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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
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**IDENTIFICATION OF ISSUES TO BE CONSIDERED IN RELATION
TO EXISTING HCFC PHASE-OUT ACTIVITIES**

Background

1. In the context of agenda item 10 on Issues relevant to the Executive Committee arising from the Twenty-eighth Meeting of the Parties to the Montreal Protocol, the Executive Committee discussed a note from the Secretariat aimed at seeking guidance from the Executive Committee on a way forward to address decision XXVIII/2. Further to a discussion, the Executive Committee requested the Secretariat to prepare a document containing preliminary information in response to the elements in decision XXVIII/2 that requested the Executive Committee to take action, and addressing *inter alia* identification of the issues that the Executive Committee might want to consider in relation to existing HCFC phase-out activities (decision 77/59(b)(iv)).

2. The Executive Committee further invited members at the 77th meeting to share relevant information with the Secretariat no later than 31 January 2017, owing to the limited time remaining before the end of 2016 (decision 77/59(c))¹.

Scope of the document

3. This document presents an overview of some of the key issues that have been identified during the phase-out of HCFCs in Article 5 countries through the approval and implementation of stages I and II of HCFC phase-out management plans (HPMPs). It presents actions taken in a majority of Article 5 countries to introduce low-global warming potential (GWP) technologies mainly in the foam and refrigeration and air-conditioning (RAC) manufacturing sectors and, to a lesser extent, in the aerosol and solvent sectors. It briefly describes challenges that have been encountered while introducing low-GWP technologies including key aspects related to the refrigeration servicing sector.

¹ Information was received from the Governments of Argentina, Germany, Japan and the United States of America. However, only the Governments of Germany and Japan submitted information related to the present document. The full text of the information received from the Executive Committee members is contained in Annex II of document UNEP/OzL.Pro/ExCom/78/1/Add.1 (Annotated provisional agenda).

4. In reviewing this document, the Executive Committee might wish to consider the following information provided by Executive Committee members in response to decision 77/59(c).

Germany

5. The Government of Germany recommended that parties acknowledge the linkages between HFC and HCFC reduction schedules with respect to certain sub-sectors, in particular industrial process refrigeration, in order to avoid double conversions, and by acknowledging this linkage, the Parties signalled their alignment with the principle of using resources in the most cost-effective manner by seeking synergies between the HCFC phase-out and HFC phase-down regimes. With regard to such synergies in the consumption sector, the member suggested the following questions for consideration:

- (a) How could leapfrogging of HFC transitions be further maximised;
- (b) Could this also apply to HPMP projects where high-GWP alternatives have been approved already, but have not yet been implemented;
- (c) How to account for additional funding resources in view of the starting point for HFC, when avoiding the phase-in of high-GWP HFCs; and
- (d) How to rationalise costs following the synergizing effects of implementing servicing simultaneously under the HCFC phase-out and HFC phase-down.

6. With regard to the integrated approach with the production sector, the Government of Germany suggested that consideration be given on how to minimise or avoid transition to production of high-GWP substances. Further, the Government of Germany mentioned that opportunities to maximise energy efficiency as part of the HCFC phase-out and HFC phase-down, and how funding can be used synergistically for HCFC phase-out and HFC phase-down, need to be explored.

Japan

7. The Government of Japan indicated that the activities aimed at securing compliance of Article 5 countries with the HCFC phase-out schedule should not be delayed as HFC phase-down activities commence.

Issues identified in relation to existing HCFC phase-out activities

Approval and implementation of HPMPs

8. HPMPs for 143² Article 5 countries and one HCFC production phase-out management plan have been under implementation for more than seven years. Through these projects, HCFCs have been phased out in the foam, residential air-conditioning, commercial and industrial air-conditioning manufacturing sectors and, to a lesser extent, in refrigeration manufacturing, aerosol and solvents sectors.

9. Projects have been approved for conversion from HCFCs to both zero- and low-GWP alternatives, as well as to high-GWP HFCs, noting that the Executive Committee has sought to avoid such conversions, where possible. In addition, with very few exceptions, all the HPMPs so far approved also include the phase-out of HCFCs (mostly HCFC-22 and to a lesser extent HCFC-141b) in the refrigeration-servicing sector.

² Only Mauritania and the Syrian Arab Republic do not have an HPMP approved.

Manufacturing sector

10. In line with decision XIX/6, the Executive Committee has to the extent possible given priority to cost-effective projects and programmes which focus, *inter alia*, on substitutes and alternatives that minimize other impacts on the environment, including on the climate, taking into account GWP, energy use and other relevant factors. In order to facilitate the introduction of low-GWP technologies the cost guidelines adopted by the Executive Committee for stages I and II of HPMPs³ provided incentives when low-GWP technologies were adopted and for projects for small and medium enterprises (SMEs)⁴.

11. Since the approval of the first HCFC phase-out project at the 59th meeting (November 2009)⁵, the Executive Committee has approved a substantial number projects for adopting low-GWP technologies. For example, the vast majority of enterprises that phased out HCFC-141b in the foam sector converted to low-GWP alternatives. Conversions in the RAC manufacturing sector similarly included conversions to low-GWP refrigerants, e.g., in Brazil⁶, India⁷, Indonesia⁸, Thailand⁹ and Viet Nam¹⁰. In the case of Thailand, for example, the project replaced HCFC-22 with HFC-32 in the whole air-conditioning manufacturing industry, thus ensuring a level playing field for enterprises in the market; furthermore, policies and regulations for safe adoption of a flammable alternative and capacity-building activities helped the process of adoption of the technology¹¹.

12. In cases where conversion to high-GWP HFCs were approved by the Executive Committee, the main considerations were the country's strategy and compliance needs, the cost-effectiveness of the selected technology, the expected availability and feasibility of alternatives for the specific applications in the local market, whether zero and low-GWP alternatives could be safely used, and other impacts on the climate. In all cases, the Executive Committee has taken a variety of approaches to minimize the risk of conversion from HCFCs to high-GWP HFCs. For example, the Executive Committee approved the conversion to high-GWP HFCs (i.e., R-410A) in stage I of the HPMPs for Argentina¹² and Jordan¹³ as those conversions were considered necessary by the countries to achieve their compliance targets. In the case of Jordan, approval of the HPMP included a requirement that the overall air-conditioning sector plan would incorporate policy and technical approaches to improve the energy efficiency of residential air-conditioning equipment to offset the climate impact of the R-410A; a commitment by the Government to achieve energy consumption for residential air-conditioners using R-410A at least equal to or lower than the HCFC-22 air-conditioners they replaced; and a commitment by one of the enterprises, Petra Engineering Industries Co. to develop, convert manufacture and actively promote hydrocarbon-based split air conditioners.

³ Decision 60/44 and decision 74/50, respectively.

⁴ Up to 25 per cent above the thresholds is provided when low-GWP alternative technologies are introduced (decision 60/44(f)(iv)); and for stage II HPMPs, up to 40 per cent above the cost-effectiveness threshold is provided when low-GWP alternative technologies are introduced by SMEs in the foam sector with consumption of less than 20 metric tonnes (decision 74/50(c)(iii)).

⁵ Stand-alone HCFC phase-out projects were approved outside an HPMP up until the 62nd meeting (December 2010).

⁶ UNEP/OzL.Pro/ExCom/75/40 and Add.1.

⁷ UNEP/OzL.Pro/ExCom/77/49.

⁸ UNEP/OzL.Pro/ExCom/64/34.

⁹ UNEP/OzL.Pro/ExCom/68/41.

¹⁰ UNEP/OzL.Pro/ExCom/76/55

¹¹ UNEP/OzL.Pro/ExCom/77/65. It may be noted that use of high-GWP technologies with regulations along with HCFC-based/low-GWP technologies with regulations could result in higher levels of adoption of high-GWP technologies.

¹² UNEP/OzL.Pro/ExCom/61/28.

¹³ UNEP/OzL.Pro/ExCom/60/31.

13. The approval of stage I of the HPMP for Saudi Arabia¹⁴ requested the implementing agencies not to implement any conversion to HFC-245fa in the spray foam sector prior to 1 January 2016, and actively to pursue the establishment of low-GWP alternatives for that sub-sector prior to that date¹⁵. Following this, at the 77th meeting, the Government confirmed that the spray foam enterprises that were operating in the country decided to adopt reduced hydrofluoro-olefin (HFO) formulations¹⁶.

14. Guidelines for the preparation of stage I of HPMPs stated that no stand-alone projects could be approved after 2010 (decision 54/39 (d)). In order to allow the Government of Cuba to adopt a cost-effective and sustainable technology for the conditions prevailing in the country, the approval of stage I of the HPMP¹⁷ included a provision for the Government to submit during the implementation of stage I of the HPMP a stand-alone investment project to phase out 1.32 ODP tonnes of HCFC-22 used by RAC equipment manufacturer¹⁸. Similarly, in approving stage I of the HPMP for Uruguay¹⁹, the Executive Committee included a provision allowing the Government to submit at a future date a stand-alone investment project to phase-out the use of HCFC-22 in the refrigeration manufacturing and assembly of cold rooms, should appropriate alternatives be available²⁰.

15. Approved HPMPs have also included conversions to both low- and high-GWP alternatives in the same sector based on a variety of factors, including the needs of a particular sub-sector, availability of the technology and the capability and technical know-how of enterprises within a sub-sector. For example, the room air-conditioning and industrial and commercial refrigeration sectors in the stage I of the HPMP for China²¹ included funded conversions to both low- and high-GWP alternatives. Funding was only requested for conversions to low-GWP alternatives for those sectors under stage II of the HPMP in China.

16. The Executive Committee approved, as submitted, the conversion to high-GWP HFCs in the polyurethane (PU) foam sector in the stage I of the HPMP for Indonesia²². In contrast, it was agreed to change the technology for the RAC manufacturing sector to a lower-GWP alternative than originally submitted. In this case due to market and other factors, the country faced challenges in implementing the planned conversions both at enterprises in the PU foam sector (i.e., to the originally submitted technology) and in the RAC manufacturing sector (i.e., to the technology that was changed following discussions by the Executive Committee).

17. Approximately half of the phase-out of HCFC-141b (including HCFC-141b contained in imported pre-blended polyols) in the PU foam sector in Thailand was through conversion to low-GWP alternatives; the remaining conversions were to HFC-245fa (reduced with other blowing agents to minimise operating costs and CO₂-equivalent emissions) given the small size of the enterprises and their lack of infrastructure to operate using HCs. Similarly, stage II of the HPMP for Mexico²³ included the conversion in the aerosol/solvent applications to low-GWP alternatives for a larger enterprise that had the capability to do so, while the SMEs converted to formulations containing HFC-134a blended with low or zero GWP components (HFC-152a and perchloroethylene) in applications where no other financially feasible non-flammable alternative existed.

¹⁴ UNEP/OzL.Pro/ExCom/68/39.

¹⁵ Decision 68/37 and UNEP/OzL.Pro/ExCom/77/60, paragraph 16.

¹⁶ UNEP/OzL.Pro/ExCom/77/60, paragraph 16.

¹⁷ UNEP/OzL.Pro/ExCom/65/29.

¹⁸ Decision 65/24.

¹⁹ UNEP/OzL.Pro/ExCom/65/50.

²⁰ Decision 65/47.

²¹ UNEP/OzL.Pro/ExCom/64/29.

²² UNEP/OzL.Pro/ExCom/64/34.

²³ UNEP/OzL.Pro/ExCom/73/43.

18. In relation to temporary use of high-GWP technology by enterprises that had proposed to adopt low-GWP technology in the Dominican Republic²⁴ and El Salvador²⁵, the Executive Committee decided, *inter alia*, to request bilateral and implementing agencies to continue assisting Article 5 countries, during implementation of their HPMPs, in securing the supply of the alternative technologies selected and to report to the Executive Committee on the status of use of the interim technology selected by an Article 5 country at each meeting up until the original technology selected or another technology with a low-GWP had been fully introduced²⁶. Subsequently, UNDP reported that the beneficiary enterprises in the Dominican Republic and El Salvador had converted to low-GWP pre-blended polyols in the 75th²⁷ and 77th²⁸ meetings, respectively. In addition, in the case of the fisheries sector in the Maldives, and noting that low-GWP technologies for retrofitting fishing vessels using HCFC-22 as refrigerant is limited, the Executive Committee requested the implementing agency to continue assisting the Government during implementation of its HPMP in identifying low-GWP alternatives for the fisheries sector and report to the Executive Committee on the status of low-GWP technology adoption until such technology had been fully introduced²⁹.

19. At the 77th meeting, the Executive Committee considered the document on the final report on the evaluation of HCFC phase-out projects in the RAC manufacturing sector³⁰. The evaluation provided insights into some of the challenges in adopting low-GWP alternatives while phasing out HCFCs in the sector including, *inter alia*³¹:

- (a) Lack of market demand and the servicing sector's reluctance to deal with flammable refrigerants affect adoption of low-GWP flammable alternatives. In some countries, small enterprises that had proposed to adopt low-GWP flammable alternatives, temporarily manufacture high-GWP-based equipment as idle capacity may put the financial viability of the enterprise at risk. It may be noted that development of HCFC-22-based refrigeration and air-conditioning products is very limited;
- (b) Lack of standards can result in risks in adoption of flammable, toxic and high-pressure refrigerants including relevant safety standards in manufacturing and servicing of equipment; and
- (c) Limited availability of regional research institutions/centres in investigating the efficiency of various alternative refrigerants at high-ambient temperatures (HAT) affects adoption of low-GWP alternatives.

20. In the current HCFC phase-out context, conversion to alternatives includes both HFC-based and HFC-free technologies, though high-GWP alternatives are not encouraged under projects funded by the Multilateral Fund. Even in the case of some countries converting exclusively to HFC-free alternatives, the local markets have both HFC-based and low-GWP-based products, which may be higher priced than the HFC-based products. As a result, and in the absence of policy measures, the pace of adoption of low-GWP technologies was affected in a number of countries, resulting in temporary use of high-GWP technologies. In addition, enterprises may be converting to high-GWP alternatives outside of HPMPs based on their business decision, and enterprises may be converting to high-GWP alternatives within an

²⁴ UNEP/OzL.Pro/ExCom/74/27.

²⁵ UNEP/OzL.Pro/ExCom/74/29.

²⁶ Decisions 74/41(b) and (c), 74/42(b) and (c).

²⁷ Decision 75/20(b).

²⁸ UNEP/OzL.Pro/ExCom/77/41, paragraph 5(a).

²⁹ Decision 75/62.

³⁰ UNEP/OzL.Pro/ExCom/77/9, Corr.1 and Corr.2.

³¹ This is based on analysis done for the countries covered in the report.

HPMP but without funding from the Multilateral Fund (e.g., in the room-air conditioning sector in stage II of the HPMP for China³²).

Refrigeration servicing sector

21. HCFC phase-out activities addressing the refrigeration servicing sector are generally designed to minimise HCFC emissions and consumption by *inter alia* assisting service enterprises adopt good service practices and maximising recovery, recycling and reclamation of HCFCs where economically viable. With the adoption of technologies based on low-GWP refrigerants classified as flammable or toxic, service sector projects under HPMPs included activities to ensure the proper maintenance of new equipment and handling of those low-GWP refrigerants. For example, during implementation of stage I of HPMPs for China, Colombia³³, Ghana³⁴, Malaysia³⁵, Swaziland³⁶, Uganda³⁷ and Zambia³⁸, activities were implemented for safe handling of toxic and flammable refrigerants including equipment support, and training and other activities to facilitate the adoption of good and safe service practices.

22. The inclusion of activities in the servicing sector to facilitate the servicing and introduction of low-GWP-based equipment was explicitly encouraged through decision 72/41. In particular, Article 5 countries were encouraged to consider when implementing their HPMPs the development of regulations and codes of practice, and the adoption of standards for the safe introduction of flammable and toxic refrigerants, and to consider measures to limit the import of HCFC-based equipment and to facilitate the introduction of energy-efficient and climate-friendly alternatives. While such activities may not directly promote specific alternatives, they facilitate the introduction of equipment using low-GWP flammable alternatives into the market and the servicing of such equipment. Examples where such activities were included in the servicing sector of approved stage II of the HPMPs include Brazil, China, Colombia, India³⁹, Islamic Republic of Iran⁴⁰, Malaysia, and Mexico⁴¹.

23. The majority of the activities approved under the servicing sector relate mainly to the air-conditioning sector as it is the largest consumer of HCFCs. Although HFCs pure or in blends (e.g., HFC-134a, R 404A, R-410A and R-407C) are used in the sector, it has not been the focus of the Multilateral Fund as these were not controlled substances under the Montreal Protocol. Many of the activities currently being implemented to phase out of HCFCs in the refrigeration servicing sector have a potential impact on the HFC phase-down. For instance, training on low-GWP alternatives and technicians' certification schemes have a positive impact in both HCFC phase-out and HFC phase-down; and many of the HCFC recovery and recycling units distributed in Article 5 countries can also be used to recover and recycle HFCs. Additional information on the refrigeration servicing sector is available in Annex IV of document UNEP/OzL.Pro/ExCom/78/5.

Projects to demonstrate low-GWP alternatives to HCFC

24. A detailed analysis of projects to demonstrate low-GWP alternatives to HCFCs is available in document UNEP/OzL.Pro/ExCom/78/6, Information relevant to the development of the cost guidelines for the phase-down of HFCs in Article 5 countries: Enabling activities.

³² UNEP/OzL.Pro/ExCom77/37.

³³ UNEP/OzL.Pro/ExCom/62/27.

³⁴ UNEP/OzL.Pro/ExCom/61/39.

³⁵ UNEP/OzL.Pro/ExCom/65/41.

³⁶ UNEP/OzL.Pro/ExCom/63/52.

³⁷ UNEP/OzL.Pro/ExCom/68/43.

³⁸ UNEP/OzL.Pro/ExCom/64/48.

³⁹ UNEP/OzL.Pro/ExCom/77/49.

⁴⁰ UNEP/OzL.Pro/ExCom/77/50.

⁴¹ UNEP/OzL.Pro/ExCom/73/43.

25. Further to a decision at the Twenty-fifth Meeting of the Parties⁴², the Executive Committee has also approved projects to demonstrate or adapt low-GWP technologies when phasing out HCFCs in extruded polystyrene foam, PU foam, and different RAC and solvents applications. Projects were also approved for promoting low-GWP alternatives to HCFCs in HAT countries at the 69th and 76th meetings, respectively⁴³. The results of those demonstration projects, if proven technically feasible and economical viable, could avoid the introduction of high-GWP HFCs technologies. Moreover, the results of some of those demonstration projects could be applicable to technologies that currently use high-GWP HFCs. For example, successful demonstration of reduced HFOs for the conversion for HCFC-141b may be applicable to a similar conversion from HFC-245fa. In selecting demonstration projects, the Executive Committee considered a number of factors, including the level of consumption of HCFCs in the technology to be demonstrated. There may be sectors and technologies that have little consumption of HCFCs but instead consume high-GWP HFCs that may be suitable for demonstration projects (e.g., commercial refrigeration). In addition, the Executive Committee has approved a number of feasibility studies on district cooling as this could avoid increasing dependence on high-GWP HFCs.

Recommendation

26. The Executive Committee may wish to note document UNEP/OzL.Pro/ExCom/78/8 on the identification of issues to be considered in relation to existing HCFC phase-out activities.

⁴² Decision XXV/5, paragraph 4.

⁴³ UNEP/OzL.Pro/ExCom/69/19 and UNEP/OzL.Pro/ExCom/76/57.