environmental investigation agency

Meeting the Moment

Securing the Montreal Protocol's Legacy in this Decisive Decade for Climate Action

October 2023

Introduction

The decisions to be taken this year at the 35th Meeting of the Parties (MOP35) in Nairobi can shape the Montreal Protocol's legacy in delivering emission reductions during this decisive decade for climate action.

According to the Intergovernmental Panel on Climate Change (IPCC), "deep, rapid and sustained reductions" of fluorinated greenhouse gases (F-gases) alongside rapid reductions of CO_2 emissions are needed if we are to have any chance of limiting warming to 1.5°C, or even 2°C.[1] Maximising emission reductions before 2030 is critical.

At this meeting, Parties will make a crucial decision on the level of replenishment of the Multilateral Fund (MLF) in its 2024-26 triennium. However, the replenishment is only one of the many important issues to be discussed. Parties will address unexplained emissions of controlled substances that originate primarily from the F-gas production sector, including feedstocks and by-products, and will be seeking progress on lifecycle management, such as by ensuring the proper recovery and destruction of banks of controlled substances. Underpinning all of this is the need to strengthen the treaty's institutions, including to prevent illegal production, use and trade of controlled substances.

To meet this moment, Parties must comprehensively tackle these and other issues discussed in this briefing. Parties must approach these topics recognising both the incredible urgency of the climate crisis, and the Montreal Protocol's unique position to achieve substantial additional emissions reductions in the near term.

Replenishment of the Multilateral Fund for the Triennium 2024–2026 (Agenda item 4)

The Montreal Protocol faces an unprecedented need for additional financial resources to assist Article 5 (A5) Parties in the coming 2024-2026 triennium.

During this triennium, most Article 5 (A5) Parties will be faced with simultaneously meeting the 2024 freeze in hydrofluorocarbon (HFC) consumption and achieving a 67.5 per cent reduction in consumption of hydrochlorofluorocarbons (HCFCs) in 2025. Reflecting this, the high-end estimated budgetary needs submitted by the Replenishment Task Force (RTF) to this meeting are more than double the historically negotiated replenishments of the MLF (See Tables 1 and 2).

As the A5 HFC phase-down gets underway, these coming years will be pivotal to the successful implementation of the Kigali Amendment. EIA notes that Parties should be prepared to fund the amount required for full ratification (high-end scenario), based on the treaty's history of universal participation. EIA also reminds Parties that their considerations should acknowledge the reality that the cost-effectiveness of the Fund is unparalleled in climate mitigation. To date, the Multilateral Fund supported phase-outs in A5 Parties have avoided an estimated 51.1 $GtCO_2e$, at a cost effectiveness of US \$0.07/CO_2e tonne.[2] Furthermore, when adjusted for inflation, the level of funding is comparable to earlier investments, e.g. in 1994.[3] Parties should also consider the significant costs of failing to maximise the climate benefits available through the Montreal Protocol. The costs of extreme weather events attributable to climate change has been calculated at US$143 billion per year,[4] while the human cost by the end of the century, based on current mitigation policies, will be one-third of the global population living outside the human climate niche.[5]

The Multilateral Fund's assistance to A5 Parties is fundamental to the success of the Montreal Protocol. **EIA urges Parties to reach agreement on a replenishment that reflects the unprecedented need for support and provide a substantial increase to ensure A5 Parties will be able to meet their multiple HCFC and HFC commitments.**

Table 1: Estimated funding requirement for the replenishment of the MLF 2024–2026 (US$)

2024-2026 Triennium	May 2023 Estimate	Sept 2023 Updates
Subtotal - HCFC Activities	$363,911,000	$362,323,000
Subtotal - HFC Activities	$519,142,000	$643,908,000
Subtotal - EOL/Disposal	$ 13,590,000	$13,590,000
Subtotal - IS & Standard Activities	$121,581,000	$121,581,000
Total	**$1,018,224,000**	**$1,141,402,000**

Table 2: Historical replenishments of the Multilateral Fund (does not include the initial capitalisation of $240 million for 1991-1993)

Triennium	Approved	Carry-over	Interest accrued	Total MLF Budget
1994-1996	$ 455,000,000	$ 55,000,000	N/A	$ 510,000,000
1997-1999	$ 466,000,000	$ 74,000,000	N/A	$ 540,000,000
2000-2002	$ 440,000,000	$ 35,700,000	N/A	$ 475,700,000
2003-2005	$ 474,000,000	$ 76,000,000	$ 23,000,000	$ 573,000,000
2006-2008	$ 400,400,000	$ 59,600,000	$ 10,000,000	$ 470,000,000
2009-2011	$ 400,000,000	$ 73,900,000	$ 16,100,000	$ 490,000,000
2012-2014	$ 400,000,000	$ 34,900,000	$ 15,100,000	$ 450,000,000
2015-2017	$ 437,500,000	$ 64,000,000	$ 6,000,000	$ 507,500,000
2018-2020	$ 500,000,000	$ 34,000,000	$ 6,000,000	$ 540,000,000
2021-2023	$ 475,000,000	$65,000,000	N/A	$540,000,000

Addressing Emissions from the Production Sector, Including HFC-23 and Exempt Uses of Feedstocks (Agenda items 9, 13, and 14b)

An initial assessment by the Technology and Economic Assessment Panel (TEAP) Progress Report submitted to OEWG45 identified 24 chemical pathways likely to result in substantial emissions.[6]

This, coupled with the scale of ongoing emissions of ozone depleting substances (ODS), clearly warrants a broader re-examination of fluorochemical production processes and the lack of control over emissions of feedstock, intermediates, by-products, and even the products themselves. Several items on the agenda for MOP35 relate to the ongoing emissions of controlled substances from the production sector, including HFC-23 by-product emissions (ag item 9), carbon tetrachloride (CTC) mitigation (ag item 13) and exempted uses such as feedstocks (ag item 14b). The problem, however, is broader than these agenda items and warrants comprehensive consideration.

EIA estimates that avoidable fluorochemical greenhouse gas emissions from production processes and illegal production and use are as high as 870 million tonnes CO_2 equivalent emissions per year (See Table 3). A new EIA investigation, F-Gases at the Fenceline, detected emissions of various chlorofluorocarbons (CFCs), HFCs, and hydrofluoro-olefins (HFOs) in the vicinity of two major chemical production facilities in the United States.[7] These include emissions of useful products themselves, not just the feedstocks and by-products. Several of the substances detected were unreported for recent years of mandatory emissions reporting. Combined with atmospheric studies, it is clear that these facilities and emissions are not sufficiently regulated.

The Montreal Protocol should act swiftly to mitigate all avoidable emissions from the production sector, which could prove to be a cost-effective and rapid means of achieving significant additional emissions reductions this decade. For example, capture and destruction requirements, such as those placed on by-product HFC-23, could be applied to the process emissions of all controlled substances and greenhouse gas by-products, such as PFC-318. The Montreal Protocol should also re-examine the exemption for feedstocks uses from production and consumption controls.

EIA also urges Parties to initiate discussions more holistically on the mitigation of all production-related emissions, to consider actions that can be taken to improve the monitoring and reporting of production emissions, to reduce fugitive emissions from production facilities, and to consider requiring the capture and destruction of all process emissions of controlled substances, along with any high-GWP by-products associated with their production.

Figure 1: Unexpected Emissions Linked to Fluorochemical Production, Illegal Production and Use, or Unknown Sources.[8]

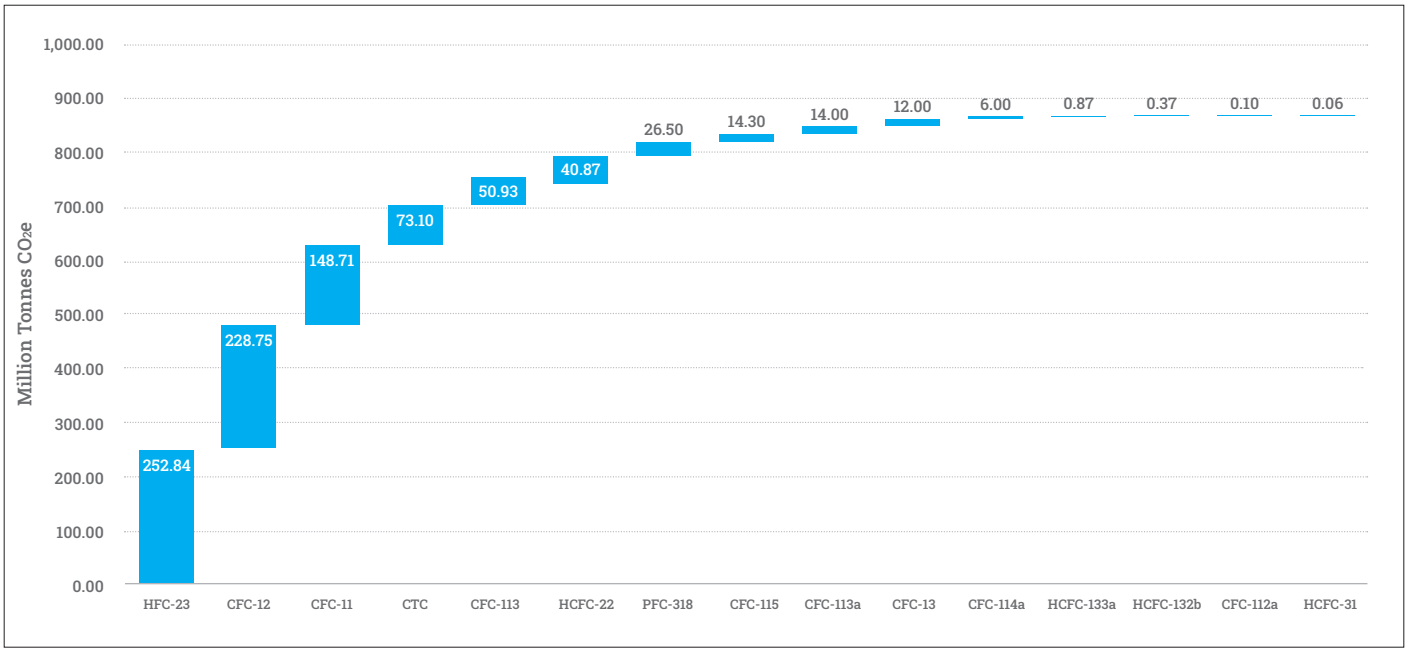


Table 3: Scientific Findings on Unexpected Emissions Linked to Fluorochemical Production, Illegal Production and Use, or Unknown Sources*

Chemical	WMO 2022 GWP	Estimated Emissions (Gg/yr)	Estimated Emissions (Million Tonnes CO_2e/yr)	Observation Year(s)
HFC-23	14,700	17.20	252.84	2019
CFC-12	12,500	18.30	228.75	2014-2016
CFC-11	6,410	23.20	148.71	2014-2016
CTC	2,150	34.00	73.10	2020
CFC-113	6,530	7.8	50.93	2014-2016
HCFC-22	1,910	21.40	40.87	2019
PFC-318	10,600	2.50	26.50	2020
CFC-115	9,630	n/a	14.30	2020
CFC-113a	3,930**	n/a	14.00	2020
CFC-13	16,300**	n/a	12.00	2020
CFC-114a	7,410**	n/a	6.00	2020
HCFC-133a	378	2.30	0.87	2016-2019
HCFC-132b	332	1.10	0.37	2019
CFC-112a	3,550**	n/a	0.10	2020
HCFC-31	85	0.71	0.06	2016-2019
Total			**869.40**	

*This figure aggregates estimated annual emissions of substances linked to fluorochemical production processes, unexplained sources, and illegal production and use, from published sources. The citations provide quantification of emissions based on either top-down atmospheric findings or bottom-up estimates. All information is based on recently available published sources. (see reference 8)

Description of Emission Sources	Reference[8]
Top-down estimate of global emissions. By-product emissions from production of HCFC-22, as well as from pyrolysis of HCFC-22 to produce TFE and HFP. Potential by-product emissions from production of HFC-32, HFC-125 and other controlled substances. Also includes emissions from banks of niche refrigerant and fire suppression uses.	WMO (2022)
Top-down estimate of unexpected emissions excluding emissions from banks. Emissions are linked to illegal production and use or other unknown sources.	Lickley *et al.* (2021)
Top-down estimate of unexpected emissions excluding emissions from banks. Emissions are linked to illegal production and use or other unknown sources.	Lickley *et al.* (2021)
Top-down estimates of global CTC emissions are 44 ± 15 Gg/yr from 2016 and 2020. Once legacy emissions from landfills and contaminated soils (5-10Gg) are subtracted, total emissions from production and unexplained sources are 44 - 10 = 34Gg. Unexplained emissions are assumed to be from feedstock and chloromethane production or other unknown sources. CTC is a feedstock to various CFCs, HFCs, HFOs, & chloroform, which is used to make HCFC-22.	WMO (2022) (Update to Sherry *et al.*, 2018)
Top-down estimate of unexpected emissions excluding emissions from banks. CFC-113 is a common feedstock used to make HFC-134a, TFA, pesticides and chlorotrifluoroethylene (CTFE) which is a precursor used to make fluoropolymers.	Lickley *et al.* (2021)
Bottom-up estimate of emissions from feedstock production and use. Feedstock to TFE/HFP to produce PTFE and other fluoropolymers.	WMO (2022)
Top-down estimate. By-product of hexafluoropropylene (HFP) production, which is used to make fluoropolymers including PTFE (aka Teflon)	WMO (2022)
Top-down estimate of global emissions. No significant banks from end uses. By-product of HFC-125 production	Western *et al.* (2023)
Top-down estimate of global emissions. No significant banks from end uses. Feedstock/By-product in HFC-125, HFC-134a, HFO-1334mzz production; feedstock in production of TFA & pesticides	Western *et al.* (2023)
Top-down estimate of global emissions. Unknown sources. Potential use as a feedstock for CFC-11, however emissions have not declined in recent years with CFC-11 emissions.	Western *et al.* (2023)
Top-down estimate of global emissions. No significant banks from end uses. Feedstock/intermediate in production of HFC-125 and HFC-134a	Western *et al.* (2023)
Top-down estimate of global emissions. No known dispersive end-uses or banks. Feedstock to produce HCFC-123, CFC-113a.	Vollmer *et al.* (2021)
Top-down estimate of global emissions. No known dispersive end-uses or banks. Likely by-product of HFC production.	Vollmer *et al.* (2021)
Top-down estimate of global emissions. No significant banks from end uses. Unexplained, previous uses as a solvent and feedstock in fluorovinyl ether production	Western *et al.* (2023)
Top-down estimate of global emissions. No known dispersive end-uses or banks. By-product of HFC production.	Vollmer *et al.* (2021)

**Author used GWPs from Hodnebrog, Ø. *et al.* Updated Global Warming Potentials and Radiative Efficiencies of Halocarbons and Other Weak Atmospheric Absorbers. Reviews of Geophysics 58, 7 e2019RG000691 (2020).

Ensuring Compliance with Obligations to Report on and Mitigate HFC-23 By-Product

Global HFC-23 emissions in the atmosphere have reached their highest levels in history in recent years.[9]

According to data presented by the Scientific Assessment Panel (SAP) at OEWG45, HFC-23 accounted for 20% of the CO_2e emissions from all HFCs in 2020.[10]

The updated information in the Technology and Assessment Panel (TEAP) decision XXXIV/7 report submitted to this meeting is helpful, but points to significant ongoing uncertainties and data discrepancies.[11] The combined Article 7 and UNFCCC reported data for 2021 – the most complete year of data available – represents HFC-23 by-product emissions of HFC-22 production of just 2,572 tonnes, and does not account for other pathways.[12] This is one eighth (15%) the top-down emissions estimate from SAP,[13] and just 10% of the annual by-product generation estimated by TEAP. The TEAP estimates that annual HFC-23 by-product generation is around 25,000 tonnes per year, based on its understanding of the chemical pathways of production considered in the report.[14]

While the report states that an estimated 95% of HFC-23 by-product is likely generated via the chloroform to HCFC-22 pathway, it also expresses significant uncertainty around the potential HFC-23 generated by Annex F substances (i.e. HFCs), and Annex C Group 1 substances (i.e. HCFCs) other than HCFC-22. TEAP points to insufficient data, lack of emissions reporting, and limited information in patents as the reasons for this uncertainty. The report lists seven potential chemical pathways for production of HFCs that could generate HFC-23 by-product, and one other chemical pathway for HCFCs from producing HCFC-142b, estimating that these generate around 1% of total HFC-23 by-product. Finally, the report estimates that 3-4% of HFC-23 by-product is generated from production of non-Annex F or Annex C substances, primarily through the pyrolysis of HCFC-22 to make tetrafluoroethylene (TFE) and hexafluoropropylene (HFP), but also through other feasible pathways that could be used to produce CFC-113 and CFC-114.[15]

As recommended by TEAP, Parties should consider measures to improve the reporting of HFC-23 generation and emissions, addressing both their accuracy and scope. A submission by Australia, Canada, Norway and the United States submitted to OEWG45 has been forwarded to the MOP35 for discussion.[16] It requests additional information from SAP and TEAP, and requests Parties to submit relevant information on chemical manufacturing processes other than Annex C Group 1 or Annex F substances that may generate HFC-23, and quantities of HFC-23 being consumed by sector. **EIA supports this submission, and also encourages Parties to consider additional implementation requirements to verify emissions controls, such as licensing for chemical pathways with the potential to generate HFC-23 by-product that requires third party verification for reporting and mitigation measures**.

Tackling Emissions from Feedstocks

The mass of ODS used as feedstocks increased by 75% between 2000 and 2019.[17]

Global ODS feedstock production reached 1,492Gg in 2021, dominated by HCFC-22, representing 713Gg, or 48% of the total mass quantity of ODS feedstocks produced.[18] CTC (or CCl4) is the second most widely used ODS feedstock substance with 318Gg (21%) produced in 2021, followed by HCFC-142b at 174Gg (12%) and CFC-113/113a at 108Gg (7%).[19] The 2022 SAP report assessed emissions for regulated ODS feedstocks, estimating 2019 total emissions to be 37.2–58.9 Gg, equivalent to 88.1–145.8 $MtCO_2e$.[20] However, there is a high level of uncertainty about applying accurate emissions factors for production of feedstocks and other fluorochemicals, and the discrepancies with atmospheric observations of several feedstock substances including CTC means that a re-examination of these assumptions is warranted. According to the TEAP, emission rates are likely to vary significantly over time, from process to process, and can be impacted by a range of factors. Recent emissions factors applied to fluorochemical production, including those applied in the SAP report, have typically ranged from 2–4% (4.3% for CTC). However, the 2022 Medical and Chemicals Technical Options Committee (MCTOC) Assessment Report estimates potential emission factors could reach up to 12% in a high scenario.[21] Higher emission factors would considerably increase the existing estimates of emissions from feedstock production.

The proposal submitted by Australia at OEWG45 provides a basis for continuing discussion on this issue, and for taking a decision at MOP35. It calls for relevant parties to take steps to minimise emissions related to feedstocks; encourages them to replace, where technically feasible, the use of ODS with non-controlled substances; and reminds them, when reporting feedstock production, to include unintentional production of isolated and non-isolated intermediates. It also requests TEAP to prepare, for consideration by the OEWG46, a report that includes information on alternative chemicals and processes, and estimates of annual global emissions of ozone-depleting substances, by species, from feedstock production and by-product emissions.[22]

EIA urges Parties to adopt a decision on feedstocks which sets in motion a process to limit exemptions for feedstock production of controlled substances where alternative chemicals and processes are available. It is also imperative to improve monitoring and reporting on feedstock emission rates given the uncertainties noted above and findings in EIA's latest investigation. Parties should consider setting up a mechanism to ban the feedstock production and use of phased-out controlled substances for uses where alternative chemicals and processes are available. This approach has recently been agreed in the EU, under the revised ODS Regulation.[23]

Strengthening Montreal Protocol Institutions, Including for Combatting Illegal Trade, and Enhancing Atmospheric Monitoring (Agenda items 17 & 18)

At OEWG45, during a one-day workshop and in a working group, Parties considered how to strengthen the effective implementation and enforcement of the Montreal Protocol, producing a list of suggested elements to be included in draft decisions on:[24]

- Preventing illegal trade, including defining, controlling, monitoring and reporting;
- Licensing and quota systems, addressing both the international and national levels;
- Implementation and enforcement systems, addressing both the international and national levels;
- Reporting systems and practices within and outside the scope of Article 7; and
- Assessment of opportunities to strengthen the Montreal Protocol.

The intention was for informal discussions to continue during the intersessional period with a view to one or several draft decisions being submitted to MOP35 for consideration.[25] At the time of writing, no draft decisions on the suggested elements above have been proposed. MOP35 will be the first opportunity for Parties to consider this matter further and make recommendations on a way forward.

EIA believes that the suggested elements above are a critical component of a comprehensive review—and eventual strengthening—of the institutions and processes of the Montreal Protocol to ensure continued success. They complement issues that will be considered at MOP35, including unexplained HFC-23 and CTC emissions (agenda item 9), exempt and feedstock uses (agenda item 14) and gaps in global coverage of atmospheric monitoring (agenda item 18) – many of which are also the subject of draft decisions.[26] And they should be supplemented by issues not on the agenda at MOP35 but which have repeatedly been raised, such as the environmentally sound management of banks.[27] To EIA, the Montreal Protocol is at the beginning of a new cycle of policymaking, which should be embraced as it approaches its 40th year, and Parties should be methodical in their consideration of the issues that have been raised.

To this end, EIA recommends that, without delaying progress on those issues currently proposed for consideration at MOP35, a roadmap or pathway be agreed upon for future work. This should include an intersessional process for soliciting input from Parties, observers and other stakeholders and experts on specific issues, summarised in a synthesis report prepared by the Secretariat, and timeframes for Parties to consider them in future years. This should include as a priority a practical way forward to address the gaps in the global atmospheric monitoring network, identifying priorities and ensuring sustained funding. **The outcome of the comprehensive review should be a list of recommendations for future decisions and amendments to strengthen the Protocol's institutions and mechanisms**. In this way, Parties can ensure that the Protocol is fit for purpose to sustain the achievements thus far and rise to the new challenges that must be addressed to align with our climate objective to limit global heating to 1.5°C.

Potential Impacts of the COVID-19 Pandemic on HFC Consumption for Article 5, Group 1 Parties (Agenda item 10)

At OEWG45, Parties discussed a proposed adjustment put forward by Cuba.

Citing the impact of Covid-19 on A5 consumption of HFCs, the adjustment would allow Group 1 A5 Parties to calculate their HFC baselines based on average consumption between 2018-2019 or 2015-2019, rather than 2020-2022.[28] By the close of OEWG45, 26 Group 1 A5 Parties had formally noted concern about the impact of the Covid-19 pandemic on their HFC consumption.[29]

EIA does not support the proposed across-the-board adjustment, however we recognise that a limited number of Parties face a genuine challenge in ensuring compliance with the baseline freeze in 2024. As such, **EIA recommends that an alternative solution is sought to assist countries that can demonstrate a significant reduction in their average consumption during 2020-22 compared to the pre-pandemic period**.

EIA additionally found that only 10 of the concerned Parties with available data recorded a reduction in their HFC consumption between 2019 and the baseline years of 2020-2022 (ranging from a 3% to 73% decrease). Meanwhile, 14 of the concerned Parties experienced increases in their HFC consumption, ranging from 10% to 464%.[30] (See Table 4).

Table 4: Analysis of HFC Consumption and potential non-compliance for A5 Parties that have expressed concern about the impact of the Covid-19 pandemic on their baselines (all figures in CO_2e tonnes, unless otherwise stated).

Country	Kigali baseline	2019	2020	2021	2022	Average HFC consumption 2020-2022	% change from consumption in 2019 to average consumption in 2020-2022 (%)
Armenia	475,254	137,680	195,790	317,041	465,778	326,203	137
Chile	6,698,099	4,763,686	4,465,255	4,957,950	7,089,350	5,504,185	16
Colombia	8,624,850	5,270,350	5,064,307	5,086,999	9,158,361	6,436,556	22
Costa Rica	1,451,498	1,098,992	1,100,536	953,108	1,578,209	1,210,618	10
Dominican Republic	3,834,205	2,406,616	2,472,708	2,071,592	3,714,281	2,752,860	14
Gambia	271,515		173,033	282,417	258,735	238,062	
Guyana	146,169	92,782	60,724	112,245	156,067	109,679	18
Mauritius	665,957	587,594	503,851	336,000	650,471	496,774	**-15**
Panama	2,515,910	1,565,901	1,457,267	1,946,551	2,674,324	2,026,047	29
Philippines	11,903,687	7,276,387	7,170,780	6,013,387	14,908,531	9,364,233	29
Saint Lucia	99,954	54,429	32,643	30,454	167,727	76,941	41
Maldives	434,163	358,171	289,705	315,809	440,495	348,670	**-3**
Paraguay	1,684,479	934,649	1,467,204	876,188	1,563,023	1,302,138	39
Republic of Moldova	371,068	446,684	379,136	340,079	333,986	351,067	**-21**
Cuba	1,030,662	1,255,737	739,658	519,644	882,672	713,991	**-43**
Rwanda	336,373	700,970	268,616	266,728	221,209	252,184	**-64**
Barbados	295,426	158,343	341,967	180,981	125,780	216,243	37
Botswana	389,992	574,066	173,589	173,589	116,757	154,645	**-73**
Burundi	207,530	46,214	51,774	56,843	57,963	55,527	20
Ethiopia	347,035	369,744	281,607	306,842	99,705	229,385	**-38**
Grenada	52,815	29,276	32,006	43,461	29,700	35,056	20
Kenya	1,543,824	588,860	603,944	365,395	315,618	428,319	**-27**
Liberia	180,909	12,169	73,313	85,249	47,273	68,612	464
Mongolia	57,309	30,176	24,183	31,701	32,305	29,396	**-3**
Turkmenistan	597,121	551,438	586,253	510,256	256,793	451,101	**-18**
Georgia							

Forecast HFC consumption based on 6% annual growth from 2022 reported figure, as per forecast scenario outlined in Cameroon's approved Phase I Kigali Implementation Plan (UNEP/OzL.Pro/ExCom/92/23).

EIA analysis suggests, based on available data, that 15 of the Parties expressing concern are at risk of non-compliance with the 2024 freeze. However, the available data does not indicate sufficient evidence to warrant an across-the-board adjustment to the Group 1 A5 baseline formula. Furthermore, the baseline calculation formulas outlined in Cuba's proposal are ultimately unworkable. The proposed 'Option C' relies on the availability of reliable HFC consumption data for 2015-19, something which only one Group 1 A5 country has recorded and submitted to the Ozone Secretariat. 'Option B' meanwhile, suffers from a similar problem, relying on data for 2018-19, which has only been reported by a minority of A5 Parties.

At OEWG45, the potential of a time-limited derogation from compliance with the 2024 freeze was discussed. Following this approach, affected Parties' baselines would still be set according to the Group 1 A5 formula, however the requirement that they limit their consumption to the baseline level would not enter into force until a later year. Future compliance with the subsequent Group 1 A5 phase-down steps, starting with the 10% reduction in 2029, would be unaffected.

EIA supports this as a potential solution but notes that any derogation should be available only to Parties that can demonstrate a 'COVID-19 effect' on their consumption, where their reported levels of pre-pandemic consumption exceed their calculated baseline. Any derogation should also be supported by sufficient additional resources to enable affected Parties to accelerate their phase-down steps in the near future. Finally, EIA urges all Group 1 A5 Parties with baselines that exceed their historic levels of HFC consumption not to pursue any derogations from their Kigali Amendment obligations, and to focus their efforts on a swift and effective HFC phase-down.

Whether 2019 consumption exceeded baseline figure	2024 Freeze at baseline	2025 estimate	2026 estimate	2027 estimate	2028 estimate	2029 10% reduction from baseline	Year exceeding baseline freeze or later compliance target (year)
NO	523,348	554,749	588,034	623,316	660,715	700,358	2023
NO	7,965,594	8,443,529	8,950,141	9,487,149	10,056,378	10,659,761	2023
NO	10,290,334	10,907,754	11,562,220	12,255,953	12,991,310	13,770,789	2023
NO	1,773,276	1,879,672	1,992,453	2,112,000	2,238,720	2,373,043	2023
NO	4,173,366	4,423,768	4,689,194	4,970,546	5,268,779	5,584,905	2023
	290,715	308,158	326,647	346,246	367,021	389,042	2023
NO	175,357	185,878	197,031	208,853	221,384	234,667	2023
NO	730,869	774,721	821,205	870,477	922,706	978,068	2023
NO	3,004,870	3,185,163	3,376,272	3,578,849	3,793,580	4,021,194	2023
NO	16,751,225	17,756,299	18,821,677	19,950,978	21,148,036	22,416,918	2023
NO	188,458	199,766	211,751	224,457	237,924	252,199	2023
NO	494,940	524,637	556,115	589,482	624,851	662,342	2023
NO	1,756,213	1,861,585	1,973,281	2,091,677	2,217,178	2,350,209	2024
YES	375,267	397,783	421,650	446,949	473,766	502,191	2024
YES	991,770	1,051,276	1,114,353	1,181,214	1,252,087	1,327,212	2025
YES	248,550	263,463	279,271	296,028	313,789	332,617	2029
NO	141,326	149,806	158,794	168,322	178,421	189,127	DOES NOT EXCEED
YES	131,188	139,059	147,403	156,247	165,622	175,559	DOES NOT EXCEED
NO	65,127	69,035	73,177	77,568	82,222	87,155	DOES NOT EXCEED
YES	112,029	118,750	125,875	133,428	141,433	149,919	DOES NOT EXCEED
NO	33,371	35,373	37,496	39,745	42,130	44,658	DOES NOT EXCEED
NO	354,628	375,906	398,460	422,368	447,710	474,573	DOES NOT EXCEED
NO	53,116	56,303	59,681	63,262	67,058	71,081	DOES NOT EXCEED
NO	36,298	38,476	40,784	43,231	45,825	48,575	DOES NOT EXCEED
NO	288,533	305,845	324,195	343,647	364,266	386,122	DOES NOT EXCEED

Kigali baseline is "Average consumption for 2020 to 2022, plus 65% of HCFC baseline" [i.e., =((2020+2021+2022)/3) + 65% HCFC baseline].

Lifecycle Refrigerant Management (Agenda item 16)

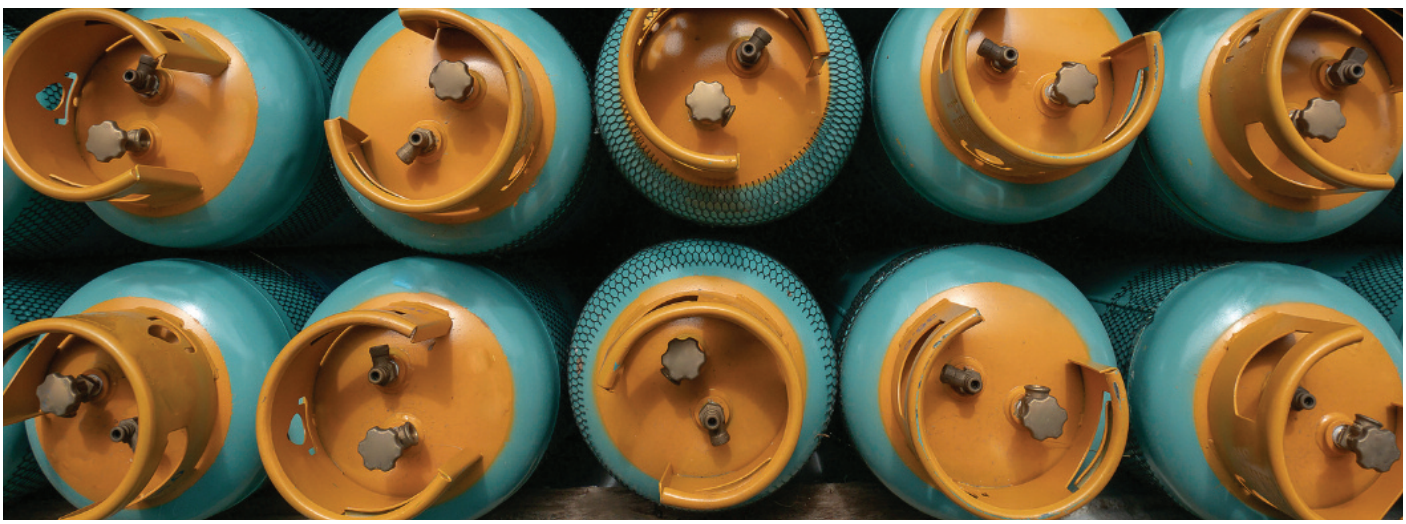
At OEWG45, the Federated States of Micronesia, Ghana, Grenada and other A5 Parties raised the topic of lifecycle refrigerant management for consideration of the Parties, asserting that a systemic approach to refrigerant management would support Kigali Amendment compliance and secure additional climate and economic benefits.[31]

EIA strongly supports this discussion, as robust lifecycle refrigerant management (LRM) to prevent emissions from existing equipment and banks of controlled substances can avert up to 61 billion tonnes of CO_2e globally by mid-century and 91 billion by century's end.[32]

There are many actions that Parties can explore to reduce emissions from equipment and to ensure proper recovery and reclamation or destruction at end-of-life. Preventing emissions from existing equipment necessitates effective monitoring and rapid repair of system leaks, particularly in large commercial cooling systems. We recommend the Parties explore efforts and resources towards best practice leak prevention and maintenance, such as the required use of automatic leak detection systems on large systems, and how to support the near-term deployment of these solutions.

Recovery and reclamation or destruction of refrigerants is a core pillar of strong lifecycle management to prevent emissions from venting at end-of-life. **EIA encourages the Parties to invest in addressing the ODS and HFC banks, which provides a substantial climate mitigation opportunity. Specifically, recapture and destruction of the CFC bank is "the single most effective ozone depletion and climate change mitigation option" for ODS**.[33] This is also important to advance globally as the HFC phase-down will diminish available supply, spurring the potential for illegal trade and undercutting climate benefits. As the HFC phase-down progresses, an initial focus is expected to be on reclamation and reuse of HFCs to service the installed equipment, however, scaling up destruction will ultimately be essential to avoiding emissions.

In 2022, the MLF established a funding window for conducting national inventories and plans for collection, transport, and disposal of such substances, including development of national plans for policies and regulations.[34] EIA recommends the Parties continue discussions toward shaping these policy interventions and consider additional financial support for implementation of national plans. Such policies and plans may include Extended Producer Responsibility (EPR) schemes, in which manufacturers and distributors are required to take back or assume responsibility for recovered refrigerant at the end of the product's life. It may also be useful to consider support for regional expansion of fractional distillation capacity for reclaiming HFC blends and consider strategies to ensure compliance and enforcement requirements to enable robust reclamation and reuse without enabling illegal trade. EIA also recommends the Parties establish a plan for development of a global inventory to more effectively quantify banks and their emissions and inform the direction of resources to facilitate responsible end-of-life management.[35] These and other detailed discussions warrant a decision at this meeting to hold a workshop on ODS and HFC banks ahead of OEWG46.



Conclusions and Recommendations

The climate crisis dictates an urgent need to tackle unexpected and new emissions from the fluorochemical industry and advance the conversation on strengthening institutional processes to ensure the sustainability of the Montreal Protocol's achievements to date.

Donor countries must dig deep to rise to the challenge of the increasing scale of financial support required to meet this moment. All Parties must come together and rise to the challenge of writing the next chapter of a successful legacy for the Montreal Protocol.

EIA recommends Parties to the Montreal Protocol to:

- Adopt a robust replenishment for the 2024-2026 triennium that addresses the increasing demands of the simultaneous HFC phase-down and HCFC phase-out;
- Support the draft decision on HFC-23 with additional consideration of implementation requirements to verify emissions controls, such as licensing for chemical pathways with the potential to generate HFC-23 by-product that requires third party verification for reporting and mitigation measures;
- Adopt a decision on feedstocks which sets in motion a process to limit exemptions for feedstock production of controlled substances where alternative chemicals and processes are available.
- Initiate discussions to consider broader measures to more comprehensively monitor and address emissions from the fluorochemical production sector, including process emissions from all by-products and controlled substances;
- Adopt a decision on strengthening the Montreal Protocol that sets a roadmap for a comprehensive evaluation of the Montreal Protocol's institutions and processes and enhanced atmospheric monitoring;
- Advance discussions on global, regional and national measures to support advancement of lifecycle refrigerant management, including a workshop to discuss development of national plans, potential regional projects, and a global inventory of ODS and HFC banks;
- Finalise a decision to allow flexibility for a limited number of Group 1 A5 Parties demonstrating impact of COVID-19 on their consumption to ensure compliance with the 2024 freeze in HFC consumption, while maintaining the current baseline formula and subsequent consumption reduction targets under the Group 1 schedule.

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