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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Eighty-ninth Meeting
Montreal, 7-11 March 2022
Postponed to 16, 18 and 20 May 2022 (part I) and
16-18 June 2022 (part II)[1]

POTENTIAL STRATEGIES, POLICY MEASURES AND COMMITMENTS AS WELL AS PROJECTS AND ACTIVITIES THAT COULD BE INTEGRATED WITHIN STAGE I OF HFC PHASE-DOWN PLANS FOR ARTICLE 5 COUNTRIES (DECISION 88/75)

This document consists of:

- A note by the Secretariat, referring to the discussions at the 88th meeting
- Potential strategies, policy measures and commitments, as well as projects and activities that could be integrated within stage I of HFC phase-down plans, for Article 5 countries; prepared by the Secretariat for discussion at the 88th meeting (document UNEP/OzL.Pro/ExCom/88/71).

[1] Due to coronavirus disease (COVID-19), part I of the 89th meeting will be held online while part II will be held in-person.

Note by the Secretariat

1. In response to decision 84/54(b), the Secretariat submitted to the 87th meeting document UNEP/OzL.Pro/ExCom/87/45 on potential strategies, policy measures and commitments, as well as projects and activities that could be integrated within stage I of the HFC phase-down plans for Article 5 countries, to ensure limits on growth as well as reductions in HFC consumption that were sustained over time, taking into account the parallel or integrated implementation of HCFC phase-out and HFC phase-down activities where appropriate.[2]

2. Further to a presentation by the Secretariat at the formal online 87th meeting, there was general appreciation of the document, which raised a number of important issues and showed opportunities for Article 5 countries to integrate or synchronize HFC phase-down and HCFC phase-out activities. Some of the elements highlighted as interesting or worthy of further consideration included: possibilities for an integrated approach to HCFC and HFC projects; the use of lessons learned during the phase-out of CFCs and HCFCs; alignment of the licensing and importing systems; opportunities for early action to limit growth in HFC consumption; the eligibility of sectors or sub-sectors to submit plans early; the provision of funding on a case-by-case basis; the different treatment of Article 5 group 1 and group 2 countries; and the eligibility of countries that did not ratify the Kigali Amendment but submitted a letter of intent. A number of members from Article 5 Parties expressed concern that the proposed measures might either contradict, be more stringent than, or reduce the flexibility offered to Article 5 countries by decision XXVIII/2.

3. Given the complexity of the issues under discussion, it was agreed that more time, more information, and a deeper analysis of certain ideas was required. Acknowledging that the subject matter could be considered properly only at an in-person meeting, the Executive Committee deferred to its 88th meeting consideration of the document (decision 87/49).

4. In line with decision 87/49, at the 88th meeting, the Secretariat presented document UNEP/OzL.Pro/ExCom/88/71, which was largely the same as document UNEP/OzL.Pro/ExCom/87/45. Given, however, that the guidelines for the preparation of the Kigali HFC implementation plans (KIPs) approved at the 87th meeting had already covered certain elements discussed in the document, the Secretariat made several observations on the recommendation contained in the document submitted to the 87th meeting, for further consideration by the Executive Committee.

5. The Executive Committee discussed the document at its formal online meeting, followed by discussions among the contact group established to discuss the matter. Members held general discussions on several elements contained in the document, but were unable to enter into more substantive discussions on some other ideas. Certain members felt that additional time was needed to gain a better understanding of those ideas, and preferred not to address the recommendations or adopt a decision at that time. Concerns were also raised about the concept of limiting growth in HFC consumption, as some members considered that it would constitute an obligation beyond the terms of decision XXVIII/2, or remove the flexibility that the decision offered to Article 5 countries; several members also considered it important that a decision was first made on the HFC cost guidelines. Other members, however, were in favour of adopting a decision indicating that the document could be used as a reference by Article 5 countries and bilateral and implementing agencies when designing strategies to phase down HFCs and in preparing KIPs, on the understanding that the ideas and suggestions therein were not to be seen as prescriptive or binding, but rather to be taken into consideration, as relevant, depending on the national circumstances of each country, while bearing in mind that the fundamental purpose of such projects was HFC phase-down and sustained compliance. One member proposed a text of a draft decision accordingly. Although no consensus was reached with regard to the adoption of a decision on the proposal, the group expressed interest in continuing

[2] The document should have been submitted to the 85th meeting; consideration of the document was deferred to the 87th meeting in accordance with the agreed procedures for conducting the 85th and 86th meetings in light of the COVID-19 pandemic.

discussions on the idea and on document UNEP/OzL.Pro/ExCom/88/71 at the following meeting.

6. Accordingly, the Executive Committee decided to continue, at its 89th meeting, discussions on document UNEP/OzL.Pro/ExCom/88/71 and on the text of a draft decision seeking to encourage bilateral and implementing agencies and Article 5 countries, in accordance with their national circumstances, to take into account, when appropriate, the ideas and suggestions contained within that document when designing strategies to phase down HFCs and developing KIPs (decision 88/75).

7. Pursuant to decision 88/75, document UNEP/OzL.Pro/ExCom/88/71 is attached to this note for further discussion.

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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Eighty-eighth Meeting
Montreal, 15-19 November 2021[1]

POTENTIAL STRATEGIES, POLICY MEASURES AND COMMITMENTS, AS WELL AS PROJECTS AND ACTIVITIES THAT COULD BE INTEGRATED WITHIN STAGE I OF HFC PHASE-DOWN PLANS FOR ARTICLE 5 COUNTRIES (DECISION 84/54(b))

Background

1. At its 84th meeting, the Executive Committee considered requests for preparatory funding for HFC phase-down plans and demonstration pilot projects included in the work programme amendments of one implementing agency.[2] During the discussion, members underscored that the phase-down plans would result in a sustained reduction of HFC consumption, limit growth in HFC consumption, and provide guidance on the type of commitment required from Governments in order to give the Executive Committee confidence that the HFC consumption phased out would remain phased out. It was also proposed that the Secretariat be requested to prepare a document providing analysis and options for potential strategies, project activities and policy measures for inclusion in phase-down plans to ensure that they led to sustained reductions or limits on consumption. It was further suggested that the document also reflect the Secretariat's analysis of the implications of parallel or integrated implementation of HCFC phase-out and HFC phase-down activities,[3] which would be discussed under agenda item 12. Subsequently, the Executive Committee considered a draft decision on the matter and, following a brief discussion, referred the matter to a contact group.

2. Based on the report submitted by the convener of the contact group, the Executive Committee requested the Secretariat to prepare for the 85th meeting:

(a) Draft guidelines for the preparation of HFC phase-down plans for Article 5 countries that would include an overarching strategy and a stage I to meet the freeze in consumption and the 10 per cent reduction (decision 84/54(a)); and

[1] Online meetings and an intersessional approval process will be held in November and December 2021 due to coronavirus disease (COVID-19)

[2] The issue is contained in paragraphs 16 to 20 of document UNEP/OzL.Pro/ExCom/84/32, "Overview of issues identified during project review."

[3] UNEP/OzL.Pro/ExCom/84/65

(b) A document discussing potential strategies, policy measures and commitments, as well as projects and activities that could be integrated within stage I of the HFC phase-down plans for Article 5 countries, to ensure limits on growth, as well as reductions in HFC consumption that were sustained over time, taking into account the parallel or integrated implementation of HCFC phase-out and HFC phase-down activities, where appropriate (decision 84/54(b)).

3. At its 84th meeting, the Executive Committee also discussed document UNEP/OzL.Pro/ExCom/84/65, presenting an analysis of the implications of parallel or integrated implementation of HCFC phase-out and HFC phase-down activities. During its discussions, members expressed appreciation for the analysis, which would support cost-effectiveness in the Committee's future work and prove particularly useful in the development of plans for the phase-down of HFCs; and also expressed an interest in further discussion of ways to support a cost-effective approach to HCFC phase-out and HFC phase-down activities.

Structure of the document

4. In response to decision 84/54(b), the Secretariat prepared document UNEP/OzL.Pro/ExCom/87/45 and submitted it to the 87th meeting.[4]

5. In preparing the above-mentioned document, the Secretariat extracted relevant information from the following documents that have been or will be considered by the Executive Committee:

(a) The document presenting an analysis of the implications of parallel or integrated implementation of HCFC phase-out and HFC phase-down activities,[5] as the information, analysis, and discussion contained therein supplements[6] the present document;

(b) The draft guidelines for the preparation of HFC phase-down plans for Article 5 countries,[7] submitted to the 86th meeting in response to decision 84/54(a),[8] noting that the resulting phase-down plans will include an overarching strategy, an action plan and a set of activities to meet initial reduction obligations for the phase-down of HFCs, several of which are discussed in the present document;

(c) The document on information relevant to the development of the cost guidelines for the phase-down of HFCs in Article 5 countries: enabling activities,[9] which *inter alia* reviewed all the policies and guidelines that have been adopted by the Executive Committee related

[4] The document should have been submitted to the 85th meeting; consideration of the document was deferred to the 87th meeting in accordance with the agreed procedures for conducting the 85th and 86th meetings in light of the COVID-19 pandemic.

[5] UNEP/OzL.Pro/ExCom/84/65

[6] During the discussion of document UNEP/OzL.Pro/ExCom/84/65, Committee members highlighted the potential for synergies in the HCFC phase-out and HFC phase-down in the refrigeration servicing sector, while noting opportunities in the foam, room air conditioner, commercial refrigeration and chiller manufacturing sectors.; and also expressed an interest in further discussion of ways to support a cost-effective approach to HCFC phase-out and HFC phase-down activities.

[7] UNEP/OzL.Pro/ExCom/86/88

[8] At its 86th meeting, the Executive Committee discussed the draft guidelines document first in plenary and then in contact group meetings. As the contact group was unable to conclude its deliberations, the Executive Committee decided to continue consideration of the draft guidelines for the preparation of HFC phase-down plans for Article 5 countries at its 87th meeting, on the basis of the working document produced by the contact group formed at the 86th meeting, as contained in Annex XLVII to the report of the 86th meeting (decision 86/93). The draft guidelines document was submitted to the 87th meeting (UNEP/OzL.Pro/ExCom/87/46) and discussed by the Executive Committee; further to a discussion the Committee adopted decision 87/50.

[9] UNEP/OzL.Pro/ExCom/78/6

to enabling activities (listed under paragraph 20 of decision XXVIII/2) to support the phase-out of controlled substances in Article 5 countries;

(d) A preliminary document on all aspects related to the refrigeration servicing sector that support the HFC phase-down (decision 80/76(c)),[10] as it contains an overview of the refrigeration servicing sector under the Multilateral Fund, including an analysis of the current characteristics of the sector; an analysis of existing capacity created with the funding approved for the sector that could be used when phasing down HFCs; an analysis of the information needed for the development of training and certification programmes for service technicians and customs officers; and a discussion of the joint implementation of the HCFC phase-out and HFC phase-down in the sector;

(e) The analysis of the level and modalities of funding for HFC phase-down in the refrigeration servicing sector[11] submitted to the 86th meeting in response to decisions 83/65(b) and 84/86(b)(ii), as it discusses the level and modality of funding in the servicing sector for HFC phase-down, taking into consideration the need to integrate HCFC phase-out and HFC phase-down in a single strategy that will assist Article 5 countries to build the infrastructure for the sustained adoption of low-global-warming-potential (GWP) alternatives;

(f) The document on key considerations for developing a methodology for establishing the starting point for sustained aggregate reductions for the consumption and production sectors under the Kigali Amendment (decision 81/67(e)),[12] in particular the discussion related to the role of the starting point in the servicing sector, considering *inter alia* that the initial years of the phase-down of HFCs will overlap with the phase-out of HCFCs, which for the majority of Article 5 countries would be mainly used in the refrigeration servicing sector;

(g) The document on country programme data and prospects for compliance[13] submitted to the 86th meeting, as it contains, *inter alia*, a comprehensive analysis on the HCFC and HFC data reported under country programme implementation reports submitted by Article 5 countries;

(h) The results achieved from the national surveys of alternatives to ODS[14] undertaken by 119 Article 5 countries, summarized in the document on the overall analysis of the results of the surveys of ODS alternatives,[15] noting that the scope of the surveys was to assist Article 5 countries to better understand their historical and predicted consumption trends for non-ODS alternatives, and their distribution by sector and sub-sector; and

(i) The guidelines for enabling activities for the phase-down of HFCs[16] approved at the 79th meeting (decision 79/46), noting *inter alia* that Article 5 countries have the flexibility to undertake a range of enabling activities to help their national ozone units (NOUs) to

[10] UNEP/OzL.Pro/ExCom/82/64

[11] UNEP/OzL.Pro/ExCom/86/89, resubmitted to the 87th meeting as document UNEP/OzL.Pro/ExCom/87/47, and to the 88th meeting as document UNEP/OzL.Pro/ExCom/88/72

[12] UNEP/OzL.Pro/ExCom/82/66

[13] UNEP/OzL.Pro/ExCom/86/8

[14] At its 74th meeting, the Executive Committee agreed on the funding modalities for undertaking national surveys of alternatives to ODS, approved the requests for funding surveys of ODS alternatives submitted by Article 5 countries to that meeting, and allowed the submission of funding requests for surveys from countries that had not submitted a request to the 74th meeting (decision 74/53).

[15] UNEP/OzL.Pro/ExCom/80/54

[16] UNEP/OzL.Pro/ExCom/79/47

fulfil their initial obligations under the Kigali Amendment.[17]

6. The Secretariat also considered the aggregated levels of consumption for all Article 5 countries reported under the TEAP Task Force under decisions XXV/5 and XXVI/9,[18] noting that as at 5 March 2021, only 91 Article 5 countries (50 of which have ratified the Kigali Amendment), had reported consumption of HFCs under Article 7 of the Montreal Protocol and/or under their 2019 country programme implementation reports.[19]

Discussion at the 87th meeting (new text in bold)

7. **At the 87th meeting, the Executive Committee considered document UNEP/OzL.Pro/ExCom/87/45. In the ensuing discussion, there was general appreciation of the document, which was considered to raise a number of important issues and show opportunities for Article 5 countries to integrate or synchronize HFC phase-down and HCFC phase-out activities. Among the elements that were highlighted were: possibilities for an integrated approach to HCFCs and HFCs; the use of lessons learned during the phase-out of CFCs and HCFCs; alignment of licensing and importing systems; opportunities for early action to limit growth in HFC consumption; the eligibility of sectors or sub-sectors to submit early plans; the provision of funding on a case-by-case basis; differentiated treatment of Article 5 group 1 and group 2 countries; and whether ratification of the Kigali Amendment was a requirement or whether a letter of intent should suffice.**

8. **A number of observations were made by members as summarized below:**

(a) **A number of members from Article 5 Parties expressed concern that the proposed measures might contradict, be more stringent than or reduce the flexibility offered to Article 5 countries by decision XXVIII/2; in response, the representative of the Secretariat explained that the potential actions identified were optional, leaving countries to choose the approach that was most advantageous to them according to their national circumstances;**

(b) **Although the integrated compliance strategy appeared on paper to be an excellent suggestion, it could be very hard to implement; experience had shown that implementation plans were constantly updated and refined over time and, therefore, the synchronization of various tranches of different plans for different substances would be difficult;**

(c) **The integration of compliance plans could reduce the burden on the national ozone units, the implementing agencies and the Secretariat in terms of tranche preparation and review;**

(d) **The difficulty of the task of integrating HFC and HCFC activities and plans would vary from country to country and would not be problematic everywhere; and**

[17] These activities include *inter alia* country-specific activities aimed at supporting institutional arrangements, the review of licensing systems, data reporting on HFC consumption and production, and demonstration of non-investment activities; development and enforcement of policies and regulations to avoid market penetration of energy-inefficient RAC and heat-pump equipment; promotion of access to energy-efficient technologies in those sectors; and targeted training on certification, safety and standards, awareness-raising and capacity building aimed at maintaining and enhancing the energy efficiency.

[18] The surveys of ODS alternatives completed in 119 Article 5 countries provided preliminary information on their levels of HFC consumption, for the years 2012-2015.

[19] As at 27 September 2021, 108 Article 5 countries (82 of which have ratified the Kigali Amendment), had reported consumption of HFCs for 2018, 2019 or 2020 (UNEP/OzL.Pro/ExCom/88/8).

(e) The issue of the impact of the COVID-19 pandemic on the calculation of the baseline of the Article 5 group 1 countries owing to the economic downturn; it was too soon to consider limiting growth in HFC consumption without a better understanding of the dynamics of recovery.

9. **Given the numerous complex issues dealt with in the document, more time was required to consider them fully and, in certain cases, more information on and analysis of the ideas raised; the subject matter could be considered properly only at an in-person meeting and proposed that the matter be deferred. Subsequently, the Executive Committee deferred to its 88th meeting consideration of document UNEP/OzL.Pro/ExCom/87/45 (decision 87/49).**

Resubmission to the 88th meeting

10. **In response to decision 87/49, the Secretariat has submitted the present document to the 88th meeting, without introducing any changes to the information contained in the two sections of the document and the recommendation. However, as a result of the discussions held at the 87th meeting and the approval of the guidelines for preparation of Kigali HFC implementation plans (KIPs) (decision 87/50), noting that the guidelines for the preparation of KIPs had already taken into consideration some of the elements being discussed in the present document, the Secretariat has included under the section "Recommendation", observations for further consideration by the Committee.**

11. The present document consists of the following sections:

I Potential strategies, policy measures, activities and commitments to limit the growth of HFC consumption, that could be integrated within stage I of the HFC phase-down plans

II Overview of activities under HCFC phase-out and HFC phase-down

Recommendations. In various sections of the document, the Secretariat has provided a recommendation relevant to that section. To facilitate the discussions, the Secretariat has compiled all the recommendations in the various sections, under the "Recommendation" presented at the end of the document

12. The document also includes the following four annexes:

I Model to forecast the potential risk of non-compliance with the HFC phase-down obligations of 91 Article 5 countries that reported HFC consumption in 2019 under Article 7 of the Protocol or country programme implementation reports[20]

II Summary of modalities of implementation of investment projects

III Proposed integrated compliance strategy document (to be submitted along with stage I of the HFC phase-down plan for information purposes)

IV Decision 87/50 on guidelines for the preparation of KIPs for Article 5 countries

[20] In preparation for the present meeting, the Secretariat considered updating the model presented at the 87th meeting using 2020 data. However, it was noted that: the number of Article 5 countries that reported HFC data for 2020 was lower that those that reported in 2019; other Article 5 countries that did not report HFC data in 2019 reported in 2020; in many cases the level of consumption in 2020 was lower than in 2019 (possibly due to the impact of COVID-19 pandemic); a few countries the reported consumption in 2020 was substantially higher than in 2019. Under these circumstances, and for the purpose of the present document, the Secretariat considered prudent not to update the model with date reported for 2020.

I. POTENTIAL STRATEGIES, POLICY MEASURES, ACTIVITIES AND COMMITMENTS TO LIMIT THE GROWTH OF HFC CONSUMPTION

An overview of HCFC and HFC consumption

13. In order to determine the magnitude of the additional challenge and implications of a parallel or integrated implementation of HCFC phase-out and HFC phase-down,[21] it is necessary to forecast the levels of consumption of these controlled substances and the amounts that will need to be reduced during the 2020-2030 period, so that Article 5 countries remain in compliance with their obligations under the Montreal Protocol.

HCFC

14. Consumption and production of HCFCs has been reported under Article 7 of the Montreal Protocol from the time countries ratified the Montreal Protocol; therefore, the maximum allowable levels of consumption of HCFCs on any given year are known. During the period 2020 to 2030, the aggregate consumption of HCFCs should decrease from a maximum of up to 348,219 metric tonnes (mt) (23,225 ODP tonnes) in 2020 to 13,393 mt (893 ODP tonnes) in 2030 (a reduction of 334,826 mt), as shown in Table 1.

Table 1. Maximum allowable levels of consumption of HCFCs during the 2020-2030 period

HCFC (mt)*	Baseline	2020	2025	2030
HCFC-22	394,655	256,525	128,263	9,866
HCFC-141b	107,872	70,117	35,058	2,697
HCFC-142b	33,195	21,577	10,789	830
Total HCFC	535,722	348,219	174,110	13,393

* Main HCFCs consumed representing over 99.0 per cent of the aggregated baseline

15. The Executive Committee has approved funding for the phase-out of HCFCs in 144 Article 5 countries,[22] mainly through HCFC phase-out management plans (HPMPs). So far, implementation of the approved HPMPs has resulted in the reduction of HCFC consumption well in advance of the allowable levels under the Protocol. For example, the aggregate consumption of HCFCs in 2019 (358,511 mt) represented 67 per cent of the aggregate HCFC baseline and was 123,639 mt lower than the allowable level of consumption for that year (482,150 mt), as shown in Table 2.

Table 2. HCFC consumption of the three main HCFCs (mt)

Consumption	Baseline	2014	2015	2016	2017	2018	2019	% 2019 to baseline
Reported*								
HCFC-22	394,655	341,207	298,506	301,003	296,258	297,000	291,787	73.9
HCFC-141b	107,872	89,452	69,091	65,103	63,493	56,990	54,777	50.8
HCFC-142b	33,195	15,414	18,243	15,899	16,628	11,140	11,947	36.0
Actual	535,722	446,073	385,840	382,005	376,380	365,131	358,511	66.9
Allowable	535,722	535,722	482,150	482,150	482,150	482,150	482,150	
Difference		(89,649)	(96,310)	(100,145)	(105,770)	(117,019)	(123,639)	

* Including the Republic of Korea (1,310.5 ODP tonnes), Singapore (58.0 ODP tonnes) and the United Arab Emirates (475.3 ODP tonnes).

[21] As explained in document UNEP/OzL.Pro/ExCom/84/65, in line with the implementation modalities under the Multilateral Fund, for the purposes of this document, "parallel" implementation refers to HFC phase-down activities that will have to be implemented simultaneously with ongoing HCFC phase-out activities with separate actions and sometimes with different stakeholders. On the other hand, "integrated" implementation refers to the HFC phase-down activities that can be incorporated into ongoing or planned HCFC phase-out activities, sharing specific actions and with common stakeholders.

[22] Excluding Croatia, which became a non-Article 5 country in 2014.

16. Considering that the HPMPs approved so far will address the phase-out of approximately 71.3 per cent of the HCFC baseline once completed, and that additional stages of HPMPs will be approved possibly prior to 2025, it is expected that the 2020-2030 levels of consumption of HCFCs will likely be lower than those indicated in Table 1. While a faster reduction in HCFC consumption is encouraging, as HCFCs and HFCs are used in several common applications it is important to undertake efforts to ensure that these HCFC reductions do not result in increased HFC consumption.

HFC

17. The aggregate level of HFC consumption in Article 5 countries reported under the TEAP Task Force under decisions XXV/5 and XXVI/9, amounted to 284,325 mt in 2015 and, in the absence of the Kigali Amendment (i.e., business-as-usual scenario) consumption would be expected to increase to 1,021,216 mt by 2030, as shown in Table 3.[23] Five HFCs (including HFC-blends), namely R-410A, HFC-134a, R-407C, R-404A, and R-507A represented over 97 per cent of the total consumption in 2025.

Table 3. HFC consumption in Article 5 countries reported by the TEAP Task Force

HFC	Consumption (mt)				Growth rate (%)*
	2015	2020	2025	2030	
R-410A	106,661	192,770	284,682	364,845	8.5
HFC-134a	78,688	106,731	139,547	177,432	5.6
R-407C	55,278	101,216	174,433	285,500	11.6
R-404A	18,202	31,982	55,964	83,845	10.7
R-507A	18,202	31,982	55,964	83,845	10.7
HFC-152a	3,364	5,669	11,280	15,225	10.6
HFC-245fa	2,172	3,840	4,986	5,504	6.4
HFC-365mfc/HFC-227ea	1,758	3,428	4,546	5,020	7.2
Total	284,325	477,618	731,402	1,021,216	8.9

* Average growth rate between 2015 and 2030.

18. The actual levels of consumption of HCFCs and HFCs (Tables 1 and 3) will depend on, *inter alia*, the completion of approved projects to phase out HCFCs, the growth of refrigeration and air-conditioning (RAC) equipment in Article 5 countries, the introduction of alternative refrigerants that could be used as drop-ins for certain applications (e.g., R-407C has been used as an alternative to HCFC-22 in air-conditioning (AC); R-407F or R-448A, among others, could be use as replacement for R-404A in refrigeration), and the introduction of available cost-effective alternative technologies in HCFC and HFC applications.

19. With regard to the sectoral distribution of HFC, the TEAP Task Force report indicates that over 95 per cent of the total HFC consumption in Article 5 countries is in the RAC sector, as shown in Table 4.

Table 4. Distribution of HFC consumption in Article 5 countries

Sector	2015		2020		2025		2030	
	mt	%	mt	%	mt	%	mt	%
RAC manufacturing	185,838	65.4	281,619	59.0	392,390	53.6	510,596	50.0
RAC servicing	87,033	30.6	176,493	37.0	305,922	41.8	468,550	45.9
Other sectors	11,454	4.0	19,506	4.1	33,090	4.5	42,070	4.1
Total	284,325	100.0	477,618	100.0	731,402	100.0	1,021,216	100.0

20. Similar to the sectoral distribution of HCFCs, it is assumed that in approximately 100 Article 5 countries HFC is used solely in the refrigeration servicing sector. This assumption is supported by

[23] Table 2 of document UNEP/OzL.Pro/ExCom/82/66

information available from surveys of ODS alternatives in 119 Article 5 countries,[24] which indicates that HFC consumption in the refrigeration servicing sector accounted for 97 per cent of total consumption for low-volume-consuming (LVC) countries and 76 per cent for non-LVC countries.[25]

Benefits of an early action on regulatory activities and comprehensive consumption surveys

21. The HFC phase-down plans that will be prepared will include an overarching strategy, an action plan and a set of activities to meet the initial HFC reduction obligations under the Montreal Protocol. Based on the experience of preparing and approving sectoral and national phase-out plans, on average it will take up to two years for HFC phase-down plans to be formulated by Article 5 countries and approved by the Executive Committee (i.e., 2022-2023), and up to three years (i.e., 2023-2025) for the first phase-down activities to be implemented.

22. During this period, Article 5 Parties could consider, on a voluntary basis and in line with national priorities and circumstances, completing comprehensive surveys on HFC consumption and their sectoral distribution and developing and implementing policy measures including extending ODS-related policies and regulations to HFCs.

23. Previous surveys on alternatives to ODS submitted by 119 Article 5 countries pursuant to decision 74/53, provided the first set of HFC consumption data collected by the NOUs. However, to prepare their HFC phase-down plans, Article 5 countries will require more detailed, updated and comprehensive information on HFC consumption by substance/blend and by sector/sub-sector, identification of the HFC-based equipment users, and analysis of the market trends and impact of HCFC phase-out actions on HFC consumption trends. The surveys will also allow for a better estimation of the magnitude of the HFC phase-down to be addressed. In addition, if the detailed analysis undertaken by the consumption surveys cover one or more of the years used as reference to estimate the baseline, the surveys will contribute to a more accurate calculation of the countries' HFC consumption baseline.

24. Regarding policies and regulations, Article 5 countries will need to implement as a matter of urgency, a system for licensing the import and export of new, used, recycled and reclaimed HFCs in compliance with Article 4B of the Montreal Protocol.[26] In addition to fulfilling a compliance obligation, the early establishment of these licensing systems will also help Article 5 countries strengthen their HFC data collection systems and enable a more accurate calculation of their HFC consumption baselines.[27]

25. Article 5 countries could also consider establishing other regulatory measures to help prevent the uncontrolled growth of HFC consumption, including HFC production/import/export quota systems,

[24] Paragraph 4 of decision XXVI/9 requested the Executive Committee to consider providing additional funding to conduct inventories or surveys on alternatives to ODS in interested Article 5 parties upon their request. On this basis, funding for 127 surveys was approved. At the 80th meeting, the results from surveys in 119 countries (42 non-LVC and 77 LVC countries) were presented in document UNEP/OzL.Pro/ExCom/80/54.

[25] The aggregate HCFC baseline of the 42 non-LVC countries represents 24 per cent of the aggregate baseline of all non-LVC countries, while the aggregate HCFC baseline of the 77 LVC countries represents 91 per cent of the aggregate baseline of all LVC countries. Surveys were not submitted by the largest consuming countries, including Brazil, China and India.

[26] Each Party shall, by 1 January 2019 or within three months of the date of entry into force of this paragraph for it, whichever is later, establish and implement a system for licensing the import and export of new, used, recycled and reclaimed controlled substances in Annex F. Any Party operating under paragraph 1 of Article 5 that decides it is not in a position to establish and implement such a system by 1 January 2019 may delay taking those actions until 1 January 2021. In addition, Article 5 countries that produce HCFC-22 will have reporting obligations related to the generation, control and emissions of HFC-23 by-product, as well as obligations related to the control of emissions of HFC-23 by-product.

[27] In the past, the establishment of HCFC licensing systems after the baseline years in several countries resulted in inaccuracies in the estimation of baselines and starting points for sustained reductions of HCFC consumption that were subsequently revised.

mandatory reporting by HFC importers and exporters, measures to control HFC losses during servicing, or measures to record imports of equipment containing HFCs, which could help them determine future needs for servicing.

26. Regulatory activities and comprehensive consumption surveys were key components of the preparatory funding for HPMPs and are now also included as part of the funding for preparation of HFC phase-down plans, as explained in document UNEP/OzL.Pro/ExCom/86/88. The early consideration and approval of preparatory funding for HFC phase-down plans will therefore help Article 5 countries to immediately start these key activities that will contribute to limiting HFC consumption growth and improve HFC recording and reporting.

Staged approach for HFC phase-down

27. When the Parties adopted decision XIX/6 on the accelerated phase-out of HCFCs, the Executive Committee decided that a staged approach to phase out HCFCs would allow Article 5 countries to prioritize some uses where substitute technologies were readily available and economically viable, while giving more time to address uncertainties related to alternatives to HCFCs in other applications (i.e., availability, maturity, cost-effectiveness and other environmental considerations).

28. A staged approach continues to be the best approach to implement HFC phase-down plans given the long timeline (reduction of 80 per cent of the HFC baseline for compliance by 2045 for Article 5 group 1 countries, and 85 per cent of the HFC baseline by 2047 for Article 5 group 2 countries), and the evolving availability of cost-effective and sustainable alternatives to HFCs in some applications. In addition, it will allow Article 5 countries to establish their priorities according to their specific national circumstances. Accordingly, at its 86th meeting, the Executive Committee started consideration of the draft guidelines for funding the preparation of HFC phase-down plans for Article 5 countries that would include an overarching strategy and a stage I to meet the freeze in consumption and the 10 per cent reduction. Discussions will continue at the 87th meeting.

Submission of HFC phase-down plans

29. In order to decide when to start implementing HFC phase-down plans, Article 5 countries will need to determine the level of action required to achieve compliance with the first control measures (the freeze and the 10 per cent reduction on HFC consumption) under the Montreal Protocol.

30. When the acceleration of HCFC phase-out was considered, there were two years between the years used as the basis for the HCFC consumption baseline (2009 and 2010) and the first control measure (freeze in 2013). The existing data indicated that HCFC consumption was expected to grow in 2011 and 2012, making it difficult for Article 5 countries to achieve a sudden reduction and to freeze the 2013 consumption at the 2009-2010 average level. Extensive Article 7 and country programme implementation report data available at the time showed growth rates of between 4 and 34 per cent over the previous five years, with an average annual growth rate of 18 per cent during the period. The Secretariat notes that, based on the Article 7 data subsequently reported, the actual average annual growth rate in HCFC consumption between 2010 and 2012 was only 2.82 per cent.

31. The current situation regarding HFCs is different from that of HCFCs. As some countries have started to report HFC consumption data for 2019, there is no historical information supporting either a rapid or slow increase in HFC consumption. There seems to be an indication from limited information on the consumption of HFCs reported in a few HPMPs under implementation, that in certain AC applications, the demand for HFC is increasing (e.g., R-410A and more recently HFC-32 in residential AC manufacturing), while the use of other HFCs is decreasing in other RAC applications. Moreover, because there is only one year between the years used to establish the baseline and the first control measure, growth of HFC consumption without control measures could only occur for one year, as compared to the two years for

HCFCs. In addition, the HFC consumption baseline for Article 5 countries will also include 65 per cent of the HCFC baseline for consumption (in CO_2 equivalent tonnes). This value effectively provides a buffer that would allow some Article 5 countries to temporarily remain in compliance notwithstanding continued HFC consumption growth.

32. To have a better understanding of the above, the Secretariat developed (a simple) model using the 2019 consumption of HFCs of 91 Article 5 countries as reported under Article 7 of the Protocol or under the country programme implementation reports, forecasted the consumption from 2019 to 2024 using annual growth rates of 3 per cent (based on the actual annual growth of 2.82 per cent in HCFC consumption between the baseline years and the first control measure) and 10 per cent,, and calculated the estimated HFC baseline for compliance (including the HCFC component).[28]

33. Based on this model, seven of the 91 Article 5 countries might be at risk of non-compliance with their initial obligations in 2024 if no phase-down actions are immediately implemented; however, at a 10 per cent annual growth rate, the number of countries that might be at risk of non-compliance, will increase to 47 countries.

34. The Secretariat also analyzed a scenario with variable annual growth rate in which growth is minor during the baseline years due to economic constraints caused by the COVID-19 pandemic (estimated 2 per cent per year), followed by a larger annual growth rate in subsequent years due to economic recovery (10 per cent). In such a scenario, a total of 23 countries would be at risk of non compliance in 2024. Annex I to the present document presents the results of the model (with annual growth rates of 3 per cent, 10 per cent and variable growth).

35. Further to the analysis, the Secretariat notes that independent of the assumptions and variables used by a country to forecast its HFC consumption and determine when assistance is needed to ensure compliance, it has been the experience of the Multilateral Fund that earlier action resulted in more cost-effective phase-out. Particularly in the RAC sector (where most of the HFCs are consumed) early action to control the influx of equipment operating with controlled substances and to facilitate the introduction of equipment based on alternatives will reduce the growth in banks of controlled substances and the future consumption associated with servicing such equipment.

36. Moreover, irrespective of the consumption growth rate assumed, Article 5 countries would need to start the preparatory process at least five years prior to the year the country will need to have implemented HFC mitigation measures to stay in compliance. This will allow for an estimated period of two years for project preparation and approval, and three years for implementation of the first approved activities of the phase-down plan.

Early action and opportunities for projects and activities that could be integrated within stage I of the HFC phase-down plans

37. As determined by decision XXVIII/2, Article 5 countries will have the flexibility to prioritize HFCs, define sectors, select technologies and alternatives, and elaborate and implement their strategies to meet the agreed HFC obligations, based on their specific needs and national circumstances, following a country-driven approach.

38. On that basis, this section is intended to identify potential opportunities for reducing the growth or even achieving sustained reductions of HFC consumption in the coming years, in some cases even before the HFC phase-down plans are fully formulated. It is not intended to set out a prescriptive set of elements

[28] For the purpose of the analysis, it was assumed that the first control measure for all countries in the model is 2024, even though there are few group 2 countries. In developing the model, the Secretariat also noted that the HFC consumption reported by several countries, in particular LVC countries, was proportionally higher than their HCFC consumption.

to be included in stage I of the HFC phase-down plans.

Opportunities for integrated HCFC phase-out and HFC phase-down activities in the manufacturing sector

39. As a large number of the HCFC phase-out investment projects are being completed with the completion of stage I and II of HPMPs, HFC phase-down investment projects could be initiated gradually, in particular in some manufacturing sectors where alternative technologies are commercially available and are cost-effective, such as domestic refrigeration, and stand-alone commercial refrigeration.[29] Some Article 5 countries could start converting these enterprises even before their HFC phase-down plans have been fully formulated.

40. According to the data reported by the TEAP Task Force (Table 4 above), of the total HFC consumption 59.0 and 53.6 per cent in 2020 and 2025, respectively, is related to manufacturing of RAC equipment. The early conversion of this sector, particularly for applications where cost-effective and sustainable technologies are available, will have a major impact on the current and future levels of consumption, as the new RAC equipment in these applications will not require HFC-based refrigerants for servicing and maintenance, and future HFC banks will be reduced.

41. In addition, there could be opportunities for integrated HCFC phase-out and HFC phase-down implementation in enterprises that manufacture both HCFC-based and HFC-based equipment/products and wish to convert both technologies, as explained below. For each industrial application, a recommendation for a potential action by the Executive Committee is proposed.

Polyurethane (PU) foam

42. In a large number of Article 5 countries, PU foam enterprises and local systems houses using HCFC-141b (including those contained in imported pre-blended polyols) have converted to low-GWP blowing-agent technology as part of their HPMPs. Article 5 countries are establishing regulations to ban the import and use of HCFCs in the PU foam sector once all their enterprises have been converted, with the objective of ensuring sustainability of the HCFC phase-out in the sector. Low-GWP foam blowing alternatives are increasingly available, although some have limitations due to flammability or performance issues, while others still have limited commercial availability in several markets.

43. Despite the increasing availability and affordability of low-GWP alternatives in the PU foam sector, HFCs (mainly HFC-245fa and HFC-365mfc/HFC-227ea) are also readily available in several Article 5 countries. These high-GWP HFCs are affordable, easily adopted, can be used as a drop-in for many foam applications, and have satisfactory performance and no flammability issues. In the absence of any control of HFCs, many already converted or newly established enterprises could easily start using them, thus undermining the results achieved in the HPMP, increasing HFC consumption (pure or contained in imported pre-blended polyols) ineligible for funding and making the future HFC phase-down more difficult for the country.

44. For example, out of the 84 Article 5 countries that reported HFC consumption data in 2019 under the country programme implementation report, 11 (eight non-LVC countries and three LVC countries) identified a total use of 1,151 mt of HFC-245fa and/or HFC-365mfc/HFC-227ea in the foam sector. In addition, one of these countries reported use of 2,865 mt of HFC-245fa in the refrigeration sector, possibly for the insulation of the equipment. It is expected that the actual amount of HFCs used in PU foam may be higher than the amounts above as some of the countries with manufacturing capacity have not yet reported their HFC consumption.

[29] The majority of the stand-alone investment projects approved pursuant to decision 78/3(g) have involved domestic and commercial stand-alone refrigeration equipment.

45. Those Article 5 countries that have completed or are in the process of completing their phase-out of HCFC-141b in the PU foam sector could consider integrating into their plans the phase-out of HFC-245fa and HFC-365mfc/HFC-227ea pure or contained in imported pre-blended polyols. This approach would be cost-effective, as it would take advantage of the existing infrastructure within the HPMP and would help avoid potential HFC consumption growth that would be ineligible for funding under the Multilateral Fund.[30] In order to ensure a sustained phase-down of HFC, the plan should consider the entire sector including self-funded ineligible enterprises, and should feature regulatory measures to support the phase-out, including for controlled substances contained in imported pre-blended polyols.

46. During the HCFC phase-out, noting the importance of the consumption of HCFC-141b contained in imported pre-blended polyols, and given the desire to ensure that all eligible enterprises using these pre-blended polyols could be converted with the support from the Multilateral Fund, the Executive Committee decided on a policy to fund PU foam enterprises that consumed HCFC-141b contained in imported pre-blended polyols, on the understanding that Article 5 countries would commit to issuing regulatory measures to stop the supply and use of imported pre-blended polyols using HCFC-141b.[31] This allowed Article 5 countries to effectively phase out HCFC-141b in all forms and avoid migration from the use of pure HCFC-141b to HCFC-141b contained in imported pre-blended polyols. A similar situation is occurring with HFCs used as blowing agents and HFCs contained in imported pre-blended polyols; therefore, the same approach should be followed regarding the phase-out of HFCs pure or contained in imported pre-blended polyols and regarding exports of HFCs contained in pre-blended polyols.

47. The Executive Committee may wish:

(a) To approve sector plans for the total phase-out of HFC pure or contained in pre-blended polyols in the PU foam sector, on the understanding:

(i) That any Article 5 country submitting a project will have ratified the Kigali Amendment or submitted a formal letter indicating the Government's intention to ratify the Amendment;

(ii) That the sector plan will be implemented in coordination with or complementary to the activities under the country's HPMP;

(iii) That the sector plan will be integrated into stage I of the HFC phase-down plan once the HFC phase-down plan has been formulated;

(iv) That the amount of HFC phased out by the sector plan will be deducted from the starting point for sustained reductions in HFC consumption once the starting point has been established;

(v) That the country will report exports of HFCs contained in pre-blended polyols for the last three years prior to project submission, and the average will be deducted from the country's starting point for sustained reductions in HFCs once the starting point has been established; and

(vi) That the country will establish the necessary regulatory measures to ensure the sustainability of the complete phase-out of all HCFCs and HFCs pure and/or contained in pre-blended polyols in the sector; and

[30] I.e., capacity installed after the cut-off date or new HFC consumption by enterprises assisted to replace HCFC-141b by low-GWP alternatives.
[31] Decisions 61/47 and 63/15.

(b) To approve, when required, preparatory funding for the formulation of these sector plans on a case-by-case basis and in line with the draft guidelines for the preparation of HFC phase-down plans for Article 5 countries contained in document UNEP/OzL.Pro/ExCom/86/88.

Extruded polystyrene (XPS) foam manufacturing sector

48. The majority of Article 5 countries with an XPS foam manufacturing sector have largely phased out the use of HCFC-22/HCFC-142b and have introduced low-GWP alternatives, mainly CO_2 and isobutane. Only a few Article 5 countries are still in the process of phasing out HCFC-22 and HCFC-142b in the XPS foam sector as part of their already approved HPMPs (i.e., China (2026)).

49. The amount of HFCs consumed by Article 5 countries in the manufacturing of XPS foam is still unknown; however, preliminary data indicates that it may be low. Out of the 84 Article 5 countries that reported HFC consumption data in 2019 under the country programme implementation reports, only one country identified consumption of 38 mt of HFC-152a (with a GWP of 124) in the foam sector (presumably XPS foam), and two countries identified a total consumption of 5.73 mt of HFC-134a, which could be used in the production of either PU foam or XPS foam.

50. The benefits of pursuing an integrated HCFC phase-out and HFC phase-down in the XPS foam sector appear to be limited to a few countries, as most Article 5 countries have already phased out HCFCs in the sector and no significant HFC use has been identified. However, opportunities for early action may become more evident as additional Article 5 countries report HFC consumption data.

51. In reviewing the HPMPs, the Secretariat noted that in a few Article 5 countries XPS foam manufacturing capacity based on HCFCs was installed after the cut-off date for HCFC capacity of 21 September 2007 and was therefore ineligible for funding. Article 5 countries that do not have HFC consumption in the XPS foam sector could consider, as an early action, establishing regulatory measures to avoid the installation of new high-GWP HFC-based XPS foam manufacturing capacity. This will make it possible to avoid potential imports of HFC-based manufacturing capacity being phased out in non-Article 5 countries and the associated future HFC consumption in the sector.

52. The Executive Committee may wish to encourage Article 5 countries that do not have HFC consumption in the XPS foam sector to consider establishing regulatory measures as soon as possible to avoid the installation of new capacity for the manufacturing of high-GWP HFC-based XPS foam.

Domestic and commercial stand-alone refrigeration units

53. Out of the 84 Article 5 countries that reported HFC consumption data in 2019, seven (five non-LVC and two LVC countries) identified a total use of 3,057 mt of HFC-134a and 1,659 mt of R-404A in the refrigeration manufacturing sector. Part of this consumption is presumably in the manufacturing of domestic and commercial stand-alone units; two countries are already implementing stand-alone investment projects in these sectors. The amount of HFCs used in these two applications may be larger than the figures above as some of the countries with manufacturing capacity have not yet reported their HFC consumption.

54. Cost-effective alternative technologies are currently available for the conversion of HFC-based domestic and commercial stand-alone refrigeration equipment. Early conversion of these manufacturing lines is possible as cost-effective and sustainable alternative technologies are available in markets in Article 5 countries. A sector-wide approach complemented by regulatory measures would ensure that the HFC phase-out by assisted enterprises is not offset by increased consumption in other enterprises in the sector. In addition, the early conversion of this sector will reduce the future demand for HFCs in associated servicing of equipment and will reduce the potential emissions from banks.

55. The Executive Committee may wish:

(a) To approve sector plans for the total phase-out of HFC in the manufacturing of domestic and commercial stand-alone refrigeration units, on the understanding:

(i) That any Article 5 country submitting a project will have ratified the Kigali Amendment or submitted a formal letter indicating the Government's intention to ratify the Amendment;

(ii) That the sector plan will be integrated into stage I of the HFC phase-down plan once the HFC phase-down plan has been formulated;

(iii) That the amount of HFC phased out by the sector plan will be deducted from the starting point for sustained reductions in HFC consumption once the starting point has been established;

(iv) That the country will establish the necessary regulatory measures to ensure the sustainability of the phase-out of HFCs in the domestic and commercial stand-alone refrigeration applications; and

(b) To approve, when required, preparatory funding for the formulation of these sector plans on a case-by-case basis and in line with the draft guidelines for the preparation of HFC phase-down plans for Article 5 countries contained in document UNEP/OzL.Pro/ExCom/86/88.

Commercial refrigeration manufacturing sector (other than stand-alone units)

56. Several commercial refrigeration enterprises manufacture a large variety of refrigeration systems based on different refrigerants (e.g., HFC-134a, R-404A and/or R-507A). The Secretariat notes that in some of these enterprises, the conversion of HFC-based products could potentially be implemented in an integrated manner with the ongoing conversion of HCFC-22-based products (which in most cases are at an advanced stage of implementation), ensuring the phase-out of both HCFC and HFC, with potential reductions in the overall conversion costs. However, the possibility of this integration would depend on *inter alia* the type of systems being manufactured, the feasibility of adopting low-GWP alternatives, refrigerant charges, location, and other system characteristics. Early activities in this sub-sector are unlikely to be sustainable unless the country can address all applications and enterprises (entire sector or sub-sectors and imports of such equipment), otherwise the reductions achieved by the project would be offset by the increase in HFC consumption by enterprises not covered by the project.

57. Activities designed to reduce the use of R-404A and R-507A could have a significant impact, given the high GWP of these substances. However, they would need to address the entire sector and include complementary regulatory measures to ensure sustained phase-out. Potential activities that could be implemented in stage I of the HFC phase-down plans in the servicing sector include preventive maintenance, control of leakage, and support for end-users for better handling of installed equipment.

AC manufacturing sector

58. Out of the 84 Article 5 countries that reported HFC consumption data in 2019 under their country programme implementation reports, seven (five non-LVC countries and two LVC countries) identified a total use of 15,683 mt of R-410A, R-407C, HFC-32 and HFC-125, as well as a small amount of R-404A in the AC sector.

59. The amount of HFCs used in the AC sector is expected to be much larger than the figures above, as some of the countries with large AC manufacturing sectors have not yet reported their HFC consumption under the country programme report. There is also an indication that the consumption of HFC-32 in the manufacturing of residential AC could start increasing in Article 5 countries, as some eligible and ineligible enterprises have converted to this technology. Furthermore, national energy efficiency regulations are also accelerating HCFC phase-out in residential and commercial AC, resulting in the adoption of HFC-based technologies, mainly based on R-410A, R-407C and HFC-32 refrigerants.

60. Currently, some Article 5 countries are encountering major obstacles in implementing their conversions to low-GWP alternative refrigerants. The use of R-410A in the manufacturing of residential AC continues to grow, as this is a mature technology that is already accepted and where equipment with enhanced energy efficiency is manufactured as compared to HCFC-22-based equipment.

61. During the review of HPMPs, the Secretariat noted that certain enterprises were manufacturing residential[32] and/or commercial AC equipment in Article 5 countries with lines based on HCFC-22 and R-410A, and that those lines could swing between those technologies. Adding the conversion of the R-410A lines to the ongoing conversion of the HCFC-22 lines would help ensure the phase-out of both substances in these enterprises. However, as seen in some of the ongoing HPMPs, this may not be enough to ensure the sustainability of the phase-out if other manufacturers are still using R-410A or other high-GWP HFCs (e.g., R-407C) refrigerants, or importing high-GWP-based equipment. A sector-wide approach is required to ensure sustained adoption of low-GWP alternative technologies.

62. Regarding the mobile air-conditioning (MAC) manufacturing sector, four countries reported the use of 7,362 mt of HFC-134a in 2019, out of which 7,350 mt belonged to two countries. This consumption could be at least partially in the MAC sector, for which an integrated implementation with HCFC phase-out is unlikely as there is no HCFC consumption in this sector.

63. The Executive Committee may wish:

(a) To invite Article 5 countries manufacturing residential and/or commercial AC equipment to explore opportunities to integrate HCFC-22 and R-410A or other high-GWP HFC phase-out in the sector to ensure the sustained adoption of lower-GWP alternatives;

(b) To approve a limited number of sector plans for the total phase-out of R-410A and other high-GWP alternatives used in the manufacturing of residential and/or commercial AC units in countries that have phased out, are presently phasing out, or intend in the short term to phase out HCFC-22 in the sector, on the understanding:

(i) That any Article 5 country submitting a project will have ratified the Kigali Amendment or submitted a formal letter indicating the Government's intention to ratify the Amendment;

(ii) That the sector plan will be integrated into stage I of the HFC phase-down plan once the HFC phase-down plan has been formulated;

(iii) That the amount of HFC phased out by the sector plan will be deducted from the starting point for sustained reductions in HFC consumption once the starting point has been established; and

(iv) That the country will establish the necessary regulatory measures to ensure the sustainability of the phase-out of R-410A and other high-GWP alternatives in the

[32] This application, also referred to as room AC, comprises the manufacturing of mostly split AC units with a capacity of up to three tons of refrigeration (TR).

specific AC sector(s) converted; and

(c) To approve, when required, preparatory funding for the formulation of these sector plans on a case-by-case basis and in line with the draft guidelines for the preparation of HFC phase-down plans for Article 5 countries contained in document UNEP/OzL.Pro/ExCom/86/88.

Other manufacturing sectors

64. With the exception of one country,[33] there is currently no use of HCFCs in the aerosol sector in Article 5 countries. Regarding HFCs, out of the 84 Article 5 countries that reported consumption data in 2019 under their country programme implementation reports, nine countries (six non-LVC countries and three LVC countries) identified a total use of 4,291 mt of HFCs in the aerosol sector. Around 63 per cent of this corresponds to the consumption of HFC-152a in one country; the remaining consumption corresponds to HFC-134a, part of it in metered dose inhalers, where additional time would be required to develop an alternative technology.

65. In addition, nine countries (six non-LVC countries and three LVC countries) reported the use of 6,381 mt of HFCs in the fire-fighting sector, including 6,087 mt of HFC-227ea by one country. This use may need to be further examined as more data is collected.

66. While HFC-23 is mainly a by-product generated during the production of HCFC-22 as opposed to an HFC imported and used by Article 5 countries, in 2019 ten Article 5 countries identified the use of 7.94 mt of HFC-23 in different applications, including refrigeration manufacturing, servicing and fire-fighting. Although the consumption is limited, the very high GWP (14,800) of HFC-23 might justify its phase-out as a priority. In order to avoid a potential increase in the consumption of HFC-23 in countries that are currently not consuming it, the Executive Committee may wish:

(a) To encourage Article 5 countries that do not have consumption of HFC-23 to consider establishing regulatory measures to avoid its introduction to the country; and

(b) To encourage Article 5 countries that have reported consumption of HFC-23 in fire-fighting and other niche applications, to address that consumption as a priority in their phase-down plans, noting the very high GWP of HFC-23.

Summary of manufacturing sectors

67. Annex II to the present document contains a summary table that presents an overview of the modalities of implementation of investment projects during the 2021-2030 period, based on information available so far. This analysis could evolve as more information becomes available on the consumption of HFCs and the availability of alternatives in different sectors.

Integrated HCFC phase-out and HFC phase-down in the refrigeration servicing sector

68. The majority of activities already being implemented by Article 5 countries in the refrigeration servicing sector[34] will have an impact on the reduction of consumption of HCFCs and HFCs. The overlapping schedules of HCFC phase-out and HFC phase-down present an opportunity for Article 5

[33] The 2019 country programme report for China indicates the use of 1,656 mt of HCFC-22 and 580 mt of HCFC-141b in the aerosol sector. This sector has not been addressed in stage I or II of the HPMP.

[34] These activities include training and certification of technicians, strengthening technical/vocational schools and refrigeration associations, refrigerant containment strategies, the distribution of basic equipment and service tools including recovery/recycling units, and the adoption of standards and codes of practice to facilitate the safe adoption of flammable and/or toxic low-GWP refrigerants.

countries to develop an integrated cost-effective strategy that addresses the reduction of both groups of substances in the refrigeration servicing sector, which would entail, *inter alia*:[35]

(a) Developing, revising or adopting standards, codes and norms that could facilitate the adoption, operation and servicing of refrigeration technologies based on low-GWP refrigerants;

(b) Strengthening regulatory frameworks for refrigerant management through *inter alia* certification of technicians; access to selling/buying refrigerants by trained/certified technicians, licensing of service enterprises/workshops; labelling of refrigerants, record keeping, monitoring and reporting; and capacity building for authorities and stakeholders;

(c) Reviewing and periodically updating the curricula of the training programmes for customs and enforcement officers addressing the obligations under the Montreal Protocol including its Kigali Amendment;

(d) Strengthening the capacity of vocational training systems and certification bodies by periodically reviewing the curricula of the training programmes to address good servicing practices and safety issues related to the flammability and/or toxicity of refrigerants being phased in;

(e) Developing or strengthening self-sustained refrigerant containment strategies to ensure that installed refrigeration equipment can continue operating until end-of-life; assessing the benefits and challenges of recovering, recycling and reclaiming refrigerants;

(f) Strengthening technical support for the assembly, installation and initial-refrigerant-charge sub-sector as it could influence the introduction of technologies in local markets;

(g) Helping develop business models that would ensure the long-term sustainability of activities implemented in the refrigeration servicing sector, in particular recovering, recycling and reclaiming schemes and end-user incentive schemes; and

(h) Strengthening RAC associations and ensuring their engagement in the implementation of activities related to the sector.

69. The benefits associated with an integrated strategy in the refrigeration servicing sector include:

(a) The possibility of strengthening the existing infrastructure and expanding it as needed, to facilitate the adoption of low-GWP technologies in a sustained way by spreading the plan over a long period, rather than focusing on isolated assistance projects to phase out one or two substances;

(b) The possibility of combining the funding from HCFC phase-out and HFC phase-down to implement more comprehensive longer-term activities that will have a broader impact while benefiting both plans;

(c) A lower number of synchronized tranches, with associated lower transaction costs for the preparation of reports, tranche funding requests and verifications;

(d) Stronger and more cost-effective project management and implementation units, where needed; and

[35] Paragraph 92 of document UNEP/OzL.Pro/ExCom/82/64

(e) The possibility of formulating a more comprehensive plan that combines ozone and climate benefits that will have greater relevance and achieve better "buy-in" within the Government.

70. Document UNEP/OzL.Pro/ExCom/86/89 discusses the level and modality of funding in the refrigeration servicing sector for HFC phase-down, taking into consideration the need to integrate HCFC phase-out and HFC phase-down in the sector in a single strategy that includes activities that benefit both, and that assist Article 5 countries in building the infrastructure for the sustained adoption of low-GWP alternatives.

II. OVERVIEW OF ACTIVITIES UNDER HCFC PHASE-OUT AND HFC PHASE-DOWN

71. The overlap between the national/terminal CFC phase-out plans and HPMPs was short, as most of the HPMPs started after 2010 when CFCs had already been totally phased out. In contrast, between 2021 and 2030, Article 5 countries will be simultaneously preparing and implementing multiple stages of HPMPs and stage I of HFC phase-down plans. Well-coordinated preparation and implementation of these plans would result in:

(a) An overarching strategy that encompasses commonalities and interaction between HCFC phase-out and HFC phase-down activities and ensures that the country systematically avoids an increased consumption of HFCs due to the HCFC phase-out activities being implemented;

(b) A policy and regulatory framework that work coherently to reduce the consumption of both HCFCs and HFCs;

(c) An efficient use of Multilateral Fund resources when preparing and implementing activities, particularly in the refrigeration servicing sector avoiding overlaps between the ongoing activities under the HPMP and the proposed activities under the HFC phase-down plan, giving due consideration to activities addressing the same stakeholders and institutions (e.g., refrigeration technicians, distributors, associations and training institutions); and

(d) A more efficient administrative, reporting, verification and monitoring system for Article 5 countries, bilateral and implementing agencies, the Secretariat and the Executive Committee, avoiding duplication of reports and reducing the number of submissions for multiple stages and tranches running in parallel.[36]

72. Based on the above, it is increasingly evident that having a comprehensive national compliance strategy that consolidates a country's approach to phasing out the remaining HCFCs and phasing down HFCs will be beneficial, as it will help identify activities in a unified manner, reduce overlaps in implementation, use resources more efficiently by streamlining reporting and monitoring, and enhance delivery of services.

73. For Article 5 countries where the entirety of HCFC and HFC consumption is in the refrigeration servicing sector, doing an integrated strategy would be the ideal approach to meet their compliance targets under the Montreal Protocol. Those Article 5 countries with consumption in other sectors can also benefit from an integrated strategy. The following section provides ideas on ways to implement this integration in

[36] Currently, implementation and monitoring of overlapping stages I and II of HPMPs has proven challenging in several countries; adding HFC phase down plans will increase the administrative burden even though in many countries most of the activities in these plans are in the same sector (i.e., refrigeration servicing sector in LVC countries.

an efficient manner.

Integrated compliance strategy for HCFCs and HFCs

74. Currently, all Article 5 countries are implementing various stages of their HPMPs,[37] and by 2030, all Article 5 countries will have phased out their HCFC consumption except for the amounts needed for the servicing tail.[38] Therefore, during the period from 2021 to 2030, there is a high probability that most Article 5 countries will be simultaneously implementing their HPMPs and stage I of their HFC phase-down plans. After 2030, Article 5 countries will be exclusively implementing activities to phase down HFCs for another 15 years, while the sustainability of the HCFC phase-out continues to be monitored, including compliance with the HCFC servicing tail where applicable. However, the initial 2021-2030 transition period is of critical importance given the linkages between HCFCs and HFCs.

75. The preparation of stage I of HFC phase-down plans will include activities similar to those completed for HPMP development, namely establishing regulatory measures, conducting comprehensive surveys of HFC consumption by sector, designing an overarching strategy for HFC phase-down, and formulating a concrete set of activities for the first stage of the plan. In addition, during the preparation of their HFC phase-down plans Article 5 countries will need to carefully consider the interlinkages between HCFC phase-out and HFC phase-down, for example: how the existing HPMP infrastructure could be used for HFC phase-down; how the ongoing HCFC phase-out activities affect HFC consumption; and how to implement activities that contribute to both HCFC phase-out and HFC phase-down.

76. At the time of the inception of the Multilateral Fund, Article 5 countries had the opportunity to prepare a country programme,[39] which contained a comprehensive national strategy to address the phase-out of several groups of substances in different sectors. During the phase-out of HCFCs, the concept of the "country programme" was replaced by the HPMP as HCFCs became over time the only controlled substance for Article 5 countries. The main difference between the country programme and the HPMP is that the former remained largely a strategic document, while the latter became a combined strategic and multi-year funding document supported by a performance-based agreement to fund projects and activities to phase out a determined amount of HCFCs. In the case of the country programme, the projects identified therein still had to be submitted for approval and were funded as stand-alone projects or as a sector/ sub-sector plan.

77. Currently, it appears increasingly necessary to have a comprehensive compliance strategy that describes the country's blueprint for meeting the compliance targets with the production and consumption of two groups of substances that relate to each other (i.e., HCFCs and HFCs), and that proposes activities that will have an impact on both, either in an integrated manner where possible, or in parallel.

78. An integrated compliance strategy (which would take elements from the former country programmes and the HPMP overarching strategies) could help Article 5 countries plan and ensure an efficient and coordinated implementation of HCFC phase-out and HFC phase-down in line with their

[37] Most LVC countries have implemented stage I of their HPMP up to 2020 and are submitting stage II proposals in many cases for total HCFC phase-out by 2030; many non-LVC countries have implemented stage II of their HPMPs up to the 2020-2023 period and have started to submit their stage III proposals, some of them for total HCFC phase-out in 2030.

[38] In line with paragraph 8 ter(e)(i) of the Montreal Protocol, Article 5 countries may exceed zero consumption in any twelve-month period from 1 January 2030 to 1 January 2040 so long as the sum of its calculated levels of consumption over the ten-year period, divided by ten, does not exceed two point five per cent of the average of its calculated levels of consumption in 2009 and 2010, and provided that such consumption shall be restricted to: the servicing of refrigeration and air-conditioning equipment existing on 1 January 2030; the servicing of fire suppression and fire protection equipment existing on 1 January 2030; solvent applications in rocket engine manufacturing; and topical medical aerosol applications for the specialized treatment of burns.

[39] UNEP/OzL.Pro/ExCom/3/18/Rev.1, Annex III, Section II.1.1

national circumstances and priorities. In particular, it could help Article 5 countries avoid duplication or lack of coordination between the activities intended to phase out HCFC and those intended to phase down HFCs; combine resources from the HPMP and the HFC phase-down plans to implement meaningful activities with larger impact in those areas where such integration is possible (e.g., the refrigeration servicing sector); and plan the HFC phase-down Agreement taking into account the ongoing HPMP Agreement so as to avoid unnecessary increased administrative, monitoring, reporting and verification burden of implementing two multiyear agreements.

79. It is proposed that the integrated compliance strategy be a concise document that would be submitted along with stage I of the HFC phase-down plan and would include the Government's commitment to harmonize the phase-out of HCFCs and the phase-down of HFC consumption to the extent possible; the schedule of HCFC reductions (as per ongoing Agreements for HPMPs) and proposed HFC reductions up to 2030; the proposed HFC phase-down plan tranches synchronized with the HPMP tranches up to 2030; the approach, measures and activities proposed to avoid increases in HFC consumption resulting from implementation of the HPMP; and a plan on how to combine ongoing activities under the HPMP with the proposed HFC phase-down plan for those sectors where the integrated implementation of HCFC phase-out and HFC phase-down is possible.

80. Specifically, for the refrigeration servicing sector, noting that many of the activities are expected to serve both HCFC phase-out and HFC phase-down and that activities in the latter should be formulated in light of those ongoing under the HPMPs, the integrated compliance strategy should include an overview of how this sector will be addressed to ensure both HCFC phase-out and HFC phase-down in a complementary way avoiding overlaps of activities, and how the two sources of funding (HPMP and HFC phase-down plan) will be used/combined during the implementation of these activities.

81. While the integrated compliance strategy presents an overview of the way HCFC phase-out and HFC phase-down will be implemented in a coordinated manner, it is also considered a guiding document that will help the Executive Committee consider the HFC phase-down plan in light of the ongoing activities under the HPMPs, and have a better understanding of how these activities will be integrated where possible, or implemented in parallel. The implementation of the HPMP activities will continue to be governed by the Agreement between the Government of the Article 5 country concerned and the Executive Committee (based on the template approved at the 76th meeting). The HFC phase-down plan Agreement has yet to be prepared and will differ from the Agreement for HPMP in terms of *inter alia* consumption schedules and performance metrics (i.e., ODP tonnes vs CO_2 equivalent), verification requirements, and policies on HFC that the Executive Committee might wish to adopt. Therefore, at this stage it would be premature to consider whether these agreements could be merged. However, the integrated compliance strategy could help Article 5 countries plan in a way to ensure that the operation of both agreements is synchronized to the extent possible, that tranches for HPMPs and HFC phase-down plans are submitted simultaneously and associated verifications cover both HCFC and HFC, and that administrative and reporting efforts are rationalized. While preparing their HFC phase-down plans, Article 5 countries could use the format for the integrated compliance strategy as presented in Annex III to the present document.

82. As discussed in Section I of the present document, in addition to the integration of activities in the refrigeration servicing sector, the Secretariat is also proposing the consideration of the preparation and implementation of investment projects in sectors where there are already established alternatives, in order that such projects would help limit the growth of HFC consumption and/or achieve sustained reductions in HFC consumption while the HFC phase-down plans are being prepared and initiated, on the understanding that these projects would be integrated in stage I of the HFC phase-down plans once they are submitted and approved by the Executive Committee.

83. The Executive Committee may wish to request Article 5 countries formulating HFC phase-down plans, to submit along with the HFC phase-down plans an integrated compliance strategy that will provide the overarching strategy to integrate HCFC phase-out and HFC phase-down up to 2030, containing:

(a) The Government's commitment to harmonize the phase-out of HCFCs and phase-down of HFC consumption;

(b) A schedule of the proposed maximum allowable consumption of HCFC and HFC up to 2030;

(c) The proposed synchronized tranches for the HPMP and the HFC phase-down plan up to 2030;

(d) A statement of the approach, and specific measures and activities proposed to control increases in HFC consumption, including those resulting from implementation of the HPMP; and

(e) Identification of sectors or applications in the country where:

(i) Integrated implementation of HCFC phase-out and HFC phase-down is possible, such as the refrigeration servicing sector, including a plan to combine ongoing activities under the HPMP with the proposed HFC phase-down plan; and

(ii) HFC phase-down cannot not be integrated with ongoing HCFC phase–out and therefore needs to be implemented separately, whether in parallel to HCFC phase-out or sequentially after HCFC phase-out.

Recommendation

Secretariat's observation

84. **In light of the guidelines for the preparation of KIPs for Article 5 countries agreed at the 87th meeting, the Executive Committee may wish to note the following observations when considering the recommendation contained in paragraph 85 below:**

(a) ***Paragraphs (a) to (h):*** **The present document discusses, in paragraphs 39 to 63, potential opportunities for projects and activities in several manufacturing sectors that could be integrated within stage I of the KIPs, and in some cases that could be implemented before the process of preparation of the KIP is completed. On this regard, decision 87/50 *inter alia* in its paragraph (e) allows Article 5 countries to implement individual HFC investment projects in advance of the submission of stage I of the KIPs, and in its paragraph (f) establishes level of funds to be approved for the preparation of such investment projects. These two paragraphs of decision 87/50, comprise all those potential opportunities identified in the present document, as well as others that may have not been identified. Thus, the information on the manufacturing sectors contained in the present document, can serve as a reference for Article 5 countries to determine their own priorities based on their national circumstances and in line with the flexibility inherent in decision XXVIII/2. Accordingly, the Committee may wish to decide whether it would consider necessary to have individual decisions for each sector as presented in paragraphs (a) to (h) of the recommendation in the present document, or if paragraphs (e) and (f) of decision 87/50 are sufficient to cover all possible individual investment projects in the manufacturing sector, on the understanding that each project would be considered on a case-by-case basis; and**

(b) ***Paragraph (k):*** **The present document discusses in paragraphs 68 to 70 the opportunities for integrated HCFC phase-out and HFC phase-down in the**

refrigeration servicing sector, noting that the majority of activities being implemented by Article 5 countries in this sector will have an impact on the reduction of consumption of HCFCs and HFCs. In paragraphs 71 to 83, the document discusses the need for preparing an integrated compliance strategy to be submitted along with stage I of the KIP, to have a better understanding on how the KIP activities will be integrated with HPMP activities, or implemented in parallel. In this regard, funding for the preparation of KIPs includes a provision for those Article 5 countries that wished to do so, to consider integrating HFC phase-down activities with HPMP activities (paragraph (b)(iv) of decision 87/50). The Executive Committee may wish to consider whether the provision in decision 87/50 is sufficient to cover the subject of integrated HCFC phase-out and HFC phase-down, or if additional guidance to Article 5 countries is required.

85. Based on the above observations, the Executive Committee may wish:

Polyurethane (PU) foam

(a) To approve sector plans for the total phase-out of HFC pure or contained in pre-blended polyols in the PU foam sector, on the understanding:

(i) That any Article 5 country submitting a project will have ratified the Kigali Amendment or submitted a formal letter indicating the Government's intention to ratify the Amendment;

(ii) That the sector plan will be implemented in coordination with or complementary to the activities under the country's HCFC phase-out management plan (HPMP);

(iii) That the sector plan will be integrated into stage I of the HFC phase-down plan once the HFC phase-down plan has been formulated;

(iv) That the amount of HFC phased out by the sector plan will be deducted from the starting point for sustained reductions in HFC consumption once the starting point has been established;

(v) That the country will report exports of HFCs contained in pre-blended polyols for the last three years prior to project submission, and the average will be deducted from the country's starting point for sustained reductions in HFCs once the starting point has been established; and

(vi) That the country will establish the necessary regulatory measures to ensure the sustainability of the complete phase-out of all HCFCs and HFCs pure and/or contained in pre-blended polyols in the sector;

(b) To approve, when required, preparatory funding for the formulation of these sector plans on a case-by-case basis and in line with the draft guidelines for the preparation of HFC phase-down plans for Article 5 countries contained in document UNEP/OzL.Pro/ExCom/86/88;

Extruded polystyrene (XPS) foam

(c) To encourage Article 5 countries that do not have HFC consumption in the XPS foam sector to consider establishing regulatory measures as soon as possible to avoid the installation of new capacity for the manufacturing of high GWP HFC-based XPS foam;

Domestic and commercial stand-alone refrigeration units

(d) To approve sector plans for the total phase-out of HFC in the manufacturing of domestic and commercial stand-alone refrigeration units, on the understanding:

(i) That any Article 5 country submitting a project will have ratified the Kigali Amendment or submitted a formal letter indicating the Government's intention to ratify the Amendment;

(ii) That the sector plan will be integrated into stage I of the HFC phase-down plan once the HFC phase-down plan has been formulated;

(iii) That the amount of HFC phased out by the sector plan will be deducted from the starting point for sustained reductions in HFC consumption once the starting point has been established; and

(iv) That the country will establish the necessary regulatory measures to ensure the sustainability of the phase-out of HFCs in the domestic and commercial stand-alone refrigeration applications;

(e) To approve, when required, preparatory funding for the formulation of these sector plans on a case-by-case basis and in line with the draft guidelines for the preparation of HFC phase-down plans for Article 5 countries contained in document UNEP/OzL.Pro/ExCom/86/88;

Air-conditioning (AC) sector

(f) To invite Article 5 countries manufacturing residential and/or commercial AC equipment to explore opportunities to integrate HCFC-22 and R-410A or other high-GWP HFC phase-out in the sector to ensure the sustained adoption of lower-GWP alternatives;

(g) To approve a limited number of sector plans for the total phase-out of R-410A and other high-GWP alternatives used in the manufacturing of residential and/or commercial AC units in countries that have phased out, are presently phasing out, or intend in the short term to phase out HCFC-22 in the sector, on the understanding:

(i) That any Article 5 country submitting a project will have ratified the Kigali Amendment or submitted a formal letter indicating the Government's intention to ratify the Amendment;

(ii) That the sector plan will be integrated into stage I of the HFC phase-down plan once the HFC phase-down plan has been formulated;

(iii) That the amount of HFC phased out by the sector plan will be deducted from the starting point for sustained reductions in HFC consumption once the starting point has been established; and

(iv) That the country will establish the necessary regulatory measures to ensure the sustainability of the phase-out of R-410A and other high-GWP alternatives in the specific AC sector(s) converted;

(h) To approve, when required, preparatory funding for the formulation of these sector plans on a case-by-case basis and in line with the draft guidelines for the preparation of HFC

phase-down plans for Article 5 countries contained in document UNEP/OzL.Pro/ExCom/86/88;

Consumption of HFC-23 in specialized applications

(i) To encourage Article 5 countries that do not have consumption of HFC-23 to consider establishing regulatory measures to avoid its introduction to the country;

(j) To encourage Article 5 countries that have reported consumption of HFC-23 in fire-fighting and other niche applications, to address that consumption as a priority in their phase-down plans, noting the very high GWP of HFC-23;

Integrated compliance strategy

(k) To request Article 5 countries formulating HFC phase-down plans, to submit along with the HFC phase-down plans an integrated compliance strategy that will provide the overarching strategy to integrate HCFC phase-out and HFC phase-down up to 2030, containing:

(i) The Government's commitment to harmonize the phase-out of HCFCs and phase-down HFC consumption;

(ii) A schedule of the proposed maximum allowable consumption of HCFC and HFC up to 2030;

(iii) The proposed synchronized tranches for the HPMP and the HFC phase-down plan up to 2030;

(iv) A statement of the approach, and specific measures and activities proposed to control increases in HFC consumption, including those resulting from implementation of the HPMP;

(v) Identification of sectors or applications in the country where:

a. Integrated implementation of HCFC phase-out and HFC phase-down is possible, such as the refrigeration servicing sector, including a plan to combine ongoing activities under the HPMP with the proposed HFC phase-down plan; and

b. HFC phase-down cannot be integrated with ongoing HCFC phase–out and therefore needs to be implemented separately, whether in parallel to HCFC phase-out or sequentially after HCFC phase-out.

Annex I

MODEL TO FORECAST THE POTENTIAL RISK OF NON-COMPLIANCE WITH THE HFC PHASE-DOWN OBLIGATIONS OF 91 ARTICLE 5 COUNTRIES THAT REPORTED HFC CONSUMPTION IN 2019 UNDER ARTICLE 7 OF THE PROTOCOL OR COUNTRY PROGRAMME IMPLEMENTATION REPORTS

Scenario: Annual growth rate = 3 per cent
Units: mt CO_2-eq
Countries are sorted according to the potential risk of non-compliance, based on data in the "Consumption 2024/HFC baseline" column, from low to high risk. Wherever the value is above 100 per cent, the estimated consumption in 2024 is higher than the estimated HFC baseline (including the HCFC component) (seven countries).

Country	2019	2020	2021	2022	2023	2024	HFC avg (2020--2024)	Complete HFC baseline	Consumption 2024 / HFC baseline
Lebanon	30,069	30,971	31,900	32,857	33,842	34,858	31,909	961,593	3.6%
Venezuela (Bolivarian Republic of)	240,541	247,757	255,190	262,846	270,731	278,853	255,264	4,013,429	6.9%
Liberia	12,169	12,534	12,910	13,297	13,696	14,107	12,914	125,211	11.3%
Nigeria	807,493	831,718	856,669	882,369	908,840	936,105	856,919	6,586,019	14.2%
Cambodia	70,072	72,174	74,339	76,570	78,867	81,233	74,361	394,610	20.6%
Cameroon	344,326	354,656	365,295	376,254	387,542	399,168	365,402	1,887,911	21.1%
Equatorial Guinea	39,686	40,877	42,103	43,366	44,667	46,007	42,115	176,654	26.0%
Burundi	46,214	47,600	49,028	50,499	52,014	53,575	49,043	201,047	26.6%
Lesotho	24,165	24,890	25,637	26,406	27,198	28,014	25,644	99,388	28.2%
Mali	108,522	111,778	115,131	118,585	122,142	125,807	115,165	435,467	28.9%
Ghana	496,683	511,583	526,931	542,739	559,021	575,792	527,084	1,776,667	32.4%
Sao Tome and Principe	22,287	22,956	23,644	24,354	25,084	25,837	23,651	69,476	37.2%
Tuvalu	1,006	1,036	1,067	1,099	1,132	1,166	1,068	3,001	38.9%
Kenya	588,860	606,526	624,722	643,463	662,767	682,650	624,904	1,740,408	39.2%
Afghanistan	275,000	283,250	291,748	300,500	309,515	318,800	291,832	795,080	40.1%
Tonga	1,802	1,856	1,912	1,969	2,028	2,089	1,912	4,912	42.5%
Antigua and Barbuda	4,079	4,201	4,327	4,457	4,591	4,729	4,329	10,805	43.8%
Malawi	188,503	194,158	199,983	205,982	212,162	218,527	200,041	430,988	50.7%
Eswatini	33,980	34,999	36,049	37,131	38,245	39,392	36,060	72,955	54.0%
Armenia	137,680	141,810	146,065	150,447	154,960	159,609	146,107	295,158	54.1%
Uruguay	448,663	462,123	475,987	490,266	504,974	520,123	476,125	948,075	54.9%
Burkina Faso	622,456	641,130	660,364	680,174	700,580	721,597	660,556	1,278,365	56.4%
Haiti	93,303	96,102	98,985	101,955	105,013	108,164	99,014	176,663	61.2%
Sri Lanka	331,622	341,571	351,818	362,372	373,243	384,441	351,920	616,785	62.3%
Timor Leste	13,645	14,054	14,476	14,910	15,358	15,818	14,480	25,160	62.9%
Tunisia	1,253,622	1,291,231	1,329,968	1,369,867	1,410,963	1,453,291	1,330,355	2,172,600	66.9%
Marshall Islands	7,096	7,309	7,528	7,754	7,987	8,226	7,530	12,225	67.3%
Viet Nam	6,019,450	6,200,034	6,386,035	6,577,616	6,774,944	6,978,192	6,387,895	10,194,191	68.5%
Grenada	29,276	30,154	31,059	31,991	32,950	33,939	31,068	48,827	69.5%
Sudan	735,220	757,277	779,995	803,395	827,497	852,321	780,222	1,211,414	70.4%
Bhutan	11,659	12,009	12,369	12,740	13,122	13,516	12,373	18,982	71.2%
Palau	6,436	6,629	6,828	7,033	7,244	7,461	6,830	10,324	72.3%
Vanuatu	11,351	11,692	12,042	12,404	12,776	13,159	12,046	18,126	72.6%
Togo	797,321	821,241	845,878	871,254	897,392	924,314	846,124	1,272,705	72.6%
South Africa	10,074,432	10,376,665	10,687,965	11,008,604	11,338,862	11,679,028	10,691,078	15,887,271	73.5%
Zambia	208,794	215,058	221,510	228,155	235,000	242,050	221,575	327,401	73.9%
Senegal	1,541,337	1,587,577	1,635,204	1,684,261	1,734,788	1,786,832	1,635,681	2,408,971	74.2%
Barbados	158,343	163,093	167,986	173,026	178,216	183,563	168,035	247,211	74.3%
Dominican Republic	2,406,616	2,478,814	2,553,179	2,629,774	2,708,668	2,789,928	2,553,923	3,634,782	76.8%
Fiji	280,203	288,609	297,267	306,185	315,371	324,832	297,354	420,020	77.3%

Country	2019	2020	2021	2022	2023	2024	HFC avg (2020--2024)	Complete HFC baseline	Consumption 2024 / HFC baseline
Saint Lucia	54,429	56,062	57,744	59,476	61,260	63,098	57,761	80,773	78.1%
Colombia	5,270,350	5,428,461	5,591,314	5,759,054	5,931,825	6,109,780	5,592,943	7,775,007	78.6%
Botswana	574,066	591,288	609,027	627,297	646,116	665,500	609,204	844,551	78.8%
Paraguay	934,649	962,688	991,569	1,021,316	1,051,956	1,083,514	991,858	1,370,931	79.0%
Pakistan	7,435,247	7,658,304	7,888,054	8,124,695	8,368,436	8,619,489	7,890,351	10,836,190	79.5%
Guyana	92,782	95,565	98,432	101,385	104,427	107,560	98,461	134,951	79.7%
Zimbabwe	1,024,385	1,055,117	1,086,770	1,119,373	1,152,954	1,187,543	1,087,087	1,451,588	81.8%
Guinea	1,391,166	1,432,900	1,475,887	1,520,164	1,565,769	1,612,742	1,476,317	1,959,965	82.3%
Madagascar	1,558,144	1,604,888	1,653,035	1,702,626	1,753,704	1,806,315	1,653,516	2,186,329	82.6%
Trinidad and Tobago	2,755,910	2,838,587	2,923,745	3,011,457	3,101,801	3,194,855	2,924,596	3,855,307	82.9%
Benin	1,507,956	1,553,195	1,599,791	1,647,784	1,697,218	1,748,134	1,600,256	2,109,104	82.9%
Oman	1,988,072	2,047,714	2,109,146	2,172,420	2,237,593	2,304,720	2,109,760	2,765,083	83.4%
Suriname	132,696	136,677	140,777	145,001	149,351	153,831	140,818	183,211	84.0%
Ethiopia	369,744	380,836	392,261	404,029	416,150	428,635	392,376	510,026	84.0%
Panama	1,565,901	1,612,878	1,661,264	1,711,102	1,762,435	1,815,308	1,661,748	2,151,340	84.4%
Philippines	8,143,976	8,388,295	8,639,944	8,899,142	9,166,117	9,441,100	8,642,461	11,171,701	84.5%
Lao People's Democratic Republic	159,041	163,812	168,727	173,788	179,002	184,372	168,776	218,101	84.5%
Turkey	28,156,692	29,001,393	29,871,435	30,767,578	31,690,605	32,641,323	29,880,135	38,534,306	84.7%
Brazil	65,627,001	67,595,811	69,623,685	71,712,396	73,863,768	76,079,681	69,643,964	88,950,527	85.5%
Mauritius	587,594	605,222	623,378	642,080	661,342	681,182	623,560	792,721	85.9%
Peru	1,910,807	1,968,131	2,027,175	2,087,990	2,150,630	2,215,149	2,027,766	2,572,399	86.1%
Cook Islands	3,757	3,870	3,986	4,105	4,229	4,355	3,987	5,036	86.5%
Honduras	1,431,079	1,474,011	1,518,232	1,563,779	1,610,692	1,659,013	1,518,674	1,911,983	86.8%
Gabon	2,353,671	2,424,281	2,497,010	2,571,920	2,649,077	2,728,550	2,497,737	3,143,577	86.8%
Mexico	50,263,972	51,771,891	53,325,048	54,924,799	56,572,543	58,269,720	53,340,579	66,366,563	87.8%
Cuba	1,254,931	1,292,579	1,331,356	1,371,297	1,412,436	1,454,809	1,331,744	1,648,177	88.3%
Chile	4,763,686	4,906,597	5,053,794	5,205,408	5,361,571	5,522,418	5,055,266	6,248,912	88.4%
Kyrgyzstan	304,301	313,430	322,833	332,518	342,493	352,768	322,927	397,469	88.8%
Namibia	729,875	751,771	774,324	797,554	821,481	846,125	774,550	949,050	89.2%
Maldives	358,171	368,916	379,984	391,383	403,125	415,218	380,094	465,643	89.2%
Nicaragua	558,528	575,284	592,542	610,319	628,628	647,487	592,715	726,023	89.2%
Costa Rica	1,099,195	1,132,171	1,166,136	1,201,120	1,237,154	1,274,268	1,166,476	1,405,077	90.7%
Samoa	25,170	25,925	26,703	27,504	28,329	29,179	26,711	32,123	90.8%
Micronesia (Federated States of)	14,020	14,441	14,874	15,320	15,780	16,253	14,878	17,804	91.3%
Kiribati	5,572	5,739	5,911	6,089	6,271	6,459	5,913	7,054	91.6%
Ecuador	2,370,319	2,441,429	2,514,671	2,590,112	2,667,815	2,747,849	2,515,404	2,996,542	91.7%
Niger	1,730,118	1,782,022	1,835,482	1,890,547	1,947,263	2,005,681	1,836,017	2,177,655	92.1%
Saint Vincent and the Grenadines	30,664	31,584	32,531	33,507	34,513	35,548	32,541	38,577	92.1%
Uganda	21,480	22,124	22,788	23,472	24,176	24,901	22,795	25,937	96.0%
Bolivia (Plurinational State of)	773,894	797,111	821,024	845,655	871,025	897,155	821,263	933,795	96.1%
Guatemala	1,169,662	1,204,752	1,240,894	1,278,121	1,316,465	1,355,959	1,241,256	1,397,818	97.0%
Seychelles	227,367	234,188	241,214	248,450	255,904	263,581	241,284	270,413	97.5%
Rwanda	700,970	721,999	743,659	765,969	788,948	812,616	743,876	827,914	98.2%
Albania	1,091,972	1,124,731	1,158,473	1,193,227	1,229,024	1,265,895	1,158,811	1,285,899	98.4%
Comoros	34,149	35,173	36,229	37,316	38,435	39,588	36,239	39,157	101.1%
Qatar	21,878,613	22,534,971	23,211,020	23,907,351	24,624,571	25,363,309	23,217,781	25,085,610	101.1%
Montenegro	192,898	198,685	204,645	210,785	217,108	223,622	204,705	221,029	101.2%
Cote d'Ivoire	24,855,307	25,600,966	26,368,995	27,160,065	27,974,867	28,814,113	26,376,675	27,740,592	103.9%
Guinea-Bissau	1,391,073	1,432,805	1,475,789	1,520,063	1,565,665	1,612,635	1,476,219	1,536,221	105.0%
Chad	22,341,189	23,011,425	23,701,767	24,412,820	25,145,205	25,899,561	23,708,671	24,053,032	107.7%
Cabo Verde	3,498,447	3,603,401	3,711,503	3,822,848	3,937,533	4,055,659	3,712,584	3,734,349	108.6%

Scenario: Annual growth rate = 10 per cent
Units: mt CO_2-eq
Countries are sorted according to the potential risk of non-compliance, based on data in the "Consumption 2024/HFC baseline" column, from low to high risk. Wherever the value is above 100 per cent, the estimated consumption in 2024 is higher than the estimated HFC baseline (including the HCFC component) (47 countries).

Country	2019	2020	2021	2022	2023	2024	HFC avg (2020--2024)	Complete HFC baseline	Consumption 2024 / HFC baseline
Lebanon	30,069	33,075	36,383	40,021	44,023	48,426	36,493	966,177	5.0%
Venezuela (Bolivarian Republic of)	240,541	264,595	291,055	320,160	352,176	387,394	291,937	4,050,101	9.6%
Liberia	12,169	13,386	14,724	16,197	17,817	19,598	14,769	127,066	15.4%
Nigeria	807,493	888,242	977,066	1,074,773	1,182,250	1,300,475	980,027	6,709,128	19.4%
Cambodia	70,072	77,079	84,787	93,266	102,592	112,852	85,044	405,293	27.8%
Cameroon	344,326	378,759	416,634	458,298	504,128	554,540	417,897	1,940,407	28.6%
Equatorial Guinea	39,686	43,655	48,020	52,822	58,104	63,915	48,166	182,704	35.0%
Burundi	46,214	50,835	55,919	61,511	67,662	74,428	56,088	208,092	35.8%
Lesotho	24,165	26,582	29,240	32,164	35,380	38,918	29,328	103,072	37.8%
Mali	108,522	119,374	131,312	144,443	158,887	174,776	131,710	452,012	38.7%
Ghana	496,683	546,351	600,986	661,085	727,194	799,913	602,808	1,852,390	43.2%
Sao Tome and Principe	22,287	24,516	26,967	29,664	32,630	35,893	27,049	72,874	49.3%
Tuvalu	1,006	1,107	1,217	1,339	1,473	1,620	1,221	3,154	51.4%
Kenya	588,860	647,746	712,521	783,773	862,150	948,365	714,680	1,830,184	51.8%
Afghanistan	275,000	302,500	332,750	366,025	402,628	442,890	333,758	837,006	52.9%
Tonga	1,802	1,982	2,180	2,398	2,638	2,902	2,187	5,187	55.9%
Antigua and Barbuda	4,079	4,487	4,936	5,429	5,972	6,569	4,951	11,427	57.5%
Malawi	188,503	207,353	228,089	250,897	275,987	303,586	228,780	459,727	66.0%
Eswatini	33,980	37,378	41,116	45,227	49,750	54,725	41,240	78,135	70.0%
Armenia	137,680	151,448	166,593	183,252	201,577	221,735	167,098	316,148	70.1%
Uruguay	448,663	493,529	542,882	597,170	656,887	722,576	544,527	1,016,477	71.1%
Burkina Faso	622,456	684,702	753,172	828,489	911,338	1,002,472	755,454	1,373,264	73.0%
Haiti	93,303	102,633	112,897	124,186	136,605	150,265	113,239	190,888	78.7%
Sri Lanka	331,622	364,784	401,263	441,389	485,528	534,081	402,479	667,343	80.0%
Timor Leste	13,645	15,010	16,510	18,161	19,978	21,975	16,560	27,240	80.7%
Tunisia	1,253,622	1,378,984	1,516,883	1,668,571	1,835,428	2,018,971	1,521,479	2,363,724	85.4%
Marshall Islands	7,096	7,806	8,586	9,445	10,389	11,428	8,612	13,306	85.9%
Viet Nam	6,019,450	6,621,395	7,283,535	8,011,888	8,813,077	9,694,384	7,305,606	11,111,902	87.2%
Grenada	29,276	32,204	35,424	38,966	42,863	47,149	35,531	53,291	88.5%
Sudan	735,220	808,742	889,616	978,578	1,076,436	1,184,079	892,312	1,323,504	89.5%
Bhutan	11,659	12,825	14,107	15,518	17,070	18,777	14,150	20,760	90.4%
Palau	6,436	7,080	7,788	8,566	9,423	10,365	7,811	11,305	91.7%
Vanuatu	11,351	12,486	13,735	15,108	16,619	18,281	13,776	19,856	92.1%
Togo	797,321	877,053	964,758	1,061,234	1,167,358	1,284,093	967,682	1,394,263	92.1%
South Africa	10,074,432	11,081,875	12,190,063	13,409,069	14,749,976	16,224,973	12,227,002	17,423,196	93.1%
Zambia	208,794	229,674	252,641	277,905	305,696	336,266	253,407	359,233	93.6%
Senegal	1,541,337	1,695,471	1,865,018	2,051,520	2,256,672	2,482,339	1,870,669	2,643,959	93.9%
Barbados	158,343	174,177	191,595	210,755	231,830	255,013	192,176	271,351	94.0%
Dominican Republic	2,406,616	2,647,278	2,912,005	3,203,206	3,523,526	3,875,879	2,920,830	4,001,689	96.9%
Fiji	280,203	308,223	339,046	372,950	410,245	451,270	340,073	462,739	97.5%
Saint Lucia	54,429	59,872	65,859	72,445	79,689	87,658	66,059	89,071	98.4%
Colombia	5,270,350	5,797,385	6,377,124	7,014,836	7,716,319	8,487,951	6,396,448	8,578,512	98.9%
Botswana	574,066	631,473	694,620	764,082	840,490	924,539	696,725	932,072	99.2%
Paraguay	934,649	1,028,114	1,130,925	1,244,018	1,368,420	1,505,262	1,134,352	1,513,426	99.5%
Pakistan	7,435,247	8,178,772	8,996,649	9,896,314	10,885,945	11,974,540	9,023,911	11,969,751	100.0%
Guyana	92,782	102,060	112,266	123,493	135,842	149,426	112,606	149,096	100.2%

Country	2019	2020	2021	2022	2023	2024	HFC avg (2020--2024)	Complete HFC baseline	Consumption 2024 / HFC baseline
Zimbabwe	1,024,385	1,126,824	1,239,506	1,363,456	1,499,802	1,649,782	1,243,262	1,607,764	102.6%
Guinea	1,391,166	1,530,282	1,683,310	1,851,641	2,036,805	2,240,486	1,688,411	2,172,059	103.2%
Madagascar	1,558,144	1,713,958	1,885,354	2,073,889	2,281,278	2,509,406	1,891,067	2,423,880	103.5%
Trinidad and Tobago	2,755,910	3,031,501	3,334,651	3,668,116	4,034,928	4,438,421	3,344,756	4,275,467	103.8%
Benin	1,507,956	1,658,752	1,824,627	2,007,089	2,207,798	2,428,578	1,830,156	2,339,004	103.8%
Oman	1,988,072	2,186,879	2,405,567	2,646,124	2,910,736	3,201,810	2,412,857	3,068,180	104.4%
Suriname	132,696	145,966	160,562	176,618	194,280	213,708	161,049	203,442	105.0%
Ethiopia	369,744	406,718	447,390	492,129	541,342	595,476	448,746	566,396	105.1%
Panama	1,565,901	1,722,491	1,894,740	2,084,214	2,292,636	2,521,899	1,900,482	2,390,074	105.5%
Philippines	8,143,976	8,958,374	9,854,211	10,839,632	11,923,595	13,115,955	9,884,072	12,413,313	105.7%
Lao People's Democratic Republic	159,041	174,945	192,440	211,684	232,852	256,137	193,023	242,348	105.7%
Turkey	28,156,692	30,972,361	34,069,597	37,476,557	41,224,213	45,346,634	34,172,839	42,827,010	105.9%
Brazil	65,627,001	72,189,701	79,408,671	87,349,538	96,084,492	105,692,941	79,649,304	98,955,866	106.8%
Mauritius	587,594	646,353	710,989	782,088	860,296	946,326	713,143	882,304	107.3%
Peru	1,910,807	2,101,888	2,312,076	2,543,284	2,797,613	3,077,374	2,319,083	2,863,716	107.5%
Cook Islands	3,757	4,133	4,546	5,001	5,501	6,051	4,560	5,609	107.9%
Honduras	1,431,079	1,574,187	1,731,606	1,904,766	2,095,243	2,304,767	1,736,853	2,130,162	108.2%
Gabon	2,353,671	2,589,038	2,847,942	3,132,736	3,446,010	3,790,611	2,856,572	3,502,412	108.2%
Mexico	50,263,972	55,290,369	60,819,406	66,901,347	73,591,481	80,950,630	61,003,707	74,029,691	109.3%
Cuba	1,254,931	1,380,424	1,518,467	1,670,313	1,837,344	2,021,079	1,523,068	1,839,501	109.9%
Chile	4,763,686	5,240,055	5,764,060	6,340,466	6,974,513	7,671,964	5,781,527	6,975,172	110.0%
Kyrgyzstan	304,301	334,731	368,204	405,025	445,527	490,080	369,320	443,862	110.4%
Namibia	729,875	802,863	883,149	971,464	1,068,610	1,175,471	885,825	1,060,325	110.9%
Maldives	358,171	393,988	433,387	476,726	524,398	576,838	434,700	520,249	110.9%
Nicaragua	558,528	614,381	675,819	743,401	817,741	899,515	677,867	811,175	110.9%
Costa Rica	1,099,195	1,209,115	1,330,026	1,463,029	1,609,331	1,770,265	1,334,056	1,572,658	112.6%
Samoa	25,170	27,687	30,456	33,501	36,851	40,537	30,548	35,960	112.7%
Micronesia (Federated States of)	14,020	15,422	16,964	18,661	20,527	22,579	17,016	19,941	113.2%
Kiribati	5,572	6,129	6,742	7,416	8,158	8,974	6,763	7,904	113.5%
Ecuador	2,370,319	2,607,351	2,868,086	3,154,895	3,470,384	3,817,422	2,876,777	3,357,915	113.7%
Niger	1,730,118	1,903,130	2,093,443	2,302,787	2,533,066	2,786,372	2,099,787	2,441,424	114.1%
Saint Vincent and the Grenadines	30,664	33,730	37,103	40,814	44,895	49,385	37,216	43,252	114.2%
Uganda	21,480	23,628	25,991	28,590	31,449	34,594	26,070	29,212	118.4%
Bolivia (Plurinational State of)	773,894	851,284	936,412	1,030,053	1,133,059	1,246,364	939,250	1,051,781	118.5%
Guatemala	1,169,662	1,286,628	1,415,291	1,556,820	1,712,502	1,883,752	1,419,580	1,576,142	119.5%
Seychelles	227,367	250,104	275,114	302,625	332,888	366,177	275,948	305,077	120.0%
Rwanda	700,970	771,067	848,174	932,991	1,026,290	1,128,919	850,744	934,782	120.8%
Albania	1,091,972	1,201,169	1,321,286	1,453,415	1,598,756	1,758,632	1,325,290	1,452,379	121.1%
Comoros	34,149	37,564	41,320	45,452	49,998	54,997	41,446	44,363	124.0%
Qatar	21,878,613	24,066,474	26,473,121	29,120,434	32,032,477	35,235,725	26,553,343	28,421,172	124.0%
Montenegro	192,898	212,188	233,407	256,747	282,422	310,664	234,114	250,438	124.0%
Cote d'Ivoire	24,855,307	27,340,838	30,074,921	33,082,414	36,390,655	40,029,720	30,166,058	31,529,974	127.0%
Guinea-Bissau	1,391,073	1,530,180	1,683,198	1,851,518	2,036,670	2,240,337	1,688,299	1,748,300	128.1%
Chad	22,341,189	24,575,308	27,032,839	29,736,123	32,709,735	35,980,708	27,114,756	27,459,118	131.0%
Cabo Verde	3,498,447	3,848,292	4,233,121	4,656,433	5,122,077	5,634,285	4,245,949	4,267,714	132.0%

Scenario: Variable annual growth rate = 2 per cent between 2019 and 2022; 10 per cent in 2023 and 2024
Units: mt CO_2-eq
Countries are sorted according to the potential risk of non-compliance, based on data in the "Consumption 2024/HFC baseline" column, from low to high risk. Wherever the value is above 100 per cent, the estimated consumption in 2024 is higher than the estimated HFC baseline (including the HCFC component) (23 countries).

Country	2019	2020	2021	2022	2023	2024	HFC avg (2020-2024)	Complete HFC baseline	Consumption 2024 / HFC baseline
Lebanon	30,069	30,670	31,283	31,909	35,100	38,610	31,287	960,971	4.0%
Venezuela	240,541	245,352	250,259	255,264	280,790	308,869	250,292	4,008,456	7.7%
Liberia	12,169	12,412	12,661	12,914	14,205	15,626	12,662	124,959	12.5%
Nigeria	807,493	823,643	840,115	856,918	942,610	1,036,870	840,225	6,569,326	15.8%
Cambodia	70,072	71,473	72,903	74,361	81,797	89,977	72,912	393,162	22.9%
Cameroon	344,326	351,213	358,237	365,402	401,942	442,136	358,284	1,880,793	23.5%
Equatorial Guinea	39,686	40,480	41,289	42,115	46,327	50,959	41,295	175,833	29.0%
Burundi	46,214	47,138	48,081	49,043	53,947	59,342	48,087	200,091	29.7%
Lesotho	24,165	24,648	25,141	25,644	28,209	31,029	25,145	98,888	31.4%
Mali	108,522	110,692	112,906	115,164	126,681	139,349	112,921	433,223	32.2%
Ghana	496,683	506,617	516,749	527,084	579,792	637,772	516,817	1,766,399	36.1%
Sao Tome and Principe	22,287	22,733	23,187	23,651	26,016	28,618	23,190	69,015	41.5%
Tuvalu	1,006	1,026	1,047	1,068	1,174	1,292	1,047	2,980	43.3%
Kenya	588,860	600,637	612,650	624,903	687,393	756,133	612,730	1,728,234	43.8%
Afghanistan	275,000	280,500	286,110	291,832	321,015	353,117	286,147	789,395	44.7%
Tonga	1,802	1,838	1,875	1,912	2,104	2,314	1,875	4,875	47.5%
Antigua and Barbuda	4,079	4,161	4,244	4,329	4,762	5,238	4,244	10,721	48.9%
Malawi	188,503	192,273	196,119	200,041	220,045	242,049	196,144	427,091	56.7%
Eswatini	33,980	34,660	35,353	36,060	39,666	43,632	35,357	72,252	60.4%
Armenia	137,680	140,434	143,242	146,107	160,718	176,790	143,261	292,312	60.5%
Uruguay	448,663	457,636	466,789	476,125	523,737	576,111	466,850	938,800	61.4%
Burkina Faso	622,456	634,905	647,603	660,555	726,611	799,272	647,688	1,265,497	63.2%
Haiti	93,303	95,169	97,072	99,014	108,915	119,807	97,085	174,734	68.6%
Sri Lanka	331,622	338,254	345,020	351,920	387,112	425,823	345,065	609,929	69.8%
Timor Leste	13,645	13,918	14,196	14,480	15,928	17,521	14,198	24,878	70.4%
Tunisia	1,253,622	1,278,694	1,304,268	1,330,354	1,463,389	1,609,728	1,304,439	2,146,684	75.0%
Marshall Islands	7,096	7,238	7,383	7,530	8,283	9,112	7,384	12,078	75.4%
Viet Nam	6,019,450	6,139,839	6,262,636	6,387,888	7,026,677	7,729,345	6,263,454	10,069,750	76.8%
Grenada	29,276	29,862	30,459	31,068	34,175	37,592	30,463	48,222	78.0%
Sudan	735,220	749,924	764,923	780,221	858,243	944,068	765,023	1,196,215	78.9%
Bhutan	11,659	11,892	12,130	12,373	13,610	14,971	12,132	18,741	79.9%
Palau	6,436	6,565	6,696	6,830	7,513	8,264	6,697	10,191	81.1%
Vanuatu	11,351	11,578	11,810	12,046	13,250	14,575	11,811	17,891	81.5%
Togo	797,321	813,267	829,533	846,123	930,736	1,023,809	829,641	1,256,222	81.5%
South Africa	10,074,432	10,275,921	10,481,439	10,691,068	11,760,175	12,936,192	10,482,809	15,679,002	82.5%
Zambia	208,794	212,970	217,230	221,574	243,732	268,105	217,258	323,084	83.0%
Senegal	1,541,337	1,572,164	1,603,607	1,635,679	1,799,247	1,979,172	1,603,817	2,377,107	83.3%
Barbados	158,343	161,510	164,740	168,035	184,838	203,322	164,762	243,937	83.4%
Dominican Republic	2,406,616	2,454,748	2,503,843	2,553,920	2,809,312	3,090,243	2,504,171	3,585,030	86.2%
Fiji	280,203	285,807	291,523	297,354	327,089	359,798	291,561	414,227	86.9%
Saint Lucia	54,429	55,518	56,628	57,760	63,537	69,890	56,635	79,648	87.7%
Colombia	5,270,350	5,375,757	5,483,272	5,592,938	6,152,231	6,767,454	5,483,989	7,666,053	88.3%
Botswana	574,066	585,547	597,258	609,203	670,124	737,136	597,336	832,683	88.5%
Paraguay	934,649	953,342	972,409	991,857	1,091,043	1,200,147	972,536	1,351,609	88.8%
Pakistan	7,435,247	7,583,952	7,735,631	7,890,344	8,679,378	9,547,316	7,736,642	10,682,481	89.4%
Guyana	92,782	94,638	96,530	98,461	108,307	119,138	96,543	133,033	89.6%
Zimbabwe	1,024,385	1,044,873	1,065,770	1,087,086	1,195,794	1,315,374	1,065,909	1,430,411	92.0%
Guinea	1,391,166	1,418,989	1,447,369	1,476,316	1,623,948	1,786,342	1,447,558	1,931,205	92.5%

Country	2019	2020	2021	2022	2023	2024	HFC avg (2020-2024)	Complete HFC baseline	Consumption 2024 / HFC baseline
Madagascar	1,558,144	1,589,306	1,621,093	1,653,514	1,818,866	2,000,752	1,621,305	2,154,118	92.9%
Trinidad and Tobago	2,755,910	2,811,028	2,867,249	2,924,594	3,217,053	3,538,758	2,867,624	3,798,334	93.2%
Benin	1,507,956	1,538,115	1,568,877	1,600,255	1,760,280	1,936,309	1,569,083	2,077,931	93.2%
Oman	1,988,072	2,027,833	2,068,390	2,109,758	2,320,734	2,552,807	2,068,660	2,723,984	93.7%
Suriname	132,696	135,350	138,057	140,818	154,900	170,390	138,075	180,468	94.4%
Ethiopia	369,744	377,139	384,682	392,375	431,613	474,774	384,732	502,382	94.5%
Panama	1,565,901	1,597,219	1,629,163	1,661,747	1,827,921	2,010,713	1,629,376	2,118,968	94.9%
Philippines	8,143,976	8,306,856	8,472,993	8,642,452	9,506,698	10,457,368	8,474,100	11,003,341	95.0%
Lao People's Democratic Republic	159,041	162,222	165,466	168,776	185,653	204,218	165,488	214,813	95.1%
Turkey	28,156,692	28,719,826	29,294,222	29,880,107	32,868,117	36,154,929	29,298,052	37,952,223	95.3%
Brazil	65,627,001	66,939,541	68,278,332	69,643,898	76,608,288	84,269,117	68,287,257	87,593,820	96.2%
Mauritius	587,594	599,346	611,333	623,559	685,915	754,507	611,413	780,574	96.7%
Peru	1,910,807	1,949,023	1,988,004	2,027,764	2,230,540	2,453,594	1,988,263	2,532,897	96.9%
Cook Islands	3,757	3,832	3,909	3,987	4,386	4,824	3,909	4,958	97.3%
Honduras	1,431,079	1,459,701	1,488,895	1,518,672	1,670,540	1,837,594	1,489,089	1,882,398	97.6%
Gabon	2,353,671	2,400,744	2,448,759	2,497,734	2,747,508	3,022,259	2,449,079	3,094,919	97.7%
Mexico	50,263,972	51,269,251	52,294,636	53,340,529	58,674,582	64,542,040	52,301,472	65,327,456	98.8%
Cuba	1,254,931	1,280,030	1,305,630	1,331,743	1,464,917	1,611,409	1,305,801	1,622,234	99.3%
Chile	4,763,686	4,858,960	4,956,139	5,055,262	5,560,788	6,116,867	4,956,787	6,150,432	99.5%
Kyrgyzstan	304,301	310,387	316,595	322,927	355,219	390,741	316,636	391,179	99.9%
Namibia	729,875	744,473	759,362	774,549	852,004	937,205	759,461	933,961	100.3%
Maldives	358,171	365,334	372,641	380,094	418,103	459,914	372,690	458,238	100.4%
Nicaragua	558,528	569,699	581,093	592,714	651,986	717,184	581,168	714,476	100.4%
Costa Rica	1,099,195	1,121,179	1,143,602	1,166,475	1,283,122	1,411,434	1,143,752	1,382,354	102.1%
Samoa	25,170	25,673	26,187	26,711	29,382	32,320	26,190	31,602	102.3%
Micronesia (Federated States of)	14,020	14,300	14,586	14,878	16,366	18,003	14,588	17,514	102.8%
Kiribati	5,572	5,683	5,797	5,913	6,504	7,155	5,798	6,939	103.1%
Ecuador	2,370,319	2,417,725	2,466,080	2,515,401	2,766,942	3,043,636	2,466,402	2,947,540	103.3%
Niger	1,730,118	1,764,720	1,800,015	1,836,015	2,019,617	2,221,578	1,800,250	2,141,888	103.7%
Saint Vincent and the Grenadines	30,664	31,277	31,903	32,541	35,795	39,374	31,907	37,943	103.8%
Uganda	21,480	21,910	22,348	22,795	25,074	27,582	22,351	25,493	108.2%
Bolivia (Plurinational State of)	773,894	789,372	805,160	821,263	903,389	993,728	805,265	917,796	108.3%
Guatemala	1,169,662	1,193,055	1,216,916	1,241,255	1,365,380	1,501,918	1,217,075	1,373,638	109.3%
Seychelles	227,367	231,914	236,553	241,284	265,412	291,953	236,584	265,713	109.9%
Rwanda	700,970	714,989	729,289	743,875	818,262	900,089	729,385	813,423	110.7%
Albania	1,091,972	1,113,811	1,136,088	1,158,809	1,274,690	1,402,159	1,136,236	1,263,325	111.0%
Comoros	34,149	34,832	35,529	36,239	39,863	43,849	35,533	38,451	114.0%
Qatar	21,878,613	22,316,185	22,762,509	23,217,759	25,539,535	28,093,488	22,765,484	24,633,313	114.0%
Montenegro	192,898	196,756	200,691	204,705	225,175	247,693	200,717	217,041	114.1%
Cote d'Ivoire	24,855,307	25,352,413	25,859,461	26,376,651	29,014,316	31,915,747	25,862,842	27,226,758	117.2%
Guinea-Bissau	1,391,073	1,418,894	1,447,272	1,476,218	1,623,840	1,786,224	1,447,462	1,507,463	118.5%
Chad	22,341,189	22,788,013	23,243,773	23,708,648	26,079,513	28,687,465	23,246,811	23,591,173	121.6%
Cabo Verde	3,498,447	3,568,416	3,639,785	3,712,580	4,083,838	4,492,222	3,640,260	3,662,026	122.7%

Annex II

SUMMARY OF THE MODALITIES OF IMPLEMENTATION OF INVESTMENT PROJECTS

Sector	HCFC	HFC	Opportunities for integrated implementation of HCFC phase-out/HFC phase-down	Other considerations (including early action to limit HFC consumption growth)
PU foam	HCFC-141b	HFC-245fa HFC-365mfc / HFC-227ea	PU foam sector plans are in advanced stages of implementation in most countries, where low-GWP alternatives are being introduced. Therefore, integrated implementation might be limited to cases where substantive HCFC phase-out work would be expected in the coming years.	HFC phase-out in this sector could help ensure sustained adoption of low-GWP alternatives under the HCFC phase-out plans.
XPS foam	HCFC-22/ HCFC-142b	HFC-134a/ HFC-152a	XPS foam sector plans are in advanced stages of implementation in most countries where low-GWP alternatives are being introduced. Therefore, integrated implementation might be limited to cases where substantive HCFC phase-out work is still expected in the coming years.	Low-GWP alternatives are being introduced through HPMPs (i.e., CO_2, isobutane and HFO). Article 5 countries could consider establishing regulatory measures to avoid the installation of HFC-based XPS foam manufacturing capacity.
Domestic refrigeration (refrigeration system)	None	HFC-134a	Conversion of HCFC-141b foam panels already completed in most countries. Integrated implementation is not possible for these refrigeration systems as HCFC is not used.	As cost-effective alternatives to HFC-134a are commercially available in local markets, this sector could be converted now, followed by regulation to ensure sustainability of the phase-out.
Commercial refrigeration (stand-alone units)	HCFC-22	HFC-134a R-404A blends	Conversion of HCFC-141b foam panels already completed in most countries. Integrated implementation possible for refrigeration systems in enterprises using multiple refrigerants for different applications (e.g., HCFC-22, HFC-134a and R-404A).	Several technical options are commercially available and others are under development. The sub-sector manufacturing smaller stand-alone units could convert now to alternatives such as R-290 and CO_2, followed by specific sub-sector regulation to ensure sustainability.
Larger commercial and industrial refrigeration	HCFC-22	HFC-134a R-404A	To be considered on a case-by-case basis given the variety of applications and types of enterprises. Integrated implementation may be feasible in enterprises using multiple refrigerants for different applications (e.g., HCFC-22, HFC-134a and R-404A). However, a sector or sub-sector approach would be more likely to ensure a sustainable phase-out.	Activities designed to reduce the use of R-404A and R-507A in manufacturing could have a significant impact given their high GWP. However, they would need to address the entire sector to ensure their sustained phase-out. Potential activities that could be implemented in stage I of the HFC phase-down plans in the servicing sector include preventive maintenance, leakage control, and end-user support to better handle installed equipment.
Residential and commercial AC	HCFC-22	R-410A R-407C Blends	Potential for integrated implementation in enterprises consuming both HCFC-22 and R-410A (or other high-GWP HFCs). However, individual enterprise conversions may not be sustainable if other manufacturers are	Energy efficiency standards in AC could favour adoption of R-410A and other high-GWP refrigerants in the short run; policy measures may be needed to avoid this.

Sector	HCFC	HFC	Opportunities for integrated implementation of HCFC phase-out/HFC phase-down	Other considerations (including early action to limit HFC consumption growth)
			still using high-GWP HFCs or importing high-GWP HFC-based equipment. A sector approach is required to ensure sustained adoption of lower-GWP alternative technologies.	
MAC (vehicles)	None	HFC-134a	Integrated implementation is not possible as HCFC is not used.	Limited information available, Currently some automobile manufacturers are using HFO-1234yf as an alternative to HFC-134a.
Chillers	HCFC-22	HFC-134a R-410A R-407C R-413A	Similar to commercial AC, although consumption levels may be lower. This sector relates more to end-users and/or assembly enterprises. Opportunities for integrated HCFC and HFC implementation are unlikely.	Limited information is available.
Aerosol	HCFC-22 HCFC-141b	HFC-134a and HFC-152a HFC-134a in MDI	To be implemented separately as alternatives become available.	Several countries using HFC-152a (124 GWP). Levels of consumption of HFC-134a in MDI and other aerosol applications appear to be low. Time is required to develop HFC-free technology for MDI. Therefore, MDI is not a sector recommended for early action.
Solvent	HCFC-141b HCFC-22 HCFC-225ca HCFC-225cb	Several HFC blends	To be determined.	Levels of consumption of HFCs appear to be low.
Fire-fighting	HCFC-123	HFC-227ea HFC-236fa HFC-23 HFC-125 Other HFCs and blends	Potential integrated implementation could be explored in the few countries that have not addressed HCFC-123 in their HPMPs and have reported HFC consumption. However, except for one country amounts are negligible. Moreover, the Parties adjusted the Montreal Protocol to allow the servicing of HCFC-123 firefighting equipment in the servicing tail. Accordingly, the impetus for early action through integrated implementation with HPMPs is likely lacking.	Levels of consumption of both HCFC-123 and HFCs in this sector appear to be low, except for the use of 6,087 mt of HFC-225ea in one country.
Several uses of HFC-23 (firefighting, low-temperature refrigeration, others)	N/A	HFC-23	Low potential for integration.	Notwithstanding the limited consumption of HFC-23 in countries, its (very) high GWP may make it an opportune target for early action.

Annex III

PROPOSED INTEGRATED COMPLIANCE STRATEGY DOCUMENT (to be submitted along with stage I of the HFC phase-down plan for information purposes)

Government's commitment

This section includes the Government's statement of commitment to harmonize to the extent possible the phase-out of HCFCs and phase down HFC consumption for the period 2021 to 2030 (2032). It also includes an overview of the approach, sectors identified as priority and specific measures and activities proposed to control increases in HFC consumption, including those resulting from implementation of the HPMP.

Integrated activities

This section identifies the sectors or applications where an integrated implementation of HCFC phase-out and HFC phase-down will be possible to be undertaken. For the refrigeration servicing sector, it includes an overview of the plan to combine ongoing and proposed activities under the HCFC phase out management plan (HPMP) with the proposed HFC phase-down plan.

Parallel activities

This section identifies the sectors where HFC phase-down could not be integrated with ongoing HCFC phase–out and therefore will need to be implemented separately, whether in parallel to ongoing HCFC phase-out or sequentially after HCFC phase-out.

Schedule of the proposed maximum allowable consumption of HCFC and HFC up to 2030

The consumption schedules can be presented in the form of a table using as reference the portion of the table showing maximum allowable consumption used in Appendix 2-A of the HPMP Agreements, as presented in Table 1. The HCFC phase-out schedule would be presented in the same manner of lines 1.1 and 1.2 of the already existing Appendix 2-A of the HPMP Agreement (in ODP tonnes). If the last stage of the HPMP has not been approved yet by the Executive Committee, a schedule should be included in the same way it will be proposed in the last stage of the HPMP.

The proposed maximum allowable HFC consumption up to 2030 (2032 for group 2 countries) can be presented in the same format used in lines 1.1 and 1.2 of Appendix 2-A of the HPMP Agreement, but in CO_2-equivalent tonnes, as shown in Table 1.

Table 1: HCFC phase-out and HFC phase-down consumption schedules up to 2030 (2032)

Particulars	2024	2025	2026	2027	2028	2029	2030
HCFC phase-out schedule							
Montreal Protocol reduction schedule of Annex C, Group I substances (ODP tonnes)							
Maximum allowable total consumption of Annex C, Group I substances (ODP tonnes)							
HFC phase-down schedule							
Montreal Protocol reduction schedule of Annex F, Group I substances (CO_2-eq.t)							
Maximum allowable total consumption of Annex F, Group I substances (CO_2-eq.t)							

Proposed HPMP and HFC phase-down plan funding tranches

The schedules can be presented in the form of a table using as reference the table with Agreed Funding schedules used in Appendix 2-A of the HPMP Agreements, as shown in Table 2. To the extent possible, the tranches for the HPMP and the HFC phase-down plans should be synchronized to minimize duplication of preparation of tranche implementation reports, tranche implementation plans, and commissioning of verifications associated to the release of tranches.

Table 2. HCFC phase-out and HFC phase-down funding schedules up to 2030 (2032)

Particulars	2024	2025	2026	2027	2028	2029	2030
HCFC funding							
Lead agency agreed funding (US $)							
Support costs for Lead agency (US $)							
Cooperating agency agreed funding (US $)							
Support costs for Cooperating agency (US $)							
Total agreed funding (US $)							
Total support costs (US $)							
Total agreed costs (US $)							
HFC funding							
Lead agency proposed funding (US $)							
Support costs for Lead agency (US $)							
Cooperating agency proposed funding (US $)							
Support costs for Cooperating agency (US $)							
Total proposed funding (US $)							
Total support costs (US $)							
Total proposed costs (US $)							

Annex IV

GUIDELINES FOR THE PREPARATION OF THE KIGALI HFC IMPLEMENTATION PLANS FOR ARTICLE 5 COUNTRIES (DECISION 87/50)

1. **The Executive Committee decided:**

(a) To note the draft guidelines for the preparation of HFC phase-down plans for Article 5 countries, contained in document UNEP/OzL.Pro/ExCom/87/46;

(b) To include, in the funding for the preparation of an overarching strategy for stage I of the HFC phase-down plan, henceforth referred to as the Kigali HFC implementation plan (KIP), assistance for:

(i) Extending existing or developing new legislation, policies and regulations as required for the import/export licensing and quota systems for controlled substances under Annex F (HFCs) of the Montreal Protocol;

(ii) The conduct of a survey of HFC consumption and its sectoral distribution, surveys of enterprises in the manufacturing and servicing sectors, with analysis of the data to estimate the HFC baselines for compliance, and taking into account any HFC surveys conducted;

(iii) The development of the overarching strategy for the phase-down of HFCs and a plan of action that would include the refrigeration servicing sector for stage I of the KIPs to address the freeze and 10 per cent reduction in HFC consumption;

(iv) For those countries that wished to do so, consideration of integrating HFC phase-down activities with HCFC phase-out management plan activities;

(v) For those countries that wished to do so, a description of relevant national initiatives, policies, regulations, and standards associated with maintaining and/or enhancing energy efficiency;

(c) To provide funding for the elements described in sub-paragraphs (b)(i) to (v) above, as specified in the table below, based on the country's HCFC consumption baseline:

HCFC baseline (ODP tonnes)	Funding for preparation of stage I of the KIPs (US $)
Below 1	100,000
1 and up to 6	130,000
Above 6 and up to 20	170,000
Above 20 and up to 100	190,000
Above 100 and up to 1,000	220,000
Above 1,000 and up to 2,000	230,000
Above 2,000	case-by-case

(d) To determine and provide funding for, on a case-by-case basis, the preparation of stage I of any regional KIPs and those countries with an HCFC baseline consumption above 2,000 ODP tonnes;

(e) That, for countries that chose to implement individual HFC investment projects or sector plans in advance of submission of stage I of the KIPs, the approval of each project should result in a phase-out of HFCs to count against the eligible consumption identified in the KIPs and should indicate how the investment project would relate to meeting the overarching strategy for the country and when the KIPs would be submitted;

(f) To provide funding for any Article 5 country with a manufacturing sector using HFCs according to the number of manufacturing enterprises to be converted in line with decision 56/16(d) and (f), as follows:

(i) One enterprise to be converted in a manufacturing sector: US $30,000;

(ii) Two enterprises to be converted in a manufacturing sector: US $60,000;

(iii) Three to 14 enterprises to be converted in a manufacturing sector: US $80,000;

(iv) Fifteen or more enterprises to be converted in a manufacturing sector: US $150,000;

(v) To limit the maximum funding provided for the preparation of the investment component for any country according to the table below:

HCFC baseline (ODP tonnes)	Funding limit (US $)
Up to 100	100,000
101–300	200,000
301–500	250,000
501–1,000	300,000
1,001 and above	400,000

(g) To request bilateral and implementing agencies, when submitting stage I of the KIPs on behalf of Article 5 countries, to include:

(i) Confirmation that the country had an established and enforceable national system of licensing and quotas for monitoring HFC imports/exports in place, consistent with decision 63/17;

(ii) The Government's commitment and actions to ensure that funded HFC phase-out would be sustained over time;

(iii) An overview of any early actions to control HFC consumption;

(h) To agree that institutions and capacities in Article 5 countries developed through Multilateral Fund assistance for the phase-out of ODS should be used to the extent practicable for the phase-down of HFCs, as appropriate; and

(i) To request the Secretariat to prepare, with the assistance of the bilateral and implementing agencies, a guide for preparation of stage I of KIPs that could be used by Article 5 countries.