/recovery of fluorocarbons or deliver fluorocarbons to a registered filling/recovery operator, at maintenance or disposal of the equipment.

## (4) Registered fluorocarbons filling/recovery operators

Registered fluorocarbons filling/recovery operators must comply with the filling/recovery criteria in filling or recovering fluorocarbons.

## (5) Approved fluorocarbons recycling/destruction operators

Approved fluorocarbons recycling/destruction operators must recycle or destroy delivered fluorocarbons.

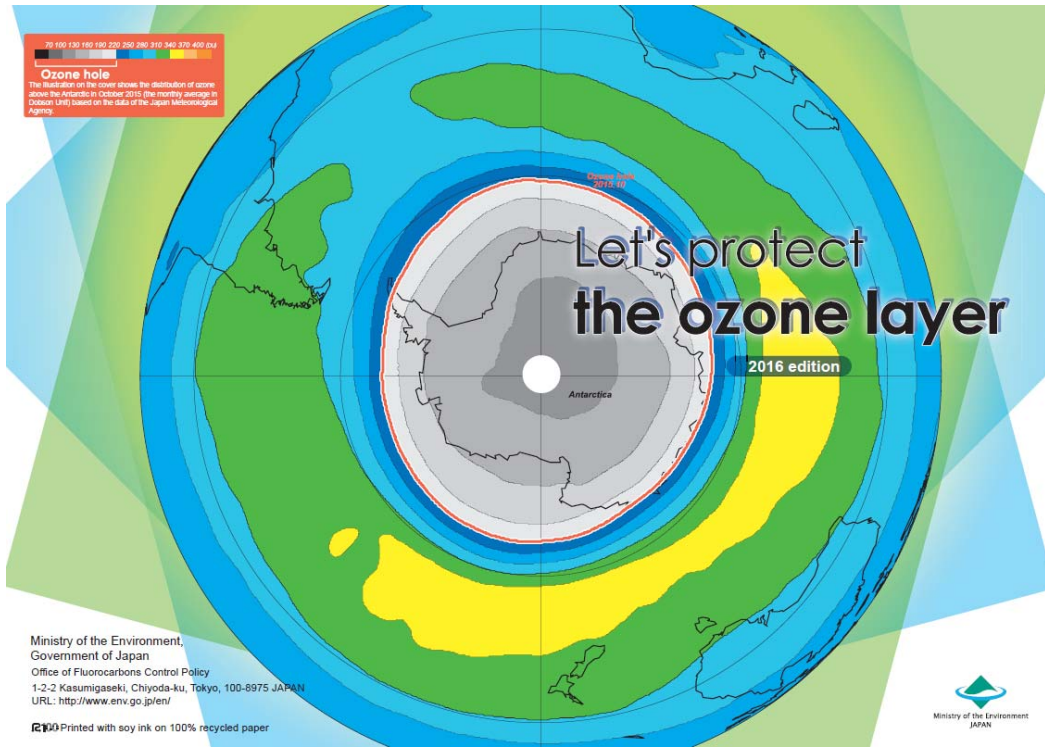
# Summary

- ❑ In order to protect the ozone layer, the Montreal Protocol on Substances that Deplete the Ozone Layer was agreed on.
- ❑ The Kigali Amendment is to phase down HFCs in order to reduce the use of high global warming potential HFCs.
- ❑ Japan amended the “Act on Rational Use and Proper Management of Fluorocarbons” in order to implement comprehensive measures throughout the life cycle of fluorocarbons.
- ❑ Taking into account the phase-down schedule under the Kigali amendment, Japan will enhance the policies and measures through the “Act on Rational Use and Proper Management of Fluorocarbons” while continuously reviewing the prospect of fluorocarbons use.

**Finish !!**

**Thank you for your attention**

# For your reference



**Ozone hole**  
The illustration on the cover shows the distribution of ozone above the Antarctic in October 2015 (the monthly average in October 1979) based on the data of the Japan Meteorological Agency.

Ministry of the Environment,  
Government of Japan  
Office of Fluorocarbons Control Policy  
1-2-2 Kasumigaseki, Chiyoda-ku, Tokyo, 100-8975 JAPAN  
URL: <http://www.env.go.jp/en/>

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## Refrigeration, Recycling & Destruction of CFC, HCFC, & HFC

CFCs and HFCs are controlled and they must be recycled, cars, and commercial equipment when these gases are discarded. Recovered gas must be instead of being released into the air.

**Recycling Law**

When you buy a product, you must buy the recycling product.

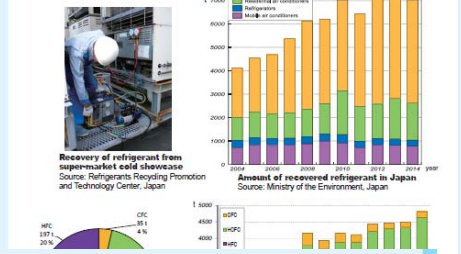
When you discard a product, you must pay the recycling fee.

**End-of-life automobiles**

When you buy a car, you must buy the car with the End-of-life Automobile Recycling Law.

When you discard a car, you must pay the recycling fee.

In Japan, there are more than 40 home-appliance recycling plants, more than 20 F-gas recycling facilities and more than 60 F-gas destruction facilities in commercial operation using various technologies such as superheated steam, municipal waste incinerators, cement kiln, etc. More than 7,000 tons of refrigerant CFC, HCFC and HFC was recovered from equipment in Japan in 2014, and about 965 tons of refrigerant was recycled and about 4,800 tons of refrigerant was destroyed in Japan in 2015.



## Preventing Global Warming

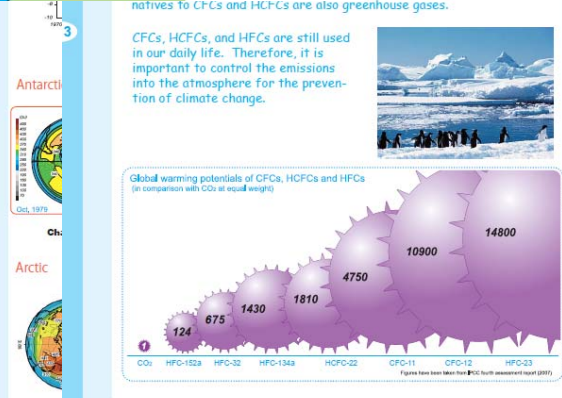
CFCs and HCFCs are also controlled under the Montreal Protocol as they contribute to the mitigation of climate change.

HFCs and PFCs are also controlled under the Kyoto Protocol as they are greenhouse gases.

Type	Ozone Depleting Potential	Global Warming Potential	Uses
CFC	CFC-11 (1.0)	CFC-11 (4,750)	Refrigerants, Foam blowing agents, Device cleanings, Aerosols
	CFC-12 (0.8)	CFC-12 (10,900)	
	CFC-113 (0.8)	CFC-113 (6,130)	
Halon	Halon-1211 (3.0)	Halon-1211 (1,500)	Fire extinguishings
	Halon-1301 (10.0)	Halon-1301 (7,140)	
	Halon-2402 (6)	Halon-2402 (1,640)	
Carbon Tetrachloride	1.1	1,400	Solvent used in laboratories and in materials
	1,1,1-Trichloroethane	0.1	Cleaning Agents
HCFC	HCFC-22 (0.055)	HCFC-22 (1,810)	Refrigerants, Foaming agents, Cleaning agents
	HCFC-141b (0.11)	HCFC-141b (725)	(Fire extinguishings)*
HBFC	0.74	-	(Solvents, Agrochemicals, Medicine, Methylene Chloride)
Bromochloromethane	0.12	-	(Solvents, Agrochemicals, Medicine, Methylene Chloride)
Methyl Bromide	0.6	-	Sulfonating agents (herbicides), Pesticide
HFC	0	HFC-23 (14,500)	Refrigerants, Foaming agents, Aerosols
		HFC-32 (675)	
		HFC-134a (1,430)	
		HFC-152a (134), R-410A (2,090)	
PFC	0	7,390 - 12,200	Solvents, Device cleaning agents, Semiconductor production, Liquid crystal production
SF6	0	22,800	Electric insulator (power transmission), Semiconductor production, Liquid crystal production, Magnesium production

\*HFC and Bromochloromethane are not used in Japan. Source: UNEP, IPCC fourth assessment report (2007)

Negative impacts of excessive UV on human health	
Acute (symptoms immediately appear)	Chronic (symptoms gradually appear)
<b>Sunburn</b> Red inflammation of the skin that appears a few hours after UV exposure  <b>Sunburn</b> Browning of the skin that appears a few days after UV exposure  <b>Snow blindness</b> Inflammation of the iris of the eye that occurs when the eye is exposed to UV in places such as snowy grounds and marine beaches. The white of the eye congests, accompanied by pain. The symptom is resolved in 1-2 days.  Suppressions of the immune system	<b>Wrinkle, Freckle, Senile plaque</b> <b>Benign tumor</b> <b>Precancerous lesion</b> <b>Solar keratosis</b> <b>Skin cancer</b>  <b>Cataract</b> 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 operations.  <b>Pterygium</b> A disease in which the abnormal growth caused by UV in the form of the white conjunctiva of the eye gradually develops towards the iris (cornea). It can be removed by surgical operations but may recur.



CFCs, HCFCs, and HFCs are used in our daily life for...

- Heat-pump washer-dryer**: Contains about 0.15 kg of CFC or HFC (=equivalent to approx. 200 kg of CO<sub>2</sub>)
- Refrigerator**: Contains about 1 kg of CFC or HFC (=equivalent to approx. 2,000 kg of CO<sub>2</sub>)
- Automobile air conditioner**: Contains about 0.6 kg of CFC or HFC (=equivalent to approx. 800 kg of CO<sub>2</sub>)
- Pressurized Gas Duster**: Contains about 0.1 kg of CFC or HFC (=equivalent to approx. 100 kg of CO<sub>2</sub>)