

# OzoNews

A fortnightly electronic news update on ozone and climate protection and the implementation of the Montreal Protocol brought to you by OzonAction

Volume XXI | 30 May 2021

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GLOBAL

## 1. Kigali Amendment latest ratification

Congratulations to the latest country which have ratified the Kigali Amendment:

[Gambia, 5 May 2021](#)

At the Twenty-Eighth Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer, held in Kigali from 10 to 15 October 2016, the Parties adopted, in accordance with the procedure laid down in paragraph 4 of article 9 of the 1985 Vienna Convention for the Protection of the Ozone Layer, a further amendment to the Montreal Protocol as set out in Annex I to the report of the Twenty-Eighth Meeting of the Parties (Decision XXVIII/1).

Kigali Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, Status of Ratification 15 October 2016 to [date](#).

[United Nations Treaty Collection](#)

Image: UN Treaty Collection website



## 2. Appointment of Ms. Meg Seki as Executive Secretary, announcement by Inger Andersen, UNEP Executive Director

Ref: Oz.Sec./Staff 18 May 2021

Dear Parties to the Vienna Convention and the Montreal Protocol,

I would like to inform you that following the completion of a competitive recruitment process for the Executive Secretary at the D-2 level, the Secretary-General has appointed Ms. Meg Seki as Executive Secretary of the Ozone Secretariat.

As you may be aware, Ms. Seki, who currently serves as acting Executive Secretary for the Ozone Secretariat, is a national of Japan. She has had longstanding involvement on ozone layer issues, having joined as one of the first staff members in the Secretariat when it was formally established in 1989. Please find below a detailed bio.

I thank the Parties for their continued support through the years and ask them to join me in congratulating Ms. Seki.

Yours sincerely,  
Inger Andersen  
Executive Director



Meg's work in ozone layer issues started in 1988. She worked in the interim ozone secretariat and was one of the three core staff members of the Ozone Secretariat when it was formally established in 1989. She was the first consultant that UNEP hired to prepare country programmes for Fiji, Ghana, Maldives, Syria, Uganda and Zambia, working with the respective country teams to prepare their first country programmes. Meg also worked as Regional Network Coordinator for South East Asia Ozone Officers' Network between 1993 and 1994.

From 1994 and prior to re-joining the Ozone Secretariat in 2003 as Senior Scientific Officer, Meg worked in various parts of UNEP, including in the GEO team that prepared the first two issues of the Global Environment Outlook; in the Atmosphere Unit working climate, climate change and transboundary air pollution; and as Chief of Atmosphere and Desertification Conventions Unit on Climate and Desertification Conventions, Intergovernmental Panel on Climate Change, as well as on interlinkages among multilateral environmental agreements.

Meg has an MSc in Environmental Technology from Imperial College, London, and a BSc in Environmental Science from the University of East Anglia.

[The UN Environment Programme, Ozone Secretariat, 18 May 2021](#)

Image: Ozone Secretariat website

3. Parties to the Montreal Protocol continue online discussions on the replenishment of the Multilateral Fund

Nairobi, 25 May 2021 – Over the course of 21, 22 and 24 May 2021, parties and other stakeholders to the Montreal Protocol on Substances that Deplete the Ozone convened online to discuss the replenishment



of the Multilateral Fund for the Implementation of the Montreal Protocol for the period 2021–2023, specifically 2021 contributions by some countries. The other agenda item comprised further guidance to the Technology and Economic Assessment Panel (TEAP) Replenishment Task Force (RTF) on further work on its replenishment report, which would be needed for the continued replenishment negotiations to be held at the combined twelfth meeting (part II) of the Conference of the Parties and Thirty-Third Meeting of the Parties (COP12(II)/MOP33) in October 2021.

The newly appointed Executive Secretary of the Ozone Secretariat, United Nations Environment Programme, Megumi Seki, in her statements to participants of both the Fourth Extraordinary Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer (ExMOP4) and the replenishment meeting of the forty-third Open-ended Working Group meeting (OEWG43), acknowledged that due to the ongoing COVID-19 pandemic “we once again find ourselves unable to meet in person”. She reminded the delegates of the importance of reaching consensus despite the ongoing online negotiation challenges to ensure the continued progress in the implementation of the Montreal Protocol. Over the ExMOP4 and OEWG43 sessions, daily participant numbers comprising parties to the Montreal Protocol, experts of Assessment Panels of the Montreal Protocol and observers from industry and non-governmental organizations participated in the meeting were around 200-280.

During the ExMOP4 on 21 May, parties considered and adopted a decision to facilitate advance payments of national contributions to the Multilateral Fund. A number of donor countries required such a decision before the end of June 2021 in order to contribute. The brief consultation noted the need to maintain funding for ongoing project work, including toward phasing out hydrochlorofluorocarbons (HCFCs), which are ozone-depleting substances, and phasing down hydrofluorocarbons (HFCs), potent greenhouse gases that are often used as replacements for HCFCs. The decision was quickly and unanimously adopted.

At the online replenishment meeting of the OEWG43 on 22 and 24 May, parties sought to agree on the guidance to the TEAP task force for the scope of further work on its replenishment report issued in May 2020. Parties worked through a proposed text and agreed in the end to update the report with corrections, clarifications, and incorporation of the outcomes of the Multilateral Fund’s Executive Committee meetings this year. Suggestions for additional analyses, including economic impacts of the COVID-19 pandemic, were not agreed to, noting the travel and meeting restrictions, as well as the time constraints to complete this work before early September. The OEWG43 discussions were not so straightforward. Intense effort was required by the parties to build consensus on the language of the directives. As the session drew into overtime, the parties concluded on the guidance to the TEAP. Mindful of the late hour for some delegates, the first session of the OEWG43 was closed and will reconvene online in July 2021 to discuss CFC-11 and energy efficiency.

### [The UN Environment Programme, Ozone Secretariat, 25 May 2021](#)

Read/Download the [Summary Report](#)

**See also** >>> [4<sup>th</sup> Extraordinary Meeting of the Parties to the Montreal Protocol \(ExMOP-4\) and 1<sup>st</sup> Part of the 43<sup>rd</sup> Meeting of the Open-ended Working Group \(OEWG43\)](#), Highlights and photos and other coverages, by IISD

Image: Ozone Secretariat website

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4. 19<sup>th</sup> European Conference: The latest technologies in refrigeration and air conditioning - **environment, energy, training, certification, legislation, standards, safety**, 10-11 June 2021

UNEP OzonAction, IIR, ATF (Italian Refrigeration Association) and Centro Studio Galileo are jointly organizing the European Conference about Technologies in Refrigeration and Air Conditioning for more than 15 years which always convened in Milan, Italy.

This year's conference, 10-11 June 2021, will be organized in a hybrid format i.e. in-person and virtual which would allow more participation from developing countries.

[Learn more >>>](#)



**TO PARTICIPATE IN THE CONFERENCE**

*Including:* conference kit, conference proceedings, simultaneous translation, attendance certificate (sent via e-mail on 15<sup>th</sup> June 2021)

[Registration form \(.pdf\)](#) | [Registration form \(.doc\)](#) | [Online registration](#) (with credit card)

Image: Centro Studio Galileo



5. World Refrigeration Day announces theme of 2021 campaign

**“Cooling Champions: Cool Careers for a Better World”**

World Refrigeration Day celebrates the people and technologies responsible for creating and maintaining the world we live in, a world dependent upon temperature-controlled environments. Centered around June 26, the event is supported globally by industry, professional groups, scientific and engineering associations, as well as by governments and individuals.

The WRD 21 campaign will focus on careers in the refrigeration, air-conditioning and heat pumps industry and is titled **“Cooling Champions: Cool Careers for a Better World”**. The

goal of the campaign is to inspire students and young professionals – for both men and women – in all countries, encouraging them to meet the challenges faced in their communities.

Following successful campaigns in the last two years, the WRD Secretariat will continue partnering with UNEP OzonAction in the WRD 21 campaign to attract a new generation of Cooling Champions. The campaign includes other partners representing the industry and professionals around the world. The full list of partners and the campaign program will be announced in the coming weeks.

Refrigeration is at the very heart of modern life. More than 15 million people are employed worldwide in the refrigeration sector. The total number of refrigeration, air-conditioning and heat-pump systems in operation worldwide is around 5 billion. Those systems provide the conditions we require for health, comfort, worker productivity, manufacturing, and essential environments for food, pharmaceuticals, and digital data. Dedicated professionals design, build, maintain, and regulate them as well as educate a new generation of practitioners.

Opportunities within the industry abound for young people with a wide range of career aspirations. Advanced cooling technologies need to be implemented in order to expand life required environmental conditions while meeting sustainability requirements of international climate and ozone protection accords. A new generation of cooling champions – engineers, technicians, researchers, educators, policy experts and executives – are needed to create controlled environments modern live requires. The benefits of reaching into a wide diversity of communities for promising talent will be a high campaign priority.

To support the Cooling Champions Campaign contact: [info@worldrefrigerationday.org](mailto:info@worldrefrigerationday.org)

[World Refrigeration Day 26<sup>th</sup> June around the World](#)

Image: WRD

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## 6. Stratospheric contraction caused by increasing greenhouse gases

### Abstract

Rising emissions of anthropogenic greenhouse gases (GHG) have led to tropospheric warming and stratospheric cooling over recent decades. As a thermodynamic consequence, the troposphere has expanded and the rise of the tropopause, the boundary between the troposphere and stratosphere, has been suggested as one of the most robust fingerprints of anthropogenic climate change. Conversely, at altitudes above ~55 km (in the mesosphere and thermosphere) observational and modeling evidence indicates a downward shift of the height of pressure levels or decreasing density at fixed altitudes. The layer in between, the stratosphere, has not been studied extensively with respect to changes of its global structure. Here we show that this atmospheric layer has contracted substantially over the last decades, and that the main driver for this are increasing concentrations of GHG. Using data from coupled chemistry-climate models we show that this trend will continue, and the mean climatological thickness of the stratosphere will decrease by 1.3 km following representative concentration pathway 6.0 by 2080. We also demonstrate that the stratospheric contraction is not only a response to cooling, as changes in both tropopause and stratopause pressure contribute. Moreover, its short emergence time (less than 15 years) makes it a novel and independent indicator of GHG induced climate change. [...]

### Summary and conclusions

In summary, we have presented evidence for a substantial contraction of the stratosphere in recent decades. As estimated from an ensemble of CCM simulations, the stratospheric extent has declined by 0.4 km between 1980 and 2018 and models project a net contraction of 1.3 km by the year 2080, corresponding to a 3.7% decline compared to the 1980–2018 mean stratospheric thickness. This negative trend is monotonic with short emergence time, as the contraction is driven almost entirely by GHG. The robustness of this feature is unlikely to be affected by potential trends in solar forcing, which have an opposite thermal effect in this atmospheric region compared to GHG (Rind et al 2008). Our results indicate that the widely recognized cooling of the stratosphere while important, is not the sole driver of the reduced stratospheric extent, with complex radiative and chemical feedbacks likely at play. As model projections for the 21st century show that stratospheric contraction will continue if anthropogenic GHG emission trajectories are not reversed, a detailed understanding and quantification will be increasingly important, as it will entail decreasing density at high altitudes. Eichinger and Sacha (2020) have shown that assuming a constant scale height in the stratosphere can lead to diagnostic misinterpretations of dynamical trends in climate model projections and Zhou et al (2020) have recently analyzed the impact of its variations on the period of the QBO. The contraction may also contribute to changes in stratospheric dynamics or in radiative transfer in the stratosphere (by influencing scale-heights of the absorbers/emitters), but these impacts are yet to be determined and quantified. Moreover, it may affect satellite



trajectories, orbital life-times, and retrievals (Schroder et al 2007), and, via indirect influence on ionospheric electron density, the propagation of radio waves, and eventually the overall performance of the Global Positioning System (GPS) and other space-based navigational systems (Lastovicka et al 2006).

*Author(s):* Petr Pisoft et al 2021 Environ. Res. Lett. 16 064038

[Published by Institute of Physics \(IOP\) Publishing Ltd, Environmental Research Letters, Volume 16, Number 6, 25 May 2021](#)

Image: IOP website

## 7. Joint inference of CFC lifetimes and banks suggests previously unidentified emissions

### Abstract

Chlorofluorocarbons (CFCs) are harmful ozone depleting substances and greenhouse gases. CFC production was phased-out under the Montreal Protocol, however recent studies suggest new and unexpected emissions of CFC-11.

Quantifying CFC emissions requires accurate estimates of both atmospheric lifetimes and ongoing emissions from old equipment (i.e. 'banks'). In a Bayesian framework we simultaneously infer lifetimes, banks and emissions of CFC-11, 12 and 113 using available constraints.

We find lifetimes of all three gases are likely shorter than currently recommended values, suggesting that best estimates of inferred emissions are larger than recent evaluations. Our analysis indicates that bank emissions are decreasing faster than total emissions, and we estimate new, unexpected emissions during 2014-2016 were 23.2, 18.3, and 7.8 Gg/yr for CFC-11, 12 and 113, respectively.

While recent studies have focused on unexpected CFC-11 emissions, our results call for further investigation of potential sources of emissions of CFC-12 and CFC-113, along with CFC-11.

*Authors:* Megan Lickley, Sarah Fletcher, Matt Rigby & Susan Solomon

[Nature Communications, volume 12, Article number: 2920 \(2021\), 18 May 2021](#)

Image: Nature Communications website



ARTICLE

<https://doi.org/10.1038/s41467-021-13229-2>

OPEN

## Joint inference of CFC lifetimes and banks suggests previously unidentified emissions

Megan Lickley<sup>1</sup>, Sarah Fletcher<sup>2</sup>, Matt Rigby<sup>3</sup> & Susan Solomon<sup>1</sup>

Chlorofluorocarbons (CFCs) are harmful ozone depleting substances and greenhouse gases. CFC production was phased-out under the Montreal Protocol, however recent studies suggest new and unexpected emissions of CFC-11. Quantifying CFC emissions requires accurate estimates of both atmospheric lifetimes and ongoing emissions from old equipment (i.e. 'banks'). In a Bayesian framework we simultaneously infer lifetimes, banks and emissions of CFC-11, 12 and 113 using available constraints. We find lifetimes of all three gases are likely shorter than currently recommended values, suggesting that best estimates of inferred emissions are larger than recent evaluations. Our analysis indicates that bank emissions are decreasing faster than total emissions, and we estimate new, unexpected emissions during 2014-2016 were 23.2, 18.3, and 7.8 Gg/yr for CFC-11, 12 and 113, respectively. While recent studies have focused on unexpected CFC-11 emissions, our results call for further investigation of potential sources of emissions of CFC-12 and CFC-113, along with CFC-11.



## 8. Fighting climate change means taking laughing gas seriously

Agriculture researchers seek ways to reduce nitrous oxide's impact on warming.

As nations and industries try to cut greenhouse gas emissions to tackle climate change, agricultural practices are in the spotlight. There's good reason for that: Agriculture accounts for 16 to 27 percent of human-caused climate-warming emissions, according to the Intergovernmental Panel on Climate Change (IPCC). But much of these emissions are not from carbon dioxide, that familiar climate change villain. They're from another gas altogether: nitrous oxide.



$N_2O$ , also known as laughing gas, does not get nearly the attention it deserves, says David Kanter, a nutrient pollution researcher at New York University and vice chair of the International Nitrogen Initiative, an organization focused on nitrogen pollution research and policy making. "It's a forgotten greenhouse gas," he says. Yet molecule for molecule,  $N_2O$  is about 300 times as potent as carbon dioxide at heating the atmosphere. And like  $CO_2$ , it is long-lived, spending an average of 114 years in the sky before disintegrating. It also depletes the ozone layer. In all, the climate impact of laughing gas is no joke. IPCC scientists have estimated that nitrous oxide comprises roughly 6 percent of greenhouse gas emissions, and about three-quarters of those  $N_2O$  emissions come from agriculture.

But despite its important contribution to climate change, policy makers have not directly addressed  $N_2O$  emissions. And the gas continues to accumulate. A 2020 review of nitrous oxide sources and sinks found that emissions rose 30 percent in the last four decades and are exceeding all but the highest potential emissions scenarios described by the IPCC. Agricultural soil — especially because of the globe's heavy use of synthetic nitrogen fertilizer — is the principal culprit.

Today, scientists are looking at an array of ways to treat the soil or adjust farming practices to cut back on  $N_2O$  production.

"Anything that can be done to improve fertilizer use efficiency would be big," says Michael Castellano, an agroecologist and soil scientist at Iowa State University. [...]

It may even be possible for farmers to save money on fertilizer and water and reduce emissions, all while maintaining yields. In research on tomato farms in California's Central Valley, Six found that study plots with reduced tillage and a drip irrigation system that slowly oozed nitrogen to plants — reducing how much of the nutrient pooled in the soil — lowered  $N_2O$  emissions by 70 percent compared with conventionally managed plots. The farmer who implemented those changes was also compensated for his greenhouse gas reduction through the state's cap-and-trade program. With the right incentives, persuading farmers to cut their emissions might not be that hard, says Six.

In Missouri, farmer Andrew McCrea grows 2,000 acres of corn and soy in a no-till system. This year, he plans to trim back his fertilizer use and see if the Pivot Bio inoculant can keep his yields more or less the same. "I think all farmers certainly care about the soil," he says. "If we can cut costs, that's great too."

And if policy makers turn to tackling nitrous oxide, there should be rippling benefits for all of us, says Kanter of New York University. Some of them could be more rapid and tangible than addressing climate change. The same measures that lower N<sub>2</sub>O levels also reduce local air and water pollution as well as biodiversity losses. “Those are things that people will see and feel immediately,” Kanter says, “within years as opposed to within decades or centuries.”

[Knowable Magazine, 14 May 2021, By: Ula Chrobak](#)

Image: Knowable Magazine website. Credit Courtesy of Pivot Bio

## AFRICA

### 9. Market assessment and financial schemes for sustainable cooling in Ghana and Senegal

In partnership with the UNEP’s “United for Efficiency”, Ghana and Senegal have implemented financing schemes to replace obsolete ACs and refrigerators, as part of the ECOWAS Refrigerators and Air Conditioners Initiative (ECOFRIDGES)

The ECOWAS Refrigerators and Air Conditioners Initiative (ECOFRIDGES) is a joint project of the Governments of Ghana and Senegal, the United Nations Environment Programme’s United for Efficiency (UNEP U4E) initiative and the Basel Agency for Sustainable Energy (BASE). In collaboration with regional and local partners, the replacement of obsolete cooling equipment will be promoted through financing mechanisms: Green On-wage financing mechanism in Ghana and On-bill financing mechanism in Senegal. <sup>[1]</sup>

The ECOFRIDGES project was successfully launched in 2019 and extensive market assessments have been commissioned by UNEP U4E and BASE and conducted in Ghana and Senegal by local agencies.

Air conditioner and refrigerator market assessment in Ghana <sup>[2]</sup>

About 36% (2,581,275 in number) of households in Ghana owned a refrigerator in 2017 but very few households owned an air conditioner (AC). Based on industry data from Japan Refrigeration and Air Conditioning Industry Association (JRAIA), sales of room AC units increased from 84,000 in 2013 to 113,000 in 2018. Almost all of the room ACs sold were split systems. The demand for ACs is expected to increase by 23% annually due to the

growth in middle-income households, urbanisation and the expansion of national electrification coverage.

#### Launch of Green On-wage financing mechanism in Ghana

The Green On-Wage (GO) financial mechanism has recently been launched in Ghana to make ACs and household refrigerating appliances more affordable. The programme aims to entice the replacement of obsolete equipment by supporting the purchase of over 15,000 energy-efficient appliances by 2023. The programme will also include the proper collection and disposal of obsolete appliances, product testing, policy considerations, capacity building, as well as consumer awareness campaigns. It sets strict energy performance requirements and refrigerants limits for eligible appliances. <sup>[1]</sup>

As of January 2019, about 70% of household refrigerators in Ghana were obsolete (approximately 1.6 million second-hand household refrigerators along with 190,000 refrigerators initially bought new but installed more than 10 years ago). Similarly, there were about 12,000 second-hand ACs and 90,000 units installed more than 10 years since installation. Replacing obsolete ACs with units with higher EER in public and commercial buildings could save the country about USD 1.96 billion in electricity costs by 2030. <sup>[2]</sup>

Eligibility criteria for new appliances purchased through ECOFRIDGES GO are as follows: <sup>[3]</sup>

|                            | ACs  | Refrigerating appliances  |
|----------------------------|--|---|
| <b>Type of products</b>    | Ductless split air conditioners  | Household refrigerators and refrigerator-freezers.<br>Freezers only are excluded.   |
| <b>Product size</b>        | Nominal cooling capacity up to 5.3 kW  | Between 90L to 500L   |
| <b>Refrigerants</b>        | GWP limit of 750.  | GWP limit of 20, maximum charge of 0.15kg.  |
| <b>Foam Blowing Agents</b> | N/A  | GWP limit of 20   |
| <b>Energy efficiency</b>   | Interim criteria until introduction of new MEPS & labels regulation:<br><br>3-star equipment as per current Ghanaian regulation: EER >3.45 | Interim criteria until introduction of new MEPS & labels regulation:<br><br>5-star equipment as per current Ghanaian regulation: Climate Class ST:<br>I<30<br><br>Climate Class T: I<42 |

## Air conditioner and refrigerator market assessment in Senegal <sup>[4]</sup>

According to Senegal's national statistics and demography agency (ANSD), 28.3% of households in Senegal owned a refrigerator in 2017 and 2.0% owned an AC. The estimated figures for 2019 were about 549,152 household refrigerators and about 46,085 ACs.

## Launch of on-bill financing mechanism in Senegal

ECOFRIDGES has announced a partnership with local stakeholders in Senegal to provide an on-bill financing mechanism. Customers of the local utility, Senelec, will be allowed to repay preferential consumer loans for the purchase of certified models via their electricity bills. This programme will also include the self-sustaining collection and recycling of used devices, a systematic testing procedure for equipment to ensure advertised performance, as well as a consumer awareness campaign. ECOFRIDGES Senegal aims to release funding of USD 7 million to support consumer purchases of 20,000 eligible cooling devices by 2024. <sup>[5]</sup>

Over 70% of household refrigerators have been purchased second-hand. According to the "Agence pour l'Economie et la Maîtrise de l'Energie" (AEME), replacing obsolete refrigerators with more energy-efficient models could save 19.8% of electricity consumption for Senegalese households by 2030. [4]

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[The International Institute of Refrigeration \(IIR\), 17 May 2021](#). French language version available [here](#)

Image: IIR website

ASIA AND THE PACIFIC

## 10. Beijing aiming for green, safe 2022 Winter Olympics

With advanced technologies in place, Beijing is prepared to host a smart and safe 2022 Winter Olympic Games despite the COVID-19 pandemic still casting a pall over the global sports scene.

For the first time in the history of the Olympic Games, Beijing will use carbon dioxide in ice-making procedures. Not using ozone layer-harming Freon as a refrigerant in ice making during the Games is expected to help reduce carbon emissions equivalent to that of 3,900 cars per year, and cut emissions from the activity to nearly zero.



In April, ice sports testing programmes were conducted in several venues in Beijing, including at the National Indoor Stadium and Wukesong Sports Centre. During the 10-day trials, six ice sports were staged in five Olympic venues.

"The new ice-making technology can precisely control ice temperatures and will be helpful to ensure standardized hardness of ice surfaces. It will also significantly save electricity during ice making," said Yu Hong, head of technology at the organising committee for the 2022 Beijing Winter Olympic Games.

Meanwhile, accurate weather forecasts will be critical for the holding of outdoor sports events. China has established an advanced system that will provide weather forecasts for competitions in Beijing and Zhangjiakou, Hebei province—co-hosts of the 2022 Games.

"The system can capture high-resolution images, and update accurate data of snow temperatures, wind direction, wind speed and other metrics every 10 minutes. The forecast model will get further upgraded to improve accuracy," Yu said. [...]

[China Daily, 21 Mai 2021](#)

Image: BOCOG 2022 website

## 11. NatRef use in Japan's cold storage sector expected to double in next five years, says Industry Association

The rate of natural refrigerant use among Japanese refrigerated warehouse operators, which has doubled since 2011, is expected to double again in the next five years, according to Japan's Association of Refrigerated Warehouses (JARW).

This was a key takeaway from the association's most recent annual refrigerant use survey of its members.

Shigekatsu Koganemaru, Vice Chairman of the Association's Environment and Safety Committee, presented results from the survey during the ATMOsphere Japan 2021 conference, held online on February 15 and organized by shecco, publisher of this website.



According to the survey data from 2019, the use of R22, which accounted for 80.9% of refrigerants used in 2011, dropped to 53.1% in 2019. Meanwhile, the rate of natural refrigerant use increased from 15.0% to 36.7% during the same period.

Among the natural refrigerant systems used in 2019, ammonia/CO<sub>2</sub> systems had the largest share at 67.0%. Ammonia direct expansion (DX) systems accounted for 29.4%, while CO<sub>2</sub> systems accounted for 3.35% (doubling from 1.3% in 2018).

Much of the increase is attributed to the availability of government subsidies provided for the installation of natural refrigerant systems in cold storage applications in Japan, said Koganemaru.

"We are very grateful for the Ministry of Environment's subsidy program, as many of our members operate warehouses on a fragile financial base," said Koganemaru.

"If the subsidy program is continued, we expect the usage rate of natural refrigerants to double in the next five years."

Koganemaru also said that he predicts the use of R22 will fall below 50% in next year's annual survey.

Koganemaru is also President of Japanese cold storage operator company Yoshio Ice Manufacturing & Refrigeration. At ATMOsphere Japan, Koganemaru [presented results](#) showing significant energy-use reduction with its second installation of a transcritical CO<sub>2</sub> (R744) refrigeration system in February 2020; the company retrofitted an existing R22 system with a CO<sub>2</sub> transcritical system at one of its cold storage facilities in Fukuoka, Japan.

See Koganemaru's full presentation [here](#) (Japanese language).

[r744, 24 May 2021, By: Devin Yoshimoto](#)

Image: r744 website

## NORTH AMERICA

### 12. Rigid foam insulation gets a climate chemistry upgrade

New XPS panels are replacing HFC-134a with HFO blends for a big greenhouse gas reduction.

Insulating and air sealing are effective ways to reduce the carbon footprints of homes and other buildings, and rigid foam panels are a popular material for doing that work. But many of the panels have a little-known climate cost: the global warming potential (GWP) of the gas, or blowing agent, used to puff the foam.



In the case of panels made of extruded polystyrene (XPS)—a closed-cell foam suitable for wet or dry conditions—that gas has been hydrofluorocarbon-134a (HFC-134a). HFC-134a is a good blowing agent, but it has a GWP of 1,430, meaning it traps 1,430 times as much heat as carbon dioxide does over 100 years. As regulations seeking to eliminate HFC-134a take effect this year in Canada and the US, panel makers including Owens Corning and DuPont are switching their blowing agents to blends containing hydrofluoroolefins (HFOs).

Refrigeration is the largest use for HFCs and other fluorocarbon gases, using around 45% of the supply in North America; blowing agents use roughly 9%, according to the market research firm IHS Markit. The same key feature—a phase transition from liquid to gas at near-ambient temperatures—makes them useful in both cooling and foam manufacturing.

But cooling is done in closed-loop systems that leak a few percent a year or less. “The main thing about foams and why we even care about them is because they leak, and we can’t really recover it,” says Christina Theodoridi, a technical analyst at the Natural Resources Defense Council, an environmental group. “Once it goes into the product, it’s

out into the atmosphere.” In addition to what’s trapped in the final product, the blowing agent is also emitted during the blowing process itself.

HFCs weren’t always sustainability villains. The chemical industry introduced HFCs in the 1990s to replace hydrochlorofluorocarbons (HCFCs), which deplete the ozone layer and have high GWPs. In the 1980s, HCFCs replaced chlorofluorocarbons (CFCs), which were worse on both measures. HFCs have minimal effect on the ozone layer but are potent greenhouse gases with lifetimes of around 14 years in the atmosphere. [...]

On a global scale, an international agreement called the Kigali Amendment drives the phaseout of HFCs, according to the NRDC’s Theodoridi. It builds on the Montreal Protocol, which mandated the elimination of CFCs. The US is party to the Montreal Protocol but has not yet joined the Kigali Amendment, though in January, President Joe Biden directed the US Department of State to submit it to the Senate for ratification. Theodoridi expects it to pass with a bipartisan majority, much like a provision last year that gave the US Environmental Protection Agency the authority it would need to enforce federal regulations.

In the meantime, California, Colorado, New Jersey, New York, Vermont, and Washington have state-level bans on HFC-134a as an XPS-blowing agent as of Jan. 1. Maryland and Massachusetts will join that list July 1, and Hawaii, Maine, Virginia, and Rhode Island are looking at Jan. 1, 2022, to enact their versions. Canada took a broader approach, banning any blowing agent or blend with a GWP higher than 150. [...] The shift from HFCs to HFOs could have a big climate impact. Blowing XPS consumed 10,000 metric tons (t) of fluorocarbons in North America in 2020, according to IHS Markit. A 2018 United Nations report concluded that eliminating HFC-134a as a foam-blowing agent worldwide would avoid the equivalent of more than 1 billion t of CO<sub>2</sub> emissions.

XPS makers are technologically ready to switch to HFOs, Theodoridi says, so they should lock in their supplies now before other HFC users start clamoring for them. “It’s pretty clear where the whole world, not just the US, has to go,” she says. “And the faster industry reduces its reliance on HFCs, the better equipped they are for what’s coming.”

[Chemicals & Engineering News, Vol. 99, Issue 20, 25 May 2021, By Craig Bettenhausen](#)

Image: Craig Bettenhausen/C&EN

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EUROPE & CENTRAL ASIA

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### 13. Accelerating EU's F-Gas phase-down can save 100M tonnes of CO<sub>2</sub>e - German Environment Agency

The German environment authority seeks stronger EU regulation of f-gases to protect the climate.

The German Environment Agency (Umweltbundesamt – UBA) is calling on the European Union (EU) to accelerate its f-gas phase-down, and set a target of 90% reduction by 2030. This move can save an additional 100 million tonnes of CO<sub>2</sub>e emissions compared to the existing phase-down plan aiming for a 79% reduction, UBA said.



Based in Dessau-Rosslau, the UBA is Germany's main environmental protection agency. The Agency works with climate protection, waste avoidance and pesticide approvals. It gathers data about the state of the environment and shares it with the German Ministry of the Environment, offering policy advice.

Professor Dirk Messner, President of the UBA, said that the upcoming revision of the EU's F-Gas Regulation offers an opportunity. "If our proposal is implemented, it will also support the efforts of the international community to further reduce HFC emissions. Ambitious regulation in the EU will also open up numerous export opportunities to us in this area."

HFCs are used as refrigerants in refrigeration systems and may escape to the environment during filling, operation and disposal. HFCs have high GWPs – up to 14,800 more than CO<sub>2</sub> in the case of R23. UBA estimates that a rapid replacement of HFCs with natural refrigerants such as ammonia, water or hydrocarbons could save more than 100 million tonnes CO<sub>2</sub> equivalent in the European Union (EU) by 2030. These refrigerants have a low or no GWP. "Equipment and systems using natural refrigerants have proven to be effective in practice and are notable for their comparable or even better energy efficiency than those which use HFCs," Messner said.

HFCs and other f-gases are already regulated by the EU F-gas Regulation. It bans certain applications and outlines a pathway to phasing down HFCs for other applications. By 2030, the current regulation provides for a reduction of the annual amount of HFCs placed on the European market to 21% of the baseline, with the latter equaling the average supply in 2009 to 2012. In 2014, the EU established a phase-down schedule and pioneered global measures in the sector. "Regarding the growing urgency for climate action, UBA now proposes to enhance ambitions by further reducing the phase-down target to 10% of the baseline by 2030, in addition to further bans. From 2030, this measure would reduce HFC use by a further 20 million tonnes of CO<sub>2</sub> equivalent per year," Messner explained.

#### Kigali Amendment to the Montreal Protocol

The Kigali Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer has since 2019 ensured that HFCs are subject to a phase-down in industrialized countries worldwide. Developing countries will follow in two groups, freezing their HFC use in 2024 and 2028 respectively. Since the transition from substances that deplete the ozone layer to HFCs has not yet, or only partially, been completed in many countries, the switch

to natural refrigerants could be made directly - a strategy known as leapfrogging. "Some good examples of this already exist, such as that of an air conditioner manufacturer in India [Godrej & Boyce]. It uses the natural refrigerant propane instead of an HFC in its single-split AC units. The units are among the most energy-efficient on the Indian market," UBA said.

Full compliance with the Kigali Agreement will result in a global reduction of HFC emissions of more than 60 billion tonnes of CO<sub>2</sub> equivalent by 2050. By the end of the century, the agreement will prevent a global temperature increase of 0.4 degrees Celsius.

[Ammonia21, 12 May 2021, By: Ntsako Khosa](#)

*Image: Ammonia21 website, featuring The German Environment Agency headquarters in Dessau-Rosslau. Credit: German Environment Agency*

## FEATURED



## [OZONE SECRETARIAT](#)

### [Overview for the meetings of the ozone treaties in 2021](#)

- [43<sup>rd</sup> OEWG](#) - Online meetings | 22 May - 17 Jul 2021 (Replenishment: 22 & 24 May, CFC-11: 14 & 15 Jul, Energy Efficiency: 16 & 17 Jul)
- [66<sup>th</sup> IMPCOM](#) - Online meeting | 12 - 13 Jul 2021
- [11<sup>th</sup> ORM \(part II\)](#) - Online meeting | 19 - 23 Jul 2021
- [67<sup>th</sup> IMPCOM](#) - Nairobi, Kenya (tentative) | 23 Oct 2021
- [12<sup>th</sup> COP \(part I\)](#) – [32<sup>nd</sup> MOP Bureau](#) - Nairobi, Kenya (tentative) | 24 Oct 2021
- [12<sup>th</sup> COP \(part II\)](#) – [33<sup>rd</sup> MOP](#) - Nairobi, Kenya (tentative) | 25 - 29 Oct 2021

Click [here](#) for past and upcoming Montreal Protocol Meetings Dates and Venue.

### [The UN Environment Assessment Panels](#)

The Assessment Panels have been vital components of ozone protection since the Montreal Protocol was first established. They support parties with scientific, technological and financial information in order to reach decisions about ozone layer protection and they play a critical role in ensuring the Protocol achieves its mandate. The Assessment Panels were first agreed in 1988 to assess various direct and indirect impacts on the ozone layer. The original three panels are:

- [The Technology and Economic Assessment Panel](#)
- [The Scientific Assessment Panel](#)
- [The Environmental Effects Assessment Panel](#)

In the past there were 4 main panels. The Panels for Technology and Economic Assessments were merged in 1990 into one Panel, now called the Technology and Economic Assessment Panel.

Why are the three current panels important to ozone layer protection? Each carries out assessment in its respective field. Every four years, the key findings of all panels are consolidated in a synthesis report. [Learn more >>>](#)



### [THE MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL](#)

- [Report of the Extended Intersessional Approval Process](#) established for the 86<sup>th</sup> meeting of the Executive Committee.
- Click [here](#) for the Executive Committee upcoming and past Meetings and related documents.
- [Executive Committee Primer – 2020](#) - An introduction to the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol.



# OzonAction

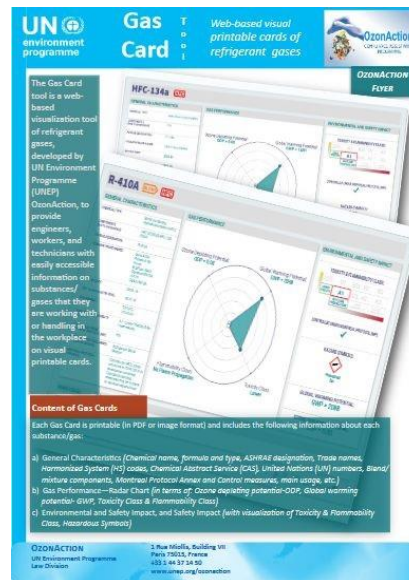
**OzonAction Compliance Assistance Programme** produces and outreaches a wide variety of information and capacity building materials and tools that support the implementation of the Montreal Protocol programs and assist Article-5 countries in meeting the compliance targets. These include publications, technology briefs and factsheets, mobile applications, videos, e-Learning, modelling and database programs and special educational or certification programs.

The section below features several of our most recent products.  
 Visit [OzonAction website](#) for more information, discover the entire range of products.

Images in this section are by OzonAction

Gas Card Tool: Web-based Visual Printable Cards of Refrigerant Gases developed by the UN Environment Programme (UNEP) OzonAction, to provide engineers, workers, and technicians with easily accessible information on substances/ gases that they are working with or handling in the workplace on visual printable cards.

Content of Gas Cards - Each Gas Card is printable (in PDF or image format) and includes the following information about each substance/gas: a) General Characteristics (Chemical name, formula and type, ASHRAE designation, Trade names, Harmonized System (HS) codes, Chemical Abstract Service (CAS), United Nations (UN) numbers, Blend/ mixture components, Montreal Protocol Annex and Control measures, main usage, etc.) b) Gas Performance—Radars Chart (in terms of: Ozone depleting potential-ODP, Global warming potential-GWP, Toxicity Class & Flammability Class) c) Environmental and Safety



Impact, and Safety Impact (with visualization of Toxicity & Flammability Class, Hazardous Symbols).

More Information - The Gas Card web-based tool is part of UNEP OzonAction's portfolio of activities and tools to assist various stakeholders in developing countries, including customs officers and technicians, to achieve and maintain compliance with the Montreal Protocol on Substances that Deplete the Ozone Layer. In the left navigation bar of the Gas Card tool web page, you will find a list of commonly used HFCs and HFC Blends in different sectors.\*

Using the Gas Card web-based tool

- The Gas Card tool is available online on the [OzonAction website](#)
- Read the full [2021 annual iPIC report](#)
- See the [flyer](#) introducing the new iPIC platform

\* Based on the Overall Analysis of the Results of the Survey of ODS Alternatives Report (conducted in 119 countries from 2012 to 2015)



[HCFC Quota and Licence Tracker](#) - UNEP OzonAction launches a new desktop application to assist with HCFC licences and quotas - National Ozone Officers have the great responsibility of managing the allocation and monitoring of quotas for substances controlled under the Montreal

Protocol. This process can be complex with many importers, especially if the country imports a range of different hydrochlorofluorocarbons (HCFCs) and mixtures containing HCFCs. To address this challenge, OzonAction developed a new desktop application that helps Ozone Officers with the tasks of planning, calculating, monitoring and managing consumption quotas and licences. It can be used on a daily basis to track and manage the current year's quota allocations for different importers, or for future planning by trying different scenarios that adjust the type of substances imported, their quantity, or the number of importers. The HCFC Quota and Licence Tracker allows Ozone Officers to see the effect of such scenarios on the national HCFC consumption and helps ensure that the quotas stay within agreed HCFC Phase-out Management Plan (HPMP) targets. For countries that have ratified the Kigali Amendment, in the future OzonAction will extend the tracker to include hydrofluorocarbons (HFCs) once countries begin designing their quota systems for those controlled substances.

Access the:

- [HCFC Quota tracker app](#)
- [Flyer for more information on the tracker](#)

- [Short video tutorial on the OzonAction YouTube Channel](#)

### [GWP-ODP Calculator Application](#) - Updated

“Quickly, efficiently and accurately convert between values in metric tonnes, ODP tonnes and CO<sub>2</sub>-equivalent tonnes”

Data are extremely important for the Montreal Protocol community, and the data reporting formats for both A7 and CP have changed recently, to a large degree triggered by the Kigali Amendment. HFCs, blends, CO<sub>2</sub>-equivalent values, etc, now have to be addressed much more frequently by Ozone Officers during their daily work. Sometimes the terminology and values are complex and can be confusing, and it helps to have it all the official facts and figures in one place. Conversion formulas need to be applied to calculate CO<sub>2</sub>-eq values from both GWP and metric tonne values. This free app from OzonAction is a practical tool for Ozone Officers to help demystify some of this process and put frequently-needed information at their fingertips.



What's new in the app:

- An updated more user-friendly interface
- Multilingual interface: English, French and Spanish
- A new **Kigali Amendment mode** - in this mode the GWP values used to calculate the refrigerant blends/mixtures only include GWP contributions from components that are controlled HFCs
- Latest updated ODP and GWP values from the recent reports from the Montreal Protocol technology and scientific expert panels as well as the Intergovernmental Panel on Climate Change (IPCC) reports
- References added for sources of all values
- New refrigerant mixtures (with ASHRAE -approved refrigerant designations)

The new and updated UNEP OzonAction **GWP-ODP Calculator** application will help you to convert between values in metric tonnes, ozone depleting potential (ODP) tonnes and CO<sub>2</sub>-equivalent tonnes of substances controlled by the Montreal Protocol and their alternatives.

This application, available at no cost, is particularly useful for National Ozone Officers to assist with understanding and calculating quantities of controlled substances, both pure substances and mixtures, for quota assignment, reporting requirements, etc. Other stakeholders interested in ODP and global warming potential (GWP) values of controlled substances and their alternatives will also find this tool useful.

Operation of the application is very simple – just select a substance from the dropdown list and enter the known value in the appropriate field; the calculator will automatically perform the conversion between metric tonnes, ODP tonnes and/or CO<sub>2</sub>-equivalent tonnes and display the corresponding converted values. The ODP, GWP and information about the substance is provided. For mixtures, the components of the mixture and their relative proportions (metric, ODP, CO<sub>2</sub>- equivalent tonnes) are also calculated.

The updated **GWP-ODP Calculator** application now includes a new Kigali Amendment mode. The app can now be used in two different modes: the regular "Actual Values" mode and the "Kigali Amendment" mode. In the Kigali Amendment mode, the GWP values provided are those specified in the Kigali Amendment to the Montreal Protocol, i.e. GWP values are only assigned to controlled HFCs. In this mode the GWP values used to calculate the refrigerant blends/mixtures only include GWP contributions from components that are controlled HFCs. The user can effortlessly switch between modes.

The OzonAction GWP-ODP Calculator uses standard ODP values and GWP values as specified in the text of the Montreal Protocol to make the conversions. Other ODP and GWP values from the recent reports of the Montreal Protocol Technology and Economic Assessment Panel and Scientific Assessment Panel as well as the Intergovernmental Panel on Climate Change (IPCC) are used when appropriate, with references to sources of all values used. The app includes new refrigerant mixtures (with ASHRAE- approved refrigerant designations).

This application is designed primarily for use by Montreal Protocol National Ozone Units and other related stakeholders. The application was produced by UN Environment Programme (UNEP) OzonAction as a tool principally for developing countries to assist them in meeting their reporting and other commitments under the Protocol and is part of the OzonAction work programme under the Multilateral Fund for the Implementation of the Montreal Protocol.

If you already have the application installed on your device, be sure to update to benefit from the new features. The app can be viewed in English, French or Spanish.



Smartphone Application: Just search for "GWP-ODP Calculator" or UNEP in the Google Play store or use the QR code – free to download! If you already have the application installed on your device, be sure to update to benefit from the new features.



Desktop Application: GWP-ODP Calculator is also available online on the OzonAction [website](#)



Watch the new short introductory tutorial video on the GWP-ODP Calculator - available now on [YouTube](#)

>>> Read/download the [flyer](#) for more information

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## OzonAction [WhatGas?](#) Updated

New features:

- An updated more user-friendly interface
- Multilingual interface: English, French and Spanish
- HFCs and HFC containing mixtures
- Latest updated ozone depleting potential and global warming potential values from the recent reports from the Montreal Protocol technology and scientific expert panels as well as the Intergovernmental Panel on Climate Change; as well as the standard ODP and GWP values as specified in the text of the Montreal Protocol
- References to sources of all values used
- New refrigerant mixtures (with ASHRAE approved refrigerant designations)
- Values for 'actual GWP' and 'Kigali Amendment context' GWP for pure substances and mixtures (i.e. only including GWP values/components assigned to controlled hydrofluorocarbons - HFCs).



The WhatGas? application is an information and identification tool for refrigerant gases: ozone depleting substances (ODS), HFCs and other alternatives. It is intended to provide a number of stakeholders, including Montreal Protocol National Ozone Officers, customs officers, and refrigeration and air-conditioning technicians with a modern, easy-to-use tool that can be accessed via mobile devices or the OzonAction website to facilitate work in the field, when dealing with or inspecting ODS and alternatives, and as a useful reference tool. If the user requires additional information or assistance in identifying a refrigerant gas they are inspecting or that is described in the relevant paperwork, this can be easily obtained by consulting the application.

Using the application:

If you already have the application installed on your device, be sure to update to benefit from the new features.

Smartphone Application: Just search for "WhatGas?" or UNEP in the Google Play store or use the QR code – free to download!



Desktop Application: WhatGas? is also available online on the OzonAction [website](#)

For more information: Watch the new short introductory tutorial [video](#) on WhatGas? available on [YouTube](#)

See/download the [WhatGas? flyer](#)

**Over 10,000 installations on Android and iOS devices to date!**



## [RAC Technician Videos](#) - Full length films!

Two 'full length' videos for refrigeration and air-conditioning (RAC) sector servicing technicians: on 1) Techniques, Safety and Best Practice and 2) Flammable Refrigerant Safety.

The OzonAction Refrigeration and Air-Conditioning Technician Video Series consists of instructional videos on techniques, security and best practice and flammable refrigerant safety. They are intended to serve as a complementary training tool RAC sector servicing technicians to help them revise and retain the skills they have acquired during hands-on training. The videos are not intended to replace structured formal technician training, but to supplement and provide some revision of tips and skills and to build on training already undertaken.




These videos are based on the successful UNEP OzonAction smartphone application, the RAC Technician Video Series app. This application has been downloaded on more than **86,000** devices since its launch.


Following many requests to make the videos more versatile and better suited to classroom and training settings, OzonAction has responded to this demand and produced two 'full-length' instructional videos.

You may wish to share this message and the flyer with:

- Your national/regional RAC associations
- Training or vocational institutes
- Master RAC trainers in your country
- Any other interested national stakeholders

 You can watch these videos on the OzonAction YouTube Channel:

- [Techniques, Safety and Best Practice](#)
- [Flammable Refrigerant Safety](#)

 The videos are also available for download by request from UNEP OzonAction: [unep-ozonaction@un.org](mailto:unep-ozonaction@un.org)



If you prefer to access the video clips via the OzonAction smartphone application, just search for "RAC Technician Video Series" or UNEP in the Google Play Store and iTunes/App Store or scan the QR code –

**Free to download!**

The flyer is available from the [OzonAction website](#).

## [Refrigerant Cylinder Colours: What has Changed](#)

A new UNEP OzonAction factsheet on the new AHRI revised guideline on a major change to refrigerant cylinder colours

One of the ways in which refrigeration cylinders are quickly identified is by cylinder colour. Although there was never a truly globally-adopted international standard, the guideline from the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) although not required by law was used by the vast majority of industry and chemical producers around the world.

An AHRI revised guideline, first published in 2015, now removes paint colour assignments for refrigerant containers and specifies that all refrigerant containers should have the same paint colour from 2020 onwards.

NOOs and technicians should be aware of this change and inform national stakeholders, as well as familiarising themselves with relevant container labels and markings for refrigerants.

Read/download the [factsheet](#)



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## Update on [new refrigerants designations and safety classifications](#)

The latest version of the factsheet providing up to date information on refrigerant designations and safety classifications is now available (September 2020 update).

The factsheet, produced by [ASHRAE](#) in cooperation with [UN Environment Programme OzonAction](#) is updated every 6 months.

The purpose is to provide an update on ASHRAE standards for refrigerants and to introduce the new refrigerants that have been awarded an "R" number (or ASHRAE designation) over the last few years and which have been introduced into the international market.

Read/download the [factsheet](#)

The factsheet, as well as more information on ASHRAE-UNEP joint activities and tools, is also available on the [ASHRAE UNEP Portal](#).

Contact: [Ayman Eltalouny](#), OzonAction, UN Environment Programme



### [OzonAction's iPIC platform - Updated](#)

Collaboration between China and Thailand using OzonAction's informal Prior Informed Consent (iPIC) system has resulted in the prevention of a huge consignment of ozone-depleting and climate damaging hydrochlorofluoro-carbons (HCFCs).

Those chemicals, which are primarily used as refrigerants for air conditioners and fridges, are controlled under the Montreal Protocol on Substances that Deplete the Ozone Layer and are being phased out by all countries according to a specific timeline.

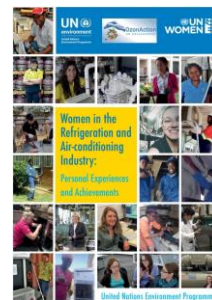


### [Women in the refrigeration and air-conditioning industry: Personal experiences and achievements](#)

The United Nations Environment Programme's (UNEP), OzonAction, in cooperation with UN Women, has compiled this booklet to raise awareness of the opportunities available to women and to highlight the particular experiences and examples of women working in the sector and to recognise their successes.

All of the professionals presented in the booklet are pioneers. They are role models whose stories should inspire a new generation of young women to enter the weld and follow in their footsteps.

Read/download the [publication](#)



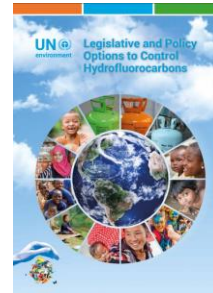
PUBLICATIONS

## [Legislative and Policy Options to Control Hydrofluorocarbons](#)

In order to follow and facilitate the HFC phase-down schedules contained in the Kigali Amendment, the Parties, including both developed and developing countries, will have to implement certain measures.

This booklet contains a recommended set of legislative and policy options which the developing (Article 5) countries may wish to consider for implementation. It is intended to be a guide/tool for countries.

[Read/download](#)



Latest issue of Centro Studi Galileo magazine, [Industria & Formazione, n. 448 - 2021](#) (in Italian).



[Sustainable Cooling in support of a Resilient and Climate Proof Recovery](#), Report by the Climate and Clean Air Coalition (CCAC), 2021.



[Solar Cooling \(2020\), 40<sup>th</sup> Informatory Note on Refrigeration Technologies](#)

Summary - Solar cooling is a promising and environmentally friendly technology that can help meet the growing global demand for space cooling. Solar cooling can be achieved by various technologies. The two main commercial options are photovoltaic (PV)-driven vapour compression chillers and heat-driven cooling machines powered by solar collectors. Thermal cooling equipment can be coupled with various types of solar collectors with different efficiencies and costs. Overall system efficiencies of PV-driven and solar thermal-driven plants may not have such different values. Economic analysis indicates that the investment cost for the PV solution is at least half that of other systems. Solar cooling may have a very positive environmental impact by reducing the use of fossil fuels, and the technology may be considered mature to compete with conventional cooling equipment.



*\* This Informatory Note is an update of a previous version published in April 2017. It was prepared by Renato Lazzarin (President of IIR Section E).*

A Summary for policy makers - Solar Cooling 2020 is [available](#) in English and French languages.

[International Institute of Refrigeration, March 2021](#)

[Leaks, maintenance and emissions: Refrigeration and air conditioning equipment report](#)

details common faults identified in both residential and commercial refrigeration and air conditioning equipment. The report also lists the impacts of these faults and how routine maintenance of the equipment has the potential to significantly reduce electricity use, refrigerant leaks and emissions.

The research was supported by an extensive survey of international and domestic literature included as Appendix B to the report.

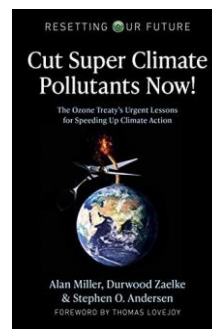
[Australian Government, Department of Agriculture, Water and the Environment, Expert Group, 2021](#)



**Green Cooling in public procurement** How to advance the procurement of climate-friendly and energy-efficient cooling equipment in the public sector? Air conditioning in public buildings is often responsible for around 50% of total electricity consumption. Switching to climate-friendly cooling technologies ("Green Cooling") can reduce costs and energy consumption and improve the carbon footprint of public buildings. This study takes a closer look at the benefits of Green Cooling in the public sector and discusses current barriers and possible solutions. The information presented provides a solid basis to revise current procurement criteria for sustainable cooling systems in public buildings. Read/Download the [study](#)



**Cut Super Climate Pollutants Now!**: The Ozone Treaty's Urgent Lessons for Speeding Up Climate Action (Resetting Our Future). We have a decade or less to radically slow global warming before we risk hitting irreversible tipping points that will lock in catastrophic climate change. The good news is that we know how to slow global warming enough to avert disaster. Cut Super Climate Pollutants Now! explains how a 10-year sprint to cut short-lived "super climate pollutants" -- primarily HFC refrigerants, black carbon (soot), and methane -- can cut the rate of global warming in half, so we can stay in the race to net zero climate emissions by 2050. Authors: Alan Miller, Durwood Zaelke, Stephen O. Andersen.



## MISCELLANEOUS

I am in the Montreal Protocol Who's Who... Why Aren't You?



The United Nations Environment Programme, OzonAction, in collaboration with Marco Gonzalez and Stephen O. Andersen are updating and expanding the "[Montreal Protocol Who's Who](#)".

We invite you to submit your nomination\*, and/or nominate Ozone Layer Champion(s). **The short profile should reflect the nominee's valuable work related to the Montreal Protocol and ozone layer protection.**

Please notify and nominate worthy candidates through the [on-line form](#).

We look forward to receiving your nomination(s), and please feel free to contact our team for any further assistance concerning your nomination.

Take this opportunity to raise the profile of women and men who made an important contribution to the Montreal Protocol success and ozone layer protection.

- View the «Montreal Protocol Who's Who» [Introductory video](#)
- Contact : [Samira Korban-de Gobert](#), UN Environment Programme, OzonAction

\* If you are already nominated, no need to resubmit your profile

# R744

CO<sub>2</sub> COOLING MARKETPLACE

**R744.com**

Originally established in 2006, the new and improved [R744.com](#) offers a trusted source for the latest CO<sub>2</sub> products, services and news from around the world with a key feature being the new marketplace. In addition to the latest CO<sub>2</sub> news and information about the site's partners, the revamped R744.com includes a store where users can browse all available products, and filter for a wide variety of criteria, including components and services. It is also possible to narrow your search to include only products

available in your home region, making it easier to find the best local options. [Watch this space!](#)



[Retradeables introducing a brand new reclaiming marketplace](#)

- F-gases are a family of man-made gases used in a range of industrial applications. As consumer demand for refrigeration and air-conditioning products increased, industry emissions have also dramatically increased. New EU regulations force us to prioritize environmental obligations, whilst

continuing to serve the increased consumer demand and operate with a decreased amount of F-gas ...



Click [here](#) to access recent OzoNews Issues [Request a PDF](#) of the current issue

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The views expressed in articles written by external authors are solely the viewpoints of those authors and do not represent the policy or viewpoint of UNEP. While UNEP strives to avoid inclusion of misleading or inaccurate information, it is ultimately the responsibility of the reader to evaluate the accuracy of any news article in OzoNews. The citing of commercial



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If you have questions or comments regarding any news item, please contact directly the source indicated at the bottom of each article.

Prepared by: Samira Korban-de Gobert

Reviewed by: Ezra Clark

If you wish to submit articles, invite new subscribers, please contact:

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