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GLOBAL

1. Kigali Amendment latest ratifications

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

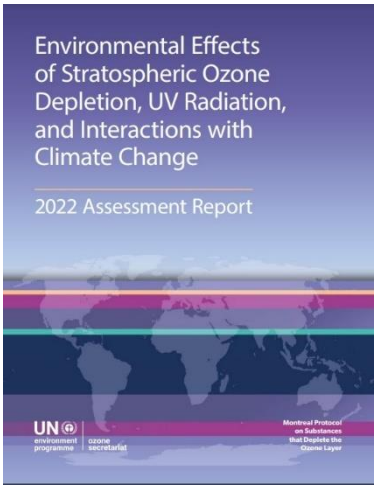
Eritrea, 7 February 2023
Republic of Korea, 19 January 2023

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. Environmental Effects of Stratospheric Ozone Depletion, UV Radiation, and Interactions with Climate Change, Executive Summary, Environmental Effects Assessment Panel 2022 Quadrennial Assessment



Introduction

The Montreal Protocol on Substances that Deplete the Ozone Layer and its Amendments and Adjustments (hereafter referred to simply as the 'Montreal Protocol') have proven highly effective in protecting the stratospheric ozone layer and preventing globalscale increases in solar ultraviolet-B radiation (UV-B; wavelengths between 280-315 nm) at the Earth's surface [1,2]. This global treaty, including the Kigali Amendment, has also been one of the most important societal actions taken to date to mitigate global warming, since many of the ozone-depleting substances (ODS) and their substitutes that are controlled by the Montreal Protocol are also potent greenhouse gases (GHGs) [3-5]. The Antarctic ozone hole is contributing to climate change in the Southern Hemisphere, and climate change is modifying the exposure of humans, other animals, plants, and materials to UV-B and UV-A radiation (315-400 nm) [6,7]. Thus, changes in stratospheric ozone, UV radiation, and climate are inextricably linked in a number of ways that have the potential to affect human health and the environment.

In this Executive Summary we highlight and summarise key findings from the 2022 Quadrennial Assessment by the Environmental Effects Assessment Panel (EEAP; Box 1) of the Montreal Protocol under the United Nations Environment Programme (UNEP). The

2022 Quadrennial Assessment presents the most recent, comprehensive assessment since the 2018 Quadrennial Assessment (available at https://ozone.unep.org/science/assessment/eeap and also for the wider scientific community in Photochemical & Photobiological Sciences 18, 595-828).

The current assessment addresses the interactive environmental effects of changes in the stratospheric ozone layer, solar UV radiation, and climate on human health, terrestrial, and aquatic ecosystems, biogeochemical cycles, air quality, materials, and microplastics in accordance with the Terms of Reference from the Parties to the Montreal Protocol (Box 1). Additionally, we assess the linkages between solar UV radiation, the Montreal Protocol, and the Coronavirus (COVID-19) pandemic.

The findings in the 2022 Quadrennial Assessment, which are summarised here, demonstrate that the Montreal Protocol continues to play a vital role in preserving human health and maintaining healthy, diverse ecosystems on land and in the water.

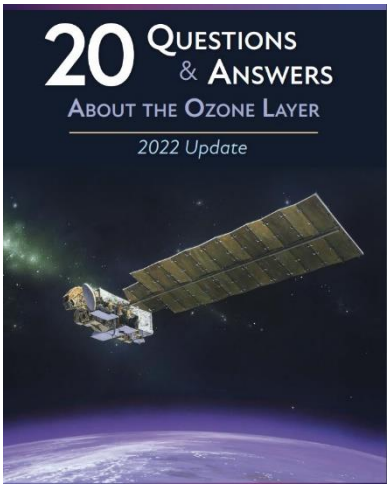
New findings refine and quantify the negative consequences on human health and ecosystem productivity of extreme levels of solar UV-B radiation that would have occurred without the Montreal Protocol.

However, other findings show that in regions of the Earth that are not currently experiencing appreciable ozone depletion (i.e., outside polar regions), levels of solar UV-B radiation can have some beneficial effects. For example, beneficial effects may include those for human health, crop vigour and defence against pests and pathogens, food quality, and important ecosystem services, such as the disinfection of surface waters and the breakdown of environmental toxins and contaminants.

Evidence that climate change is playing an increasingly important role in altering the exposure to UV radiation of organisms, ecosystems, and materials continues to mount. Changes in exposure to UV radiation are occurring through changes in extreme climate events2, cloud cover, aerosols, snow, and ice cover, mixing of ocean waters, species distributions, the seasonal patterns of growth and development (phenology), and human behaviour.

UNEP, Ozone Secretariat, Environmental Effects Assessment Panel, 4 May 2023
Image: UNEP, Ozone Secretariat website

3. Twenty Questions and Answers About the Ozone Layer: 2022 Update



Introduction

Ozone is present only in small amounts in the atmosphere. Nevertheless, ozone is vital to human well-being as well as agricultural and ecosystem sustainability. Most of Earth's ozone resides in the stratosphere, the layer of the atmosphere that is more than 10 kilometers (6 miles) above the surface. About 90% of atmospheric ozone is contained in the stratospheric "ozone layer", which shields Earth's surface from harmful ultraviolet radiation emitted by the Sun.

In the mid-1970s scientists discovered that some human-produced chemicals could lead to depletion of the stratospheric ozone layer. The resulting increase in ultraviolet radiation at Earth's surface would increase incidents of skin cancer and eye cataracts, suppress the immune systems of humans, and also adversely affect agriculture as well as terrestrial and oceanic ecosystems.

Following the discovery of this environmental issue, researchers sought a better understanding of this threat to the ozone layer. Monitoring stations showed that the abundances of gases that are ozone-depleting substances (ODSs)[1], such as chlorofluorocarbons (CFCs), were steadily increasing in the atmosphere. These trends were linked to growing production and use of CFCs and other ODSs for spray can propellants, refrigeration and air conditioning, foam blowing, industrial cleaning, and other applications. Measurements in the laboratory and in the atmosphere characterized the chemical reactions that were involved in ozone destruction. Computer models of the atmosphere employing this information were used to simulate how much ozone depletion was already occurring and to predict how much more might occur in the future.

By the mid-1980s observations of the ozone layer showed that depletion was indeed occurring. The most severe ozone loss, unexpected at the time of discovery, was found to be recurring each springtime over Antarctica. The loss in this region is commonly called the "ozone hole" because the ozone depletion is so large and localized. A thinning of the ozone layer has also been observed over other regions of the globe, such as the Arctic and northern and southern midlatitudes.

The work of many scientists throughout the world has built a broad and solid scientific understanding of the ozone-depletion process. With this foundation, we know that ozone depletion has been occurring and we understand why. Most importantly, we know that if the most potent ODSs were to continue to be emitted and increase in the atmosphere, the result would be ever greater depletion of the ozone layer.

In 1985, the world's governments adopted the Vienna Convention for the Protection of the Ozone Layer in response to the prospect of increasing ozone depletion. The Vienna Convention provided a framework through which nations agreed to take appropriate measures to protect human health and the environment from activities that harm the ozone layer, including cooperation on systematic observations, research, and exchange of information. In 1987, this framework led to the Montreal Protocol on Substances that Deplete the Ozone Layer (the Montreal Protocol), an international treaty designed to

control the production and consumption of CFCs and other ODSs. As a result of the broad compliance with the Montreal Protocol and subsequent amendments and adjustments as well as industry's development and deployment of "ozone-friendly" substitutes to replace CFCs, the total global accumulation of ODSs in the atmosphere has begun to decrease.

The replacement of CFCs has occurred in two phases: first via the use of hydrochlorofluorocarbons (HCFCs) that cause considerably less damage to the ozone layer compared to CFCs, and second by the introduction of hydrofluorocarbons (HFCs) that do not deplete ozone. In response, global ozone depletion has stabilized, and initial signs of recovery of the ozone layer are being observed. With continued compliance, substantial recovery of the ozone layer is expected by the middle of the 21st century. The day the Montreal Protocol was agreed upon, 16 September, is now celebrated as the International Day for the Preservation of the Ozone Layer. The Montreal Protocol has also decreased the human drivers of global warming because many CFCs and HFCs are potent greenhouse gases (GHGs).

The amendment and adjustment process is a vitally important aspect of the Montreal Protocol, allowing the protocol to evolve and address emerging issues as our scientific understanding matures. The Protocol was amended or adjusted between 1990 and 2007 at meetings held in London, Copenhagen, Vienna, Beijing, and Montreal (see Q14). The most recent amendment was formulated at the Meeting of the Parties of the Montreal Protocol held in Kigali, Rwanda during October 2016. The Kigali Amendment phases down future global production and consumption of some HFCs to protect future climate, an important new milestone for the Montreal Protocol (see Q19). The Kigali Amendment was motivated by projections of substantial increases in the global use of HFCs in the coming decades. The control of HFCs under this amendment marks the first time the Montreal Protocol has adopted controls solely for the protection of climate.

The protection of the ozone layer and climate under the Montreal Protocol is a story of notable achievements: discovery, understanding, decisions, actions, and verification. It is a success story written by many: scientists, technologists, economists, legal experts, and policymakers, in which continuous dialogue has been a key ingredient. A timeline of milestones related to the science of stratospheric ozone depletion, international scientific assessments, and the Montreal Protocol is illustrated in Figure Q0-1.

To help communicate the broad understanding of the Montreal Protocol, ODSs, and ozone depletion, as well as the relationship of these topics to GHGs and global warming, this component of the Scientific Assessment of Ozone Depletion: 2022 report describes the state of this science with 20 illustrated questions and answers. The questions and answers address the nature of atmospheric ozone, the chemicals that cause ozone depletion, how global and polar ozone depletion occur, the extent of ozone depletion, the success of the Montreal Protocol, the possible future of the ozone layer, and the protection against climate change now provided by the Kigali Amendment. Computer model projections show that GHGs such as carbon dioxide (CO_2), methane (CH4), and nitrous oxide (N2O) will have a growing influence on global ozone in the coming decades, and in some cases may exceed the influence of ODSs on ozone by the middle of this century, given the expected future decline in the atmospheric abundance of ODSs. For each question, a brief answer is first given in highlighted text; an expanded answer then follows. The answers are based on the information presented in the 2022 and earlier Assessment reports as well as other international scientific assessments. These reports and the answers provided here were prepared and reviewed by a large number of international scientists who are experts in different research fields related to the science of stratospheric ozone and climate[2].

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UNEP, Ozone Secretariat, Environmental Effects Assessment Panel, 3 May 2023
Image: UNEP, Ozone Secretariat website

4. Discover the winners of the IIR Scientific Awards 2023

Every four years at its Congress, the IIR offers a series of prestigious Scientific Awards that recognise those who have made outstanding contributions to the field of refrigeration. Discover this year's winners!

The International Institute of Refrigeration (IIR) is delighted to announce the winners of its prestigious Scientific Awards. To be presented this year during the 26th IIR International Congress of Refrigeration (ICR2023) in August in Paris (France), for this edition, the IIR received a record-breaking 37 applications from 15 countries for all of its awards.

Discover the winners of the following Awards:

> **A new prize: Women in Refrigeration Award**

Recent work done by the UNEP OzonAction and the IIR showed that women are significantly under-represented in the RACHP industry. As such, the IIR took the opportunity to create a new award for Women in Refrigeration in an aim to help promote diversity and role models by increasing the visibility of the achievements of women in the sector.

The Women in Refrigeration Award recognises outstanding scientific achievements, by a woman, in academic or industrial research, innovation or development, in all fields of refrigeration, air-conditioning and heat pumps (RACHP).

The winner of the first Women in Refrigeration Award is Laura Fedele (Italy), member of IIR Commission B1 – Thermodynamics and Transfer Processes, for her key work on the discovery and development of materials and systems related to energy saving and efficiency, with the aim of reducing greenhouse gases (GHG) emissions.

> **The Gustav Lorentzen Medal** is awarded to Yunho Hwang (USA)

> **The Science and Technology Medal** is awarded to Björn Palm (Sweden)

> This year, the prestigious **Medal of Merit** goes to:

- Piotr Domanski (USA),

- Philippe Lebrun (Switzerland)

The winners of the IIR Young Researchers' Awards will be announced soon!

The IIR would like to thank all those who sent in an application, acted as a sponsor, or evaluated the many submissions received for these awards.

We look forward to seeing you at the 26th IIR International Congress of Refrigeration (ICR 2023) in **Paris (France) on August 21-25, 2023**!

International Institute of Refrigeration (IIR), 4 May 2023

Image: IIR website

5. The healing of the ozone hole, and what else we can learn from atmospheric near-misses - Interview with Susan Solomon

Susan Solomon in Antarctica with some of the locals, 1987. Image courtesy of Susan Solomon.

Perhaps the best example of successfully managing a climate change "near-miss" is the Montreal Protocol that banned chlorofluorocarbons—which demonstrates the power of science and international cooperation to resolve a common environmental problem.

A **UN report released in January 2023** reported that the ozone layer is healing so quickly that it will be fully restored within a few decades—an astounding finding, considering how dire things had looked not that long ago. The fact is that the Montreal Protocol (designed to rein in the chlorofluorocarbons responsible for causing the ozone hole) did more to reduce the warming of the planet than many observers expected; the reason being that the chlorofluorocarbons themselves turned out to be not just ozone-depletors but also very potent greenhouse gases.

So, solving a problem in one area had unexpected, beneficial, knock-on effects in other areas.

Such happy results are not limited to just this one situation, says Susan Solomon, noted ozone researcher and Martin Professor of Environmental Studies at MIT. (In 1986, Solomon led a scientific expedition to Antarctica, to get real-world data and study first-hand the chemistry involved in the process of ozone destruction. Her studies identified the mechanism for ozone destruction.)

There have also been major improvements in a number of atmospheric environmental problem areas, such as air and water quality, smog, leaded gasoline, and herbicides. What all these stories of success—or if not 100 percent success, then enormous improvement—seem to have in common is what she calls the "Three Ps." Each problem felt Personal, was readily Perceptible, and could be dealt with via Practical solutions.

In this interview with the *Bulletin*'s Dan Drollette Jr., Solomon elaborates on these ideas. And she explains why it's important to make people aware of these promising outcomes,

and celebrate them—while being sure to keep the pressure on those in charge to see the solutions through to the end.

Dan Drollette: When we think of close calls, we tend to think of all those times that the Air Force accidentally dropped a bomb, or can't locate one. But it seems like there are other kinds of near-misses, such as what happened with the hole in the ozone layer. Maybe we could learn something from the experience with the ozone layer when it comes to dealing with climate change as a whole. I understand you're actually writing a book right now along these lines?

Susan Solomon: Yes, but it's not just dealing with the ozone hole. It also deals with a whole series of near-misses that ended up being amazing success stories, all related to atmospheric chemistry and physics.

For example, one of them is smog. If you think back to the way things were in Los Angeles in the '60s and '70s, we did a pretty decent job of cleaning up the air. That's not to say that we don't have any air pollution now, but we have way less.

And another example would be leaded gasoline. If we had kept using leaded gasoline the way we were, the number of damaged children surely would have continued to go up rapidly.

I don't have numbers that I can quote offhand, but the average amount of lead in the blood of young children has gone down dramatically over the past 30-odd years, and there's very good data on that. In fact, it was the blood lead levels of children that convinced people to get rid of leaded gasoline. *[Editor's note: The median concentration of lead in the blood of children between the ages of one- and five- years old* ***dropped by 96 percent from 1976 to 2018, according to the EPA****—with the greatest decline occurring after the elimination of leaded gasoline.]*

Drollette: So, getting down to the nitty-gritty, when people ask you "What was the problem with the ozone layer" and "What did the Montreal Protocol do to fix it"—what do you tell them? Because a lot of people who read the *Bulletin* were born well after the hole in the ozone layer was front-page news.

Solomon: The reason I'm writing the book is exactly because of that demographic—and that demographic has grown up in an era in which almost all we've had is environmental frustration.

But that's not how it has to be, and I think I can point to some real success stories; the Montreal Protocol being one.

First, to backtrack a little bit: In 1974, two scientists from the University of California-Irvine published a paper saying that if we continued to use chlorofluorocarbons (CFCs) at the rates we were using them, then we would see a few percent change in the ozone layer in 100 years. At first glance, a few percent in a century sort of sounds a lot like the way we used to talk about climate change, right?

But that finding was enough to spark major public interest, which in turn was enough to make people move away from spray cans that used CFCs as a propellent—things like underarm deodorant and hairspray.

And that actually destroyed the market for the American manufacturer.

Which led industry to become motivated to look for substitutes, and for governments to sign treaties —like the Montreal Protocol—to cut down on the amount of CFCs emitted into

the atmosphere, because these chemicals were combining with stratospheric ozone to form what was essentially a hole. And industry and government were very successful in accomplishing that.

But I think the fundamental thing to celebrate here is that citizens actually made a choice to do something good for the environment, which ultimately led to solving what would have been a major environmental problem.

And it's worth noting that this drive happened in the United States and a few other countries; it did not happen in most of Europe.

So the long and short of it is that after we thought there was only going to be a few percent change in 100 years, all of a sudden, boom, we get this ozone hole over the Antarctic, which nobody predicted, and we realized we had to up our game, and do more than just ban deodorants that used CFCs. We had to go after everything—refrigerants, the propellants used to blow bubbles in spray foam insulation, every kind of thing you can imagine.

The immensity of the ozone problem was first measured by the British Antarctic Survey. And what they found is that we had lost something like half the ozone already, and we were barely only into the 1980s—decades in advance of what was expected to happen a century away.

Drollette: I guess that goes to show that you can't always assume that the most conservative forecasts will be the ones that turn out to be true.

Solomon: Right. This finding was way outside all the predictions, happening much faster, and way worse. It certainly had a large role to play in getting many countries on board, because people viewed Antarctica as the canary in the coal mine. And they realized that if we didn't do something, then we were going to have massive losses of ozone all around the world. At the rate we were going, by the year 2050 there pretty much would have been an ozone hole everywhere over the whole planet.

It would have been just one giant doughnut hole—with no doughnut.

Drollette: This might be obvious, but why do we need ozone?

Solomon: The reason we need ozone is important to mention. It absorbs certain kinds of ultraviolet light that are disastrous for biological systems. If you've ever been sunburned, you know it hurts. And you probably know that if you got sunburned too many times you run a real risk of skin cancer. The other thing that happens to human beings, by the way, is cataracts from ultraviolet light. And that's just what's happening to human beings.

But imagine all the things that are probably risks to animals and plants, and everything else in the entire ecosystem.

Life on the surface of our planet was only able to come out of the sea and walk around on land because the ozone layer evolved to allow for the development of all life, not just human life. All life on Earth was intimately tied to the ozone layer's evolution.

Drollette: So, how successful was the effort to protect the ozone layer?

Solomon: In the time since the Montreal Protocol— a binding agreement to phase out ozone-depleting substances, particularly chlorofluorocarbons—was put together, the emissions of CFCs and related substances have dropped more than 99 percent.

What's left are in things like old refrigerators, and in the walls of old buildings that had insulation in the form of blown-in fluorocarbons—because they're really good at making foam.

That stuff is still in fridges and walls, and slowly leaking out. And whenever you tear down the building, a lot of it will leak out into the atmosphere.

Nobody is making CFCs anymore. And that's true worldwide, including countries like China and India, which had been given a grace period because of their situation as lower-income countries.

They were allowed to continue to make it much longer, which made sense because they were emitting almost nothing in the beginning. That's fair.

We in the States were phasing out CFCs in spray cans even before it was clear that they were going to cause this big ozone hole. But the phase-out in refrigeration and air conditioning, of course, was much later because that was more difficult to substitute with other things.

But ultimately, it wasn't that hard. Alternatives were found—and there were just so few companies that were making CFCs, maybe 15 companies worldwide.

Drollette: Could the same thing be said of the current problem with carbon emissions? We once ran an article in the *Bulletin* about a researcher who found that just 90 companies are responsible for more than 60 percent of greenhouse gases.

Solomon: That sounds right to me. Although we all consume fossil fuels, the number of those who actually make it is fairly limited.

So, you know, I'm not sure the situation is all that different.

But I will tell you what really a major difference is: In the case of chlorofluorocarbons, it was always clear that the chemical companies were going to be the primary ones to make whatever came next to replace CFCs—after all, that's their business. And they love making new chemicals. Admittedly, sometimes they get overly enamored of something that's a big seller that they don't want to give up, like [the herbicide] Round Up in the case of Monsanto—but the point is that in general, I think the willingness to change is much stronger in technology-oriented companies like that. This is especially true when the products in question aren't making them a fortune—and let's face it, CFCs were only 2 percent of DuPont's business, even at their height. (This is not to say that the chemical companies were perfect; the CFC-makers also had their issues.)

But when it comes to the fossil fuel companies, they have massive investments in the existing infrastructure. And they have massive investments in mineral resources—if you're a coal company that owns a mountaintop full of coal, then it's worth a lot of money to that company to keep being able to mine that coal; they're certainly not the ones who are going to build solar panels.

So, there's a very, very different economic dynamic for those companies.

That said, I think you have to give a number of these companies some credit, though, because if they do actually put their actions where their promises are, then they will be genuinely taking steps forward.

There's quite a few good companies that see the need to move out of that business and do things like make hydrogen, which may be able to help solve the greenhouse gas

problem. And at least some of them did move over to methane gas, which did help tremendously in phasing out coal—and coal is much worse, because it produces about twice as much carbon dioxide for every unit of energy as gas does. So, that is a real step forwards.

Fundamentally, job one is to phase out coal. If we were to burn all the world's coal, the planet has been estimated to warm by more than 10 degrees Celsius (18 degrees Fahrenheit). That would indeed be a climate catastrophe.

Drollette: That raises something I wanted to ask you about. In an **interview with *Technology Review*** you talked about the three P's to solving environmental challenges?

Solomon: I think there are three items, all beginning with the letter "P," that seem fundamental to society doing a good job on an environmental problem: Personal, Perceptible, and Practical.

The first is that the issue feels Personal to you. I think it's not good enough for it to feel personal in terms of your grandchildren. You know, we're all pretty selfish, it's really all about us. So, you know, if we're going to get skin cancer, that's a scary prospect. And that was the risk that the ozone hole posed to us.

The second P is that it needs to be Perceptible. In other words, we either need to be able to see the problem ourselves, or at least understand the problem. In the case of smog, for example, it was both heavily personal—people were getting asthma, and they couldn't breathe—and incredibly perceptible. In the case of ozone, it's pretty perceptible: Not only do you get sunburned, but the satellite images of the ozone hole over Antarctica are easy to understand. The science could be readily communicated. You didn't have to be a statistician to realize there was a hole there.

And the last one is Practical. You need to be able to believe that there are practical solutions.

In the case of the ozone problem, there were lots of options for things to replace CFCs as a propellant. The spray cans were replaced with essentially no visible change to the consumer. It was literally used largely for underarm deodorant, for example, and it was pretty easy to replace the deodorant with roll-ons or sticks. And the advertising for this was pretty straightforward: Get on the stick to save the ozone layer.

I think most people are willing to do things that aren't too hard, if they understand why it would be helpful to the environment. And certainly, the other thing that the deodorant companies did masterfully—particularly Johnson and Johnson—was to start talking about the fact that you actually get more days' worth of deodorant from a roll-on. Very practical.

So, there you have it: the three P's.

Drollette: Though I guess the problem is that sometimes things are not perceptible immediately, or not personal, or not seen as practical. I'm thinking that if you live in the South Pacific on a low-lying island and your house is sinking under the waves, then it's pretty obvious to you that the sea levels are rising. But it's not as immediately perceptible on the other side of the globe, or inland, or at high elevations.

Solomon: I think one of the blessings of the internet is that we now have a much broader knowledge of climate and weather events in other countries, along with pictures of it. And the data shows that in the past 10 years, there's been a tremendous increase in the

percentage of Americans—in every state in the union—who think that the climate is changing, and that it's a real risk that's bad for people and for the world.

That's a huge change from before. It's fantastic.

And the majority of those people are also in favor of research into renewable energy and doing things to fight climate change. So I see people taking it more personally, in part because of their own experience of heavy rainfall, increased hurricanes, and more extreme conditions.

And with more exposure to international climate events, people are beginning to realize how other people around the world are really suffering.

You have to understand that 20 years ago, when people would interview me about climate change, I would say: "Just wait, it's going to become perceptible." And I believe it really has become much more apparent—particularly on the hottest summer days in most places in the world. It's just amazing.

Drollette: From reading the literature, I get the impression that there are a lot more practical solutions around these days—a lot more affordable renewable technologies. The price of solar panels has just really dropped like a stone.

Solomon: This is absolutely true. On the practical side, you may still hear the occasional person saying, "We can't afford to change anything." But there are a lot of energy companies now building solar power plants instead of using coal, which is getting quite expensive to operate. Solar is cheaper than coal and cheaper than gas now, and so is onshore wind. Offshore wind is a little more expensive, but onshore wind is comparable to solar, in terms of price.

And the other great development that has occurred is the emergence of what they call "small community solar." In other words, you, the consumer, don't have to deal with a mammoth energy company anymore. So, community solar is becoming a big thing, particularly in rural areas. And who doesn't want to be liberated from a big monopoly?

Drollette: Any last comments?

Solomon: In regards to climate change, realistically speaking, we're not going to go live in caves and wear bearskins—and no one's asking us to. We need the modern energy lifestyle in order to not only be comfortable but also healthy and safe. We aren't going to devolve. And that means our only choice is to decarbonize the energy supply.

And to make decarbonizing happen, don't sit back, and wait for the politicians to do it for you. It's not going to happen that way. It will only happen if the public demands it and supports it.

I think that now there is enough public support for renewables for them to happen, certainly in Europe—and we're starting to catch up here in the States. I mean, the Inflation Reduction Act was a masterstroke; it's going to cause some major changes in our ability to access clean energy.

So there are lots of reasons why I think that a new day is dawning, and why we should be optimistic.

Let me give you an example. When the public demanded it, the Clean Air Act was passed, because of the overwhelming public support for change. And it happened on Richard Nixon's watch, of all things—who also created the Environmental Protection Agency.

In fact, here's how important it is to demonstrate and show politicians what you think. Nixon was looking out the window of the White House on the first Earth Day, when he saw the crowd streaming down to the National Mall. According to the memoirs of those who were with him in the room—Ehrlichman or Haldeman, I forget which—he turned to his aide and said: "I need to be a player in this." So, because public opinion was so strong—20 million people turned out for the first Earth Day—we later got the Clean Air Act, and the EPA.

Now, I'm sure the creation of these things was brewing in the back of his mind for some time; Nixon was probably already looking for ways to do something in this area, because he closely studied public opinion. But certainly, that was the day that Nixon decided he really had to kick it off.

It was done under the rubric of "streamlining of government," which involved other agencies as well, and which was kind of already underway. But I'm pretty sure he announced that he would form an EPA just a few days after Earth Day.

That first Earth Day was in April 1970. And the EPA was created at the beginning of December 1970. That was pretty fast, considering the magnitude of what happened.

Drollette: I never would have associated Richard Nixon with anything that could remotely be considered environmentally friendly or progressive.

Solomon: At the end of the day, Nixon was a politician—and as a politician he understood that "If I want to succeed, this is what will get me elected."

So, I guess that if there were to be a moral to the story here, it's that things do not always proceed in a straightforward, linear, or predictable way.

And if I could add another moral to the story, it is that success is *not* guaranteed. People have to keep banging the drum.

But we do have things like the Montreal Protocol to look at, as a case of a near-miss that was successfully avoided. The same is true with what happened with smog, with leaded gasoline and with lead paint—there were so many hazards that we successfully avoided, so many near-misses that hopefully we've learned from.

Change can happen when the public demands change, even when you're talking about a big industry like the auto industry—which realized that it had to suddenly start making cars that didn't need leaded gasoline. That was a very big change for them. But they did it.

Drollette: What's the title of your book, and when do you expect it to be out?

Solomon: It's called *Solvable*. It's from University of Chicago Press. I wish it could be faster but I'm excited for it to be out in about a year.

Editor's note: This interview has been condensed and edited for brevity and clarity.

Bulletin of the Atomic Scientists, 9 May 2023, By Dan Drollette Jr

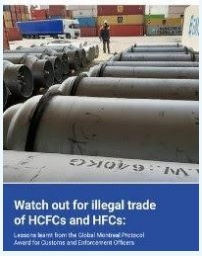
Image: Bulletin of the Atomic Scientists website / courtesy of Susan Solomon

6. GEF-8: USD 800 million pledged to fight against harmful chemicals

The Global Environment Facility (GEF) Secretariat published a **GEF-8 Chemicals and Waste Focal Area Strategy Report** in April 2023, that provides an overview of GEF-8 financing and strategic objectives regarding chemicals and waste.

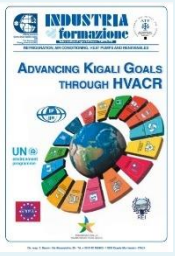
According to the strategic document, USD 800 million have been pledged by donors to provide new opportunities for implementation of the Stockholm and Minamata Conventions, and the Montreal Protocol, and to support the Strategic Approach to International Chemicals Management (SAICM).

The Global Environment Facility (GEF), Chemicals Waste, April 2023
Image: GEF Chemicals Waste PDF, pg5



Watch out for Illegal Trade of HCFCs and HFCs: Lessons learnt from the Global Montreal Protocol Award for Customs and Enforcement Officers. This publication provides an analysis of the cases submitted in the context of the **Global Montreal Protocol Award for Customs and Enforcement Officers**. The Global Award was launched in 2018 by UNEP OzonAction. This Global Award is intended to raise awareness about the Montreal Protocol and to recognise customs and enforcement officials for their efforts in preventing and combating illicit traffic in Montreal Protocol and Kigali Amendment-regulated substances. Ozone-depleting substances (ODS) include hydrochlorofluorocarbons (HCFCs) and other compounds with a high Global Warming Potential (GWP), particularly hydrofluorocarbons (HFCs).

UNEP OzonAction, ASHRAE, April 2023 Fact sheet: Update on New Refrigerants Designations and Safety Classifications. The purpose of this fact sheet is to provide an update on ASHRAE standards for refrigerants and to introduce the new refrigerants that have been awarded an «R» number over the last few years and introduced into the international market.

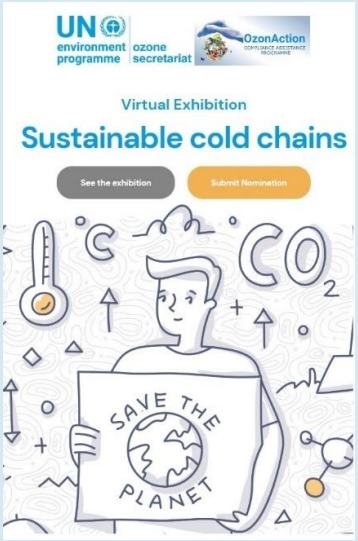


Advancing Kigali goals through HVACR - *International Special Issue 2022-2023* - To provide an update on this global effort, The Centro Studi Galileo (CSG) and the Renewable Energy Institute (REI), with support from the International Institute of Refrigeration (IIR), The United Nations Environment Programme-OzonAction, (UNEP- OzonAction) and The Air conditioning and Refrigeration European Association (AREA), Ministero Della Transizione Ecologica, have collected experiences from around the world, compiled in this special publication, featuring papers from leading global institutions and experts, addressing the current situation, the challenges ahead, and sharing opinions

from different National Ozone Units, on issues related among others to HVAC&R, training, and the role of women in the cooling industry.

*The **International Special Issue 2022- 2023** was officially launched during a side event at the Thirty-Fourth Meeting of the Parties to the Montreal Protocol in Montreal, (MOP34), 31 October – 4 November 2022 | Montreal, Canada*

Sustainable cold chains: Virtual Exhibition - The virtual exhibition for sustainable cold chains aims to highlight the critical role of cold chains in ensuring food safety and security, access to vaccines, reducing global warming and preventing ozone layer depletion.



The exhibition showcases commercially available cold chain technologies for food and vaccines, mainly targeting applications and equipment with refrigeration and cooling cycles that use ozone and climate-friendly refrigerants and have enhanced energy efficiency characteristics. It also aims to promote game-changing and systemic approaches, relevant initiatives, and not-in-kind solutions to cold chains

These technologies and approaches directly contribute to meeting national obligations under the Montreal Protocol on Substances that Deplete the Ozone Layer including its Kigali Amendment and the Paris Agreement on Climate Change. Sustainable cold chain contributes to the achievement of many **Sustainable Development Goals**.

The exhibition is ongoing and continuously updated with submissions accepted on a rolling basis. The partners of the exhibition will continue promoting the exhibition at all relevant events throughout 2022 and beyond.

Click here for more information / submit a nomination >>>

Image: Sustainable cold chains website

AFRICA

7. National ozone officers meet in Kigali to discuss the implementation of Montreal Protocol and its Kigali amendment

The Rwanda Environment Management Authority (REMA) in collaboration with the United Nations Environment Programme (UNEP)'s OzonAction has organized a five-day regional network meeting (from 8-12 May 2023) for National Ozone Officers of the English-Speaking African countries back-to-back with Thematic Workshop for customs Officers.

The meeting brought together National Ozone Officers from African countries as well as representatives of partner-organisations to exchange experiences, develop skills, and share knowledge to fulfill their obligations under the Montreal Protocol on Substances that Deplete the Ozone Layer.

The meeting is also part of the Regional Network service provided by OzonAction's Compliance Assistance Programme (CAP) to (developing) countries as part of its role as an Implementing Agency of the Multilateral Fund for the Implementation of the Montreal Protocol.

National Ozone Officers from Angola, Botswana, Egypt, Eritrea, Ethiopia, Eswatini, Gambia, Ghana, Kenya, Lesotho, Liberia, Malawi, Mauritius, Mozambique, Namibia, Nigeria, Seychelles, Sierra Leone, Somalia, South Africa, South Sudan, Tanzania, Uganda, Zambia and Zimbabwe are attending the meeting, together with representatives from partner-organisations including the United Nations Industrial Development Organisation (UNIDO), the United Nations Development Programme (UNDP), UNEP, Ozone Secretariat and the German Agency for International Cooperation (GIZ).

"As you all know; the ozone layer is a vital shield that protects us from harmful ultraviolet radiation from the sun. The depletion of the ozone layer due to the release of ozone-depleting substances (ODS) is a global problem that requires everyone's action to address it" said Juliet Kabera, Director General of REMA.

"The government of Rwanda maintains that a healthy ozone layer and climate are key to meeting all of the sustainable development goals, since the Montreal Protocol and its Kigali Amendment protect people and Mother Earth" she added.

Though the journey is still long, Rwanda has realized important achievements regarding the implementation of the Montreal Protocol.

They include its contribution to the development the Kigali Amendment, the ratification of the Kigali Amendment, reduction in consumption of the ODS by 57%, the promotion of the adoption of low Global Warming Potential alternatives to HFCs by establishing the "National Cooling Strategies", the establishment of the online application system for licensing the import and export of controlled refrigerants and appliance containing HFCs,

and those which are energy efficient, and the establishment of Africa Centre of Excellence for Sustainable Cooling and Cold Chain (ACES) among others.

Though some countries have put in place measures to phase out ODS, Patrick Salifu, the regional coordinator for the Montreal Protocol in Anglophone African Countries, said there are still some challenges which undermine efforts invested in the ozone layer recovery, including the illegal trade of ODS in certain African countries.

“You find a country is doing all it can do to phase out but besides you find other people illegally trading ODS. Mainly it’s the issue of illegal trade, in most of the African countries, that is undermining the efforts that we are doing in ozone layer recovery.” He said.

Hope for Ozone layer recovery

Despite these challenges, there is hope for the restoration of the ozone layer. Recent studies have shown that the ozone layer is on track to heal completely by the middle of this century.

This is due to various initiatives and policies, including the Kigali Amendment to the Montreal Protocol, which was adopted in 2016. The amendment was designed to eliminate the production and consumption of hydrofluorocarbons (HFCs).

Among other facts, it should be noted that various African countries, such as Rwanda and Kenya, have made significant progress in implementing the Montreal Protocol. They have accomplished this by prohibiting the importation, exportation, and use of products containing ODS, and have implemented strict enforcement measures to ensure compliance.

“You can hear figures like 90% of the gases that were destroying Ozone layer were successfully phased out. But restoration will take time that’s why it is predicted that by 2060, the ozone layer will get restored to its original shape.”

A thematic workshop will also be conducted to facilitate discussion between Ozone Officers and Customs officers from countries attending the meeting.

The workshop aims to identify current practices and challenges and to brainstorm and agree on an approach to strengthen the enforcement of licensing systems. Customs managers will be involved as they are the ones who deal with the importation and exportation of goods in their respective countries.

Republic of Rwanda updates, 10 May 2023

Image: Republic of Rwanda Website

8. Customs and law enforcement officers get training in border control

A group of Customs and law enforcement officers recently followed training on how to perform effectively in border control situations.

The April 18-20 training workshop at the Story Hotel at Bel Ombre was organised by the Ozone Unit in the Ministry of Agriculture, Climate Change & Environment in collaboration with its international partners GIZ PROKLIMA/UNEP.

Delegates included Customs, aviation security and Port Authority security officers in Seychelles.

The workshop was aimed at training these officers to perform effectively in border control situations by ensuring that the relevant laws are enforced at borders and hence play a pivotal role in the enforcement chain, helping to protect citizens and the environment from the increasingly devastating effects of uncontrolled activities and to be able to identify illegal trade at the two main ports of entry in the country, that is the International Airport and Victoria Port.

The training workshop covered relevant trade-related Multilateral Environmental Agreements (MEAs), the Montreal Protocol Ozone depleting substances (ODS), Basil Convention on Biological Diversity, Convention on international trade in Endangered Species of Wild Fauna and Flora, Minamata Convention on Mercury, Stockholm Convention that protect human health and environment from persistent organic pollutants (POPs), as well as an overview of the Environment Protection Act 2016.

Facilitators of the training comprised a team from the Ministry of Agriculture, Climate Change & Environment, who are focal persons for this convention. The ministry's legal officer was also present to give an overview of new national laws and regulations of the environmentally sensitive commodities (ESCs).

On the last day of the training participants worked in groups to address common issues and recommendations.

The participants expressed their gratitude to the organiser and recommended more of such training in the future.

Seychelles Nation, 4 May 2023

Image: Seychelles Nation Website / The participants in a souvenir photograph

9. Nigeria FG and UNIDO collaborate to phaseout of ozone depletion substances

Following approval of financial and technical support from the Multilateral fund of the Montreal Protocol, the Federal Government of Nigeria, in partnership with the United Nations Industrial Development Organisation (UNIDO), is set to implement the stage III of the Hydrochlorofluorocarbons (HCFC) Phase-Out Management Plan (HPMP) Project.

The aim of the HPMP Stage III project is to phase-out the use of HCFC-22 in the Refrigeration & Air-conditioning Manufacturing Sector and facilitate the achievement of 67.5% HCFCs reduction target by 2025. [...]

National programme coordinator, Environment and Energy, UNIDO Regional Office, Oluyomi Banjo, said the phaseout project, means that we are going to take steps in partnership with the Federal Government of Nigeria through the national liaison office to stop the usage of R22 for the manufacturing sector, which also includes looking into issues like importation and production of those refrigerants in Nigeria.

“Our second reason here today is to launch the scholarship scheme for female engineers, artisans and staff in the refrigeration and air-conditioning sector.

“Today UNIDO is partnering with the FG to launch a scholarship scheme for female technician’s and engineers. We hope to extend this to other countries in West Africa. [...]

The Sun Nigeria, 8 May 2023

Image: The Sun Nigeria Website / Participants at the event.

ASIA AND THE PACIFIC

10. Indonesia’s Cool Roofs Champion

Architecture professor Beta Paramita is on a mission to help cool the people, buildings, and cities of Indonesia with the use of a simple but effective climate-friendly solution – cool roofs. Read more about Beta’s work below or watch this short film produced by BBC

Workers applying a reflective coating to a roof in Tangerang, Indonesia.

StoryWorks Commercial Productions for the Clean Cooling Collaborative.

For more than 40 million city dwellers across Indonesia, the familiar combination of rising temperatures, uninsulated housing, high costs of buying and running cooling appliances, and unstable electricity supply threatens their health and livelihoods.

This is the case for an elderly couple and their grandson living in Tangerang – an industrial city on the outskirts of the Greater Jakarta metropolitan area. At night it can be too hot to sleep and during the day, high temperatures make it difficult to study.

According to Beta Paramita – architecture professor at Universitas Pendidikan Indonesia (UPI) and Project Manager of Cool Roofs Indonesia (the winning team of the Million Cool Roofs Challenge) – this is quite typical of low-income housing in Indonesia's cities.

Having studied urban heat islands [1] A metropolitan area that is significantly warmer than surrounding areas due to factors like less green space, more heat-absorbing materials (e.g., concrete and steel), and waste heat from human activities. for many years, Beta is on a mission to help cool the people, buildings, and cities of Indonesia with the use of a simple but effective climate-friendly solution – cool roofs

The benefits of a cool roof

On a hot day, a black roof can reach over 150°F (66°C), radiating heat into the building below, as well as the surrounding area. By applying a specially designed solar-reflective coating to a building's roof, it absorbs less of the sun's radiation, reducing internal temperatures by multiple degrees and improving thermal comfort for the building's inhabitants.

If deployed across a whole community, cool roofs can reduce local ambient temperatures and help lessen the urban heat island effect.

In addition to providing thermal comfort to those who don't have access to cooling appliances like fans and air conditioners, cool roofs also help reduce the need to switch on appliances for those who do have them, cutting energy consumption. In a country like Indonesia, where the majority of electricity comes from coal-fired power plants, reduced energy use can significantly lower greenhouse gas emissions, while also supporting the country's transition to renewable energy by lowering demand on power grids.

Scaling up cool roofs in Indonesia

Under the Million Cool Roofs Challenge, Beta and her team expanded the use of cool roofs in Indonesia, coating 70 buildings across 15 cities. In total, the team estimates that more than 10,000 people will benefit from the new cool roofs.

Beta's team saw some of the Challenge's most impressive reductions in indoor temperatures. At one industrial site, indoor temperatures dropped by around 20°F (11°C), from 104°F (40°C) to 85°F (29.4°C) following the application of the cool roof coating. And at an elementary school, a cool roof helped reduce indoor temperatures by 5.4°F (3°C).

Since winning the Challenge, Cool Roofs Indonesia has used some of its prize money to install cool roofs on more than 40 public and community buildings, with a plan to continue to deploy the technology at a similar rate over the coming years.

Through UPI and in partnership with the University of Florida and Millennium Solutions, the team is also working to make cool roofs even more accessible by scaling up local production of cool roof materials, which in turn, will reduce production costs. The team

has registered a national brand and continues to optimize the formulation of cool roof materials to make cool roofs more effective and durable.

UPI is working to set up the country's first building energy research center and test lab to establish credible rating and certification systems for cool roof products and other building materials. In turn, this will help provide reliable performance data for consumers and policy makers, enable the development of viable business models, and spur the growth of the market

Beta and her team have established distributors of their cool roofs product across 10 cities and are actively promoting the application of cool roofs on commercial and residential properties. Several commercial property managers and developers are exploring partnership opportunities and Indonesia's Ministry of Public Works and Housing is working to develop design guidelines that integrate cool surfaces into affordable modular housing.

Beyond cool roofs

While cool roofs can bring many benefits to a city, they cannot solve Indonesia's cooling challenge alone. From other passive measures like better building design and urban planning, to mechanical options like super-efficient fans and air conditioners or district cooling, a variety of climate-friendly cooling solutions will be necessary.

To support the adoption of these solutions, a range of policies, technological developments, and financial initiatives are needed.

Indonesia is taking action on clean cooling, having recently strengthened its mandatory minimum energy performance standards (MEPS) for air conditioners and refrigerators, and expanded them to include fans. While the country's AC standards are in line with most other ASEAN (Association of Southeast Asian Nations) markets, they are well below international benchmarks for model regulations, providing considerable opportunity to increase their stringency.

In December 2022, Indonesia ratified the Kigali Amendment to the Montreal Protocol (*The Kigali Amendment is an international agreement that will phase down the use of super-polluting hydrofluorocarbon (HFC) refrigerants that are often thousands of times more harmful than CO_2)*, with plans to implement the agreement this month. By transitioning to climate-friendly refrigerants, the climate-impact of Indonesia's air conditioners will be dramatically reduced. An accelerated transition would have an even greater positive effect.

Indonesia is also in the process of developing its first National Cooling Action Plan (NCAP). This will create a comprehensive and holistic approach to tackling the county's cooling challenge moving forward.

With more than 2 billion square meters of new residential floor area expected to be built across Indonesia by 2030 — and an additional 22 million new air conditioners expected to be installed over the same period — scaling up the adoption of cool roofs and other clean cooling solutions across the country will have a significant impact toward reducing the country's energy demand and expanding vital cooling access for millions.

Clean Cooling Collaborative, March 2023

Images: Clean Cooling Collaborative website

LATIN AMERICA AND CARIBBEAN

11. Meeting between Brazil Minister of Environment, and the European Commissioner for the Environment

The Minister of the Environment and Climate Change, Marina Silva, hosted a meeting, on May 2nd, 2023, with the European Commissioner for the Environment, Oceans and Fisheries, Virginijus Sinkevičius.

They declared their commitment to strengthen Brazil and European Union strategic climate and environment relationship and reiterated their strong commitment and willingness to cooperate in tackling the triple planetary crisis of climate change, biodiversity loss and pollution, promoting sustainable development, and fostering a just and inclusive ecological transition.

Both sides stressed the need to provide an urgent climate response and make efforts to nature conservation and sustainable use. They stressed the commitment of both the EU and Brazil towards the fulfilment of the 2030 Agenda and its Sustainable Development Goals (SDGs).

Both officials pledged to working together to enhance global governance and achieve ambitious results under the aegis of the United Nations Framework Convention on Climate Change (UNFCCC), the Paris Agreement, and the Kigali Amendment to the Montreal Protocol. [...]

European Commission (EC), Directorate-General for Environment, 8 May 2023

Images: EC website

EUROPE & CENTRAL ASIA

12. Naturally cool: Europe set to lead a climate revolution with refrigerants

It is clear that the use of f-gases in the growing heat pump market clashes with the EU's strategy of increasing independence in critical raw materials and luring green industry to Europe. It will actually lock one of Europe's most promising 'clean industries' into China's trade clutches. [Shutterstock / klikkipetra]

EU lawmakers' push to phase down fluorinated gases may score the most significant climate victory of the decade and rid Europe's heat pump market of China's imports, argues Davide Sabbaddin, Senior policy officer for climate at the European Environmental Bureau (EEB).

Beyond the "tunnel vision" decarbonisation talks, in which carbon emissions (CO_2) get all the attention, a crucial battle for the climate is being fought: the regulation of fluorinated gases (f-gases).

While the name hardly rings a bell, fluorinated gases are ubiquitous in several key aspects of our daily lives.

These fabricated refrigerant gases are used to produce, import, and preserve our food; heat and cool our homes and offices; transport the energy we consume; insulate our buildings with foams; and preserve our medicines and vaccines.

When f-gases burst onto the market, they did it to replace their ozone-depleting predecessor substances which got banned by the Montreal Protocol. But while they can be used to provide cooling without damaging the ozone layer, they do warm the atmosphere.

As potent greenhouse gases, f-gases global warming potential can be 25,000 times greater than CO_2. A mass destruction climate bomb.

To continue protecting the ozone layer without aggravating the climate crisis, global leaders amended the Montreal Protocol in 2016 to include a phase-down of f-gases.

Named after the city in which it was signed, Kigali (Rwanda), the new treaty agreed to an 80% f-gas reduction over 30 years.

Achieving this decline will prevent a rise of 0.5° C in global temperature by the end of the century. Hardly any other climate action can deliver such sharp results.

For decades, the European Union has boasted the most ambitious f-gases policy in the world.

Thanks to the EU **F-gas regulation**, fluorinated gas emissions have been falling every year since 2015 in the bloc. However, science urges policymakers to go even further and faster.

Time is not on our side and the ongoing revision of the regulation could deliver a significant blow to these climate-destroying substances.

EU institutions enter the final round of negotiations for the F-gas phase out and the swords are flying high.

On one side, the European Parliament aims to accelerate the phase-out of f-gases with deeper cuts from 2024 onwards, in order to bring the EU in line with its 2030 climate targets and the Montreal agreement.

On the other side, some industries have strongly opposed reducing f-gases at such speed, with the European Heat Pump Association leading the block against it.

Heat pumps, as highly energy-efficient appliances capable of both heating and cooling our homes without relying on fossil fuels, are great allies of the green transition. Their over-dependence on global warming fluorinated gases is their only major problem.

An issue that the EU regulation could fix by pushing the market towards more climate-friendly alternatives already produced in Europe.

Strategic independence

F-gases are produced by a handful of multinational companies, most of them based outside the EU.

In fact, foreign manufacturers of heat pumps have been at the forefront of lobbying to weaken the European Parliament's position on the f-gas file.

But even if fluorinated gases were manufactured in Europe, EU states would still heavily rely on imports. F-gases depend on a key raw material, fluorspar, whose production is in the hands of China and some other foreign suppliers.

It is clear that the use of f-gases in the growing heat pump market clashes with the EU's strategy of increasing independence in critical raw materials and luring green industry to Europe. It will actually lock one of Europe's most promising 'clean industries' into China's trade clutches.

If Europe has learned anything from the tragic experiences of the pandemic and the invasion of Ukraine, it is the need to shorten production chains and increase self-sufficiency.

With the quick phase-out of f-gases proposed by the EU Parliament, the European heat pump industry faces a golden opportunity to become fully independent: the quick uptake of natural refrigerants (such as hydrocarbons, ammonia, and CO_2) — which have low global warming potential and can be entirely produced in the EU.

Right moment, right pace

Some argue that the transition to natural refrigerants would be too swift. But this shift comes at the right time and speed, for both the planet and the EU's strategic interests.

Brussel's plans to install 30 million heat pumps this decade to reduce fossil gas consumption can be a double-edged sword if operated on fluorinated gases.

Hence, the rapid growth of heat pumps must be matched by a sharp decrease in fluorinated gases, as the only way to avoid jeopardising our own climate efforts or shackling us further to China.

Natural refrigerants are even natural allies to high-temperature heat pumps, one of Europe's soon-to-be popular decarbonisation solutions due to their ability to deliver efficiency and comfort even without renovations.

With Europe's rally call against fossil fuel dependency in support of an efficiency facelift for buildings across the continent, these heat pumps and free of the f-bomb are set to play a central role.

As for the feasibility of change, key industrial actors have shown signs of readiness despite the noise.

"For the residential market, it's absolutely clear that we don't need f-gases anymore", said Ingo Seliger, representative of German heat pump manufacturer Viessmann, already in January 2023.

Fast progress on f-gas limitation has also allowed Europe to consolidate its leadership in the production of natural-based solutions worldwide. Thanks to the bans on a type of f-gas with a high global-warming potential (HFCs) introduced in the first F-Gas Regulation, natural alternatives (like CO_2 and HCs) are today the mainstream refrigerants used in the commercial sector, such as supermarkets, across the EU.

At that time, some industry players also raised a hue and cry against this legislative step.

Amidst the global dash for net-zero economies and industries, the EU must consolidate its current leadership with bold policies and cutting-edge climate solutions.

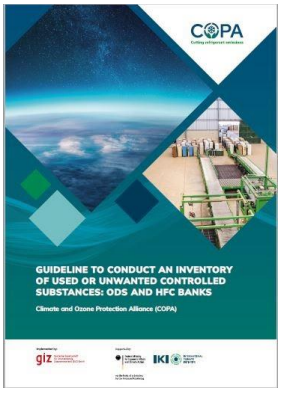
Europe might have missed other important trains in the ongoing transition such as solar panels manufacturing, but the bloc now holds the golden ticket for the one for climate-friendly heat pumps -running on natural refrigerants- and it cannot stumble now.

Read in French

EURACTIV, 8 May 2023, By Davide Sabbaddin
*Image: EURACTIVE website / [**Shutterstock / klikkipetra**]*

See also >>> EU Legislation in Progress, Revision of the Ozone Regulation, European Parliamentary Research Service (EPRS), May 2023, Author: Dessislava Yougova, Members' Research Service

13. New publication on how to conduct an inventory of used or unwanted controlled substances: ODS and HFC banks



On May 9, 2023 in the framework of the webinar: **Sustainable ODS and HFC banks management through complementary action of the Climate and Ozone Protection Alliance to the Multilateral Fund**, it was officially announced the release of the updated version of the **guideline on how to conduct an inventory on ODS and HFC banks**.

This guideline was updated to reflect all requirements stated by the decision of the Executive Committee to the Multilateral Fund 91/66 on the provision of a funding window for establishing an inventory of controlled substances and a plan for their treatment.

Considering that a sound understanding of ODS/HFC banks on the country level is the basis for any action and policy decisions in the field of bank management, it was necessary to create a guideline intended for inventory compilers involved in quantifying the amount of ozone depleting substances (ODS) and hydrofluorocarbon (HFC) banks in their country and based on this, quantifying the mitigation potential.

Climate and Ozone Protection Alliance (COPA), 9 May 2023

Image: COPA website

See also >>> Guidance Recovering, reclaiming and recycling F gas. How to recover fluorinated gas (F gas) from equipment and get it reclaimed or recycled. Latest update 18 April 2023

14. The Building Engineering Services Association (BESA) has launched a new round of free heat pump installation training

The Building Engineering Services Association (BESA) has launched a new round of free heat pump installation training to help the industry upskill its workforce in line with soaring demand as the market grows.

The new course blends practical training and online learning, and the first 400 places are being offered free of charge. It is the next phase of a programme the Association runs in partnership with MCS and heating equipment manufacturer Worcester Bosch. The first phase of online training was completed by 1,000 installers.

The Association also welcomed increased government funding which will help it to grow its training provision in Further Education colleges and give local training providers the equipment and skilled trainers needed to deliver courses leading to MCS certification.

BESA was one of the organisations to benefit from the £9.2m of funding provided by the Department for Energy Security and Net Zero following its recent Home Decarbonisation Skills Training competition to support heat pump and energy efficiency training across England.

The Association's share will allow it to deliver free training for qualified plumbing, heating, refrigeration, and air conditioning engineers looking to upskill, and provide the technical competence for businesses to be guided through the MCS-accreditation process.

This new hybrid course is being delivered through the Association's **online training Academy** and will run until the end of July. It includes a two-day practical element as well as five hours of online theory which can be completed in 'bite size chunks' at the convenience of the student.

Assessment

The two days' practical and final assessment will take place at one of BESA's approved local colleges or training centres. On completing the training, students will be able to correctly specify and install low temperature heating systems, accurately size components, commission, and handover systems properly, as well as carrying out lifecycle maintenance.

BESA said the government support would also create a "significant training legacy" by helping with the development of more training centres able to produce a new generation of engineers with the necessary skills to retrofit homes and commercial buildings.

Momentum is building in the heat pump sector and a recent pilot project showed that the technology can be successfully deployed in all types of UK housing. The Electrification of Heat Demonstration Project, which was also funded by the department then known as BEIS, did however illustrate the need for more innovation to overcome some of the barriers to a widespread roll out of the technology including cost and disruption.

"The pilot project demonstrated the huge potential for heat pumps, but a key factor will be the industry's ability to meet demand with a suitably trained workforce," said BESA's director of training and skills Helen Yeulet. "We are facing a race against time to keep the decarbonisation of UK heat on track so must rapidly scale up our training provision."

She added that upskilling to become a heat pump installer was a great way to "future-proof your business while helping homeowners and businesses reduce their energy bills and contribute to our long-term battle against climate change".

'Training the trainers' was a key element of BESA's successful application for additional funding to help extend the network of FE colleges and independent training centres able to deliver heat pump courses. The hands-on practicality of the course and the final assessment process it developed with Worcester Bosch was another element appreciated by the government.

Yeulet added that, because MCS certification was becoming more widely recognised as the industry standard, it was important that installers were also helped to navigate their way through the system so they could start applying their skills in the marketplace.

"This collaboration and the additional funding will allow us to create an extended network of local training hubs equipped to deliver meaningful, practical training to ensure heat pump technology performs to its full potential," said Yeulet.

"It will also help installers explain the various options to homeowners and commercial building customers which is a good way to gain a reputation as a knowledgeable and trustworthy business."

Click here to register your interest in the training.

The Building Engineering Services Association (BESA), 10 May 2023, By Ewen Rose

Image: BESA website

Summary of the 34th Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer (MOP34), 31 October – 4 November 2022 | Montreal, Canada

- Read/Download the **full report**
- pre/post documents, United Nations Environment Programme (UNEP), Ozone Secretariat **MOP-34**
- **Daily highlights** Earth Negotiations Bulletin-International Institute for Sustainable Development (IISD) / **Presentations and statements** / **Side events**

Image: ENB-IISD website

Overview for the meetings of the ozone treaties - Click **here** for upcoming and past Montreal Protocol Meetings dates and venues.

New gaming technology to create environment simulation game for teenagers-The UN Environment Programme's (UNEP) Ozone Secretariat today launched a simulator game and avatar using the latest software technology. **Apollo's Edition** is the latest addition to the **Reset Earth education platform**. Targeting 13-18-year-olds, the free online education material developed provides educators with resources to teach students the importance of environmental protection.

Online introductory course 'International legal framework on ozone layer protection'
Designed for government representatives and national stakeholders new to the Vienna Convention and Montreal Protocol, students of environmental law, and anyone interested in learning about the ozone treaties, the **online course** launched by the Ozone Secretariat aims to provide an introduction to the international legal framework on ozone layer protection.
United Nations Environment Programme (UNEP), Ozone Secretariat

Free teaching kits on ozone layer and environmental protection

- New free online teacher toolkits and lesson plans based on the success of UNEP's Ozone Secretariat's ***Reset Earth*** animation and video game
- Targeting Tweens by adopting animation and gamification to create innovative online lessons to raise awareness on ozone layer and environmental protection
- Available online in digital and print format for universal access

Read/download >>> **Ozone Secretariat's education platform**

Images: UNEP, Ozone Secretariat website

The UN Environment Assessment Panels

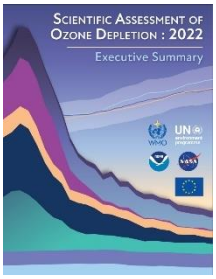
The Assessment Panels have been vital components of ozone protection since the Montreal Protocol was first established. They support parties with scientific, technological and financial information in order to reach decisions about ozone layer protection and they play a critical role in ensuring the 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 >>>**

Scientific Assessment of Ozone Depletion: 2022 - Executive Summary

United Nations Environment Programme (UNEP), Ozone Secretariat



The Multilateral Fund for the Implementation of the Montreal Protocol

The Fund is dedicated to reversing the deterioration of the Earth's ozone layer. It was established by a decision of the Second Meeting of the Parties to the Montreal Protocol (London, June 1990) and began its operation in 1991. The main objective of the Fund is to assist developing country parties to the Montreal Protocol whose annual level of consumption of the ozone depleting substances (ODS) chlorofluorocarbons (CFCs) and halons is less than 0.3 kilograms per capita to comply with the control measures of the Protocol. Currently, 147 of the 197 Parties to the Montreal Protocol meet these criteria. They are referred to as Article 5 countries.

The Multilateral Fund is managed by an Executive Committee with equal membership from developed and developing countries. Since the inception of the Fund, the Executive Committee has held 91 meetings. The Fund Secretariat, located in Montreal, assists the Executive Committee in its tasks. Projects and activities supported by the Fund are implemented by four international implementing agencies and a few bilateral agencies.

Last 16 July 2022, following the adoption of interim budgets for the Multilateral Fund due to the Covid-19 pandemic, the Fifth Extraordinary Meeting of the Parties to the Montreal Protocol (5th ExMOP) decided on the replenishment of the Multilateral Fund for the triennium 2021-2023. The Parties agreed on a budget of US $540 million for the triennium.

As at 5 December 2022, the contributions received by the Multilateral Fund from developed countries, or non-Article 5 countries, totalled over US$ 5.02 billion. The Fund has also received additional voluntary contributions amounting to US $25.5 million from a group of donor countries to finance fast-start activities for the implementation of the HFC phase-down.

To facilitate phase-out by Article 5 countries, the Executive Committee has approved 144 country programmes, 144 HCFC phase-out management plans and has funded the establishment and the operating costs of ozone offices in 145 Article 5 countries.

Latest News and Announcement:
- **Executive Committee Primer – 2023**, An introduction to the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol, 24/4/2023
- **Policies, Procedures, Guidelines and Criteria of the Multilateral Fund (Dec 2022)**, 3/30/2023
- **Framework of activities for sustainability supported by the Multilateral Fund**, 3/22/2023

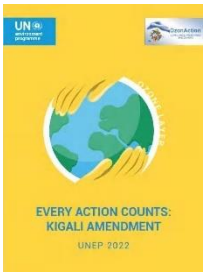
Upcoming events:
- The 92nd meeting is scheduled for 29 May to 2 June 2023, in Montreal, Canada
- The 93rd meeting is scheduled for 11 to 15 December 2023, in Montreal, Canada

>>> Click here for the Executive Committee upcoming and past Meetings and related documents.

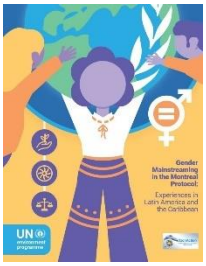
OzonAction Compliance Assistance Programme produces and outreaches a wide variety of information and capacity building materials and tools that support the implementation of the Montreal Protocol programs and assist Article-5 countries in meeting the compliance targets. These include publications, technology 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



Every Action Counts: Kigali Amendment - UNEP 2022 - This brochure targets the general public and explains in a simplified manner what the Montreal Protocol and its Kigali Amendment signify. It includes some actions that everybody can do to support the Kigali Amendment. It also covers the relationship between the Kigali Amendment and Sustainable Development Goals. It introduces some examples of successful communication campaigns on the Kigali Amendment. **English** / **Spanish**

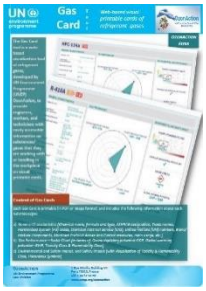


Gender Mainstreaming in the Montreal Protocol: Experiences in Latin America and the Caribbean -Taking into account that women and girls constitute half of the world's population and, therefore, represent half of the potential and innovation necessary to face the "triple planetary crisis" — climate change, nature and biodiversity loss, pollution and waste —, positioning people and the planet as central pillars of the transformation necessary to overcome it, and considering the guiding principles and the scopes of action of the Operational Policy on Gender Mainstreaming of the Multilateral Fund, the United Nations Environment Programme (Latin America and the Caribbean Office). **English** / **Spanish**

Refrigeration, Air-Conditioning, and Heat Pumps (RACHP) Associations & Organizations: This Knowledge Map provides a global directory of RACHP associations, societies, and organisations around the world. These are key stakeholders for ensuring safe and efficient refrigerant transitions.

Local Technical & Vocational Education and Training (TVET): This Knowledge Map provides a global directory of TVET entities and centres around the world. These are the strategic partners for conducting and promoting training and certification programmes related to the refrigeration servicing sector.

Click **HERE** to access the OzonAction Knowledge Maps tool
Click **HERE** to download the OzonAction Knowledge Maps tool flyer

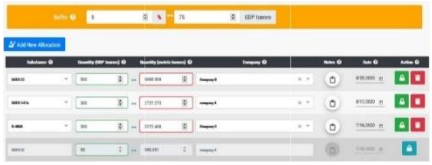


Gas Card Tool: Web-based Visual Printable Cards of Refrigerant Gases
Content of Gas Cards - Each Gas Card is printable (in PDF or image format) and includes the following information about each substance/gas: a) General Characteristics (Chemical name, formula and type, ASHRAE designation, Trade names, 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—Radar 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 the 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 Gard web-based tool

- The Gas Gard 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 - 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 licenses. 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_2-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_2-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 all the official facts and figures in one place. Conversion formulas need to be applied to calculate CO_2-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)

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.

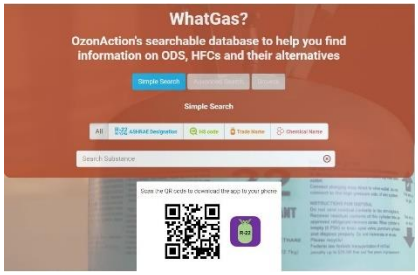
Smartphone Application: Just search for "*GWP-ODP Calculator*" or UNEP in the Google Play store or use the QR code – free to download! If you already have the application installed on your device, be sure to update to benefit from the new features.

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

Updated OzonAction "WhatGas?" Mobile App



The OzonAction 'WhatGas?' application is an information and identification tool for refrigerants gases: ozone depleting substances (ODS), HFCs and other alternatives. It is intended to provide some 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.

This latest release includes the 2022 Harmonized System (HS) Codes for HFCs and blends, which facilitates the process of inspection and identification of controlled and alternative substances.

Scan the QR code to download the app (*currently available for Android devices only*). If you've already downloaded the app, to update visit the **Google Play Store**

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:

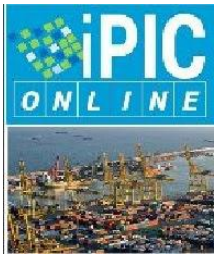
- **Techniques, Safety and Best Practice**
- **Flammable Refrigerant Safety**

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

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!**

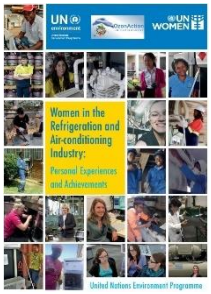
The flyer is available from the **OzonAction website**.

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-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

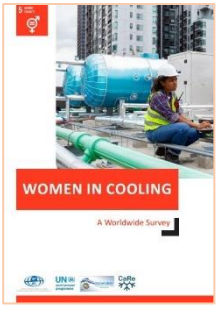


The United Nations Environment Programme's (UNEP), OzonAction, in cooperation with UN Women, has compiled this booklet to raise awareness of the opportunities available to women and to highlight the particular experiences and examples of women working in the sector and to recognise their successes. All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

As part of IIR and UNEP OzonAction's partnership, a set of Cold Chain Technology Briefs was released over the past few years, which includes in-depth summaries about the cold chain in different key sectors. They include descriptions of technology, refrigerant options and trends and conclude with prospects and challenges. They cover the main cold chain sub-sectors, i.e., **Production & Processing**, **Cold Storage**, **Transport Refrigeration**, **Commercial & Domestic**, and **Fishing Vessels**. **Download the Cold Chain Technology brief in English | French | Russian | Spanish**

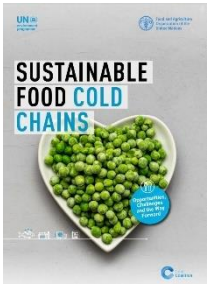
PUBLICATIONS

Results of a Worldwide Survey about Women in Cooling Released by IIR and UNEP OzonAction - Refrigeration, Air-Conditioning, and Heat-pumps (RACHP) are crucial for our health, nutrition, comfort, and well-being. It is one of the sectors that crosscuts many of the UN sustainable development goals and can contribute significantly to safeguard the environment, advance welfare of humanity and support the growth of employment and economics worldwide. Women are highly under-represented in this sector as indicated by the fact that only 6% of the members of national refrigeration associations/organisations/institutions are women. In order to better understand the background, motivation, challenges, and opportunities faced by women working in RACHP a worldwide survey was undertaken by the International Institute of Refrigeration (IIR) and OzonAction of UN Environment Programme (UNEP) in cooperation with several partners.

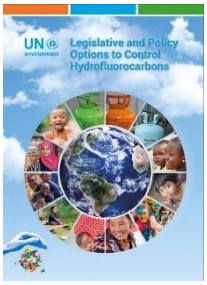


Read/Download the Full Report

Sustainable Food Cold Chains: Opportunities, Challenges and the Way Forward-This [UNEP-FAO] report explores how food cold chain development can become more sustainable and makes a series of important recommendations. These include governments and other cold chain stakeholders collaborating to adopt a systems approach and develop National Cooling Action Plans, backing plans with financing and targets, implementing and enforcing ambitious minimum efficiency standards. At a time when the international community must act to meet the Sustainable Development Goals, sustainable food cold chains can make an important difference.

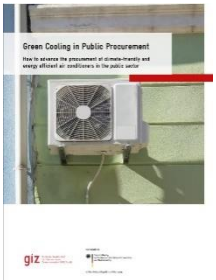


Legislative and Policy Options to Control Hydrofluorocarbons - In order to follow and facilitate the HFC phase-down schedules contained in the Kigali Amendment, the Parties, including both developed and developing countries, will have to implement certain measures.
This booklet contains a recommended 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. **10-2022**
(in Italian).

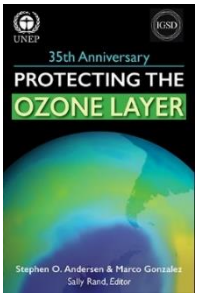
Green Cooling in public procurement How to advance the procurement of climate-friendly and energy-efficient cooling equipment in the public sector? Air conditioning in public buildings is often responsible for around 50% of total electricity consumption. Switching to climate-friendly cooling technologies ("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**



E-Book on Process Safety Management (PSM) Training for Ammonia Refrigeration - a new e-book about the critical elements of a process safety management (PSM) training program for facilities operating an ammonia refrigeration system. The e-book, titled "**7 Keys to a Compliant PSM Training Program for Ammonia Refrigeration**," outlines important questions a facility's program should address and questions that trained plant personnel should be able to answer. Topics covered include:

- Safety hazards and health considerations
- Emergency shutdown procedures
- Addressing deviations from system operating limits
- Risks and costs of non-compliance with regulatory standards

Request free Download here



Protecting the Ozone Layer - 35th Anniversary Edition - a new book celebrating the 35th Anniversary of the Montreal Protocol. The electronic version (Kindle Edition) of the book has become **available for purchase $3.03 on Amazon**. The book highlights successes and documents innovation during the first 35 years and inspires new ambition to strengthen protection of stratospheric ozone and climate before Earth passes tipping points. The book tells the story of the Montreal Protocol, revealing a model of cooperation, collaboration, universal ratification, record of compliance with over 99 per cent of controlled ozone-depleting substances (ODSs) phased out, the ozone layer on the path to recovery, the 2007 Montreal Adjustment, and the 2016 Kigali Amendment moving the Montreal Protocol further into environmental protection. Unfinished business includes: HCFC phase out, ODS bank management, HFC phase down, uncontrolled ozone-depleting greenhouse gas nitrous oxide (N_2O), feedstock exemptions for plastics production, and dumping of obsolete cooling appliances.

The book was released at 34th Meeting of the Parties to the Montreal Protocol on 31 October 2022.

MISCELLANEOUS

To be organised by the French Association of Refrigeration (AFF) under the theme "**Towards Efficient, Controlled and Smart Refrigeration**", **the 26th IIR International Congress of Refrigeration will be held in Paris (France) on August 21-25, 2023.**

26E CONGRÈS INTERNATIONAL DU FROID
26TH INTERNATIONAL CONGRESS OF REFRIGERATION

Participate to share the latest developments in the industry with the international refrigeration community.
This international event will bring together scientific and technical experts in all fields of refrigeration from across the globe to provide perspectives on the future of the industry in line with sustainable development. **Learn more >>>**

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Prepared by: Samira Korban-de Gobert
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If you wish to submit articles, invite new subscribers, please contact: Samira Korban-de Gobert, samira.degobert@un.org

UN environment programme

Multilateral Fund for the Implementation of the Montreal Protocol

OzonAction SUPPORTING MONTREAL PROTOCOL COMPLIANCE SINCE 1991 30