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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Sixty-first Meeting
Montreal, 5-9 July 2010

WORLD BANK'S WORK PROGRAMME AMENDMENTS FOR 2010

COMMENTS AND RECOMMENDATION OF THE FUND SECRETARIAT

1. The World Bank is requesting approval from the Executive Committee of US $765,453 amendments of its 2010 Work Programme, plus agency support costs of US $57,409. The Work Programme is attached to this document.

2. The activities proposed in World Bank's Work Programme Amendments are presented in Table 1 below:

Table 1: World Bank's Work Programme Amendments

Country	Activity/Project	Amount Requested (US $)	Amount Recommended (US $)
SECTION A: ACTIVITIES RECOMMENDED FOR BLANKET APPROVAL			
A1. Renewal of institutional strengthening projects:			
Tunisia	Renewal of institutional strengthening project (Phase VI)	185,453	185,453
	Subtotal for A1:	185,453	185,453
A2. Project preparation for HPMP (investment component)			
Jordan	Project preparation for HPMP investment activities in the refrigeration sector (commercial)	30,000	30,000
Thailand	Project preparation for HPMP investment activities in the foam sector	100,000	100,000
Thailand	Project preparation for HPMP investment activities in the refrigeration sector	100,000	100,000
Thailand	Project preparation for HPMP investment activities in the air-conditioning sector	100,000	100,000
	Subtotal for A2:	330,000	330,000
SECTION B: ACTIVITIES RECOMMENDED FOR INDIVIDUAL CONSIDERATION			
B1. Technical Assistance:			
Global	Resource mobilization for HCFC phase-out co-benefits study	250,000	*
	Subtotal for B1:	250,000	*
	Total for sections A and B	765,453	515,453
Agency support costs (7.5 per cent for project preparation and institutional strengthening, and for other activities over US $250,000, and 9 per cent for other activities under US $250,000):		57,409	38,659
Total:		822,862	554,112

*Project for individual consideration or pending.

SECTION A: ACTIVITIES RECOMMENDED FOR BLANKET APPROVAL

A1. Renewal of institutional strengthening projects

(a) Tunisia (Phase VI): US $185,453

Project description

3. The World Bank submitted the request for the renewal of the institutional strengthening (IS) project for Tunisia. The description of this request is presented in Annex I to this document.

Secretariat's comments

4. The Fund Secretariat reviewed the IS terminal report and action plan submitted by the World Bank on behalf of Tunisia to support the renewal request and found that the reports are in order and consistent with requirements for these renewals. The Secretariat took into account decisions 57/36(b), 58/16, 59/47 and 60/10, particularly decision 59/47 where the Executive Committee decided "to extend financial support for IS funding for Article 5 Parties beyond 2010 and up to December 2011".

Secretariat's recommendations

5. The Fund Secretariat recommends blanket approval for the IS renewal request for Tunisia at the level of funding pro-rated up to December 2011 as indicated in Table 1 of document UNEP/OzL.Pro/ExCom/61/26. The Executive Committee may wish to express to the Government of Tunisia the comments which appear in Annex II to this document.

A2. Project preparation of HPMP (investment component)

Jordan: additional project preparation for HPMP investment activities (refrigeration sector): US $30,000

Thailand: Project Preparation for HPMP investment activities (foam sector): US$100,000

Thailand: Project Preparation for HPMP investment activities (refrigeration sector): US$100,000

Thailand: Project Preparation for HPMP investment activities (air-conditioning sector): US$100,000

Project description

6. The World Bank requested funds for the preparation of investment activities for the two countries listed above that have already had approved HPMP preparation funding. In its submission, the World Bank provided basic information about the countries' HCFC consumption and sectors where HCFCs are used, and how these sector plans will link to a comprehensive HCFC phase-out management plan (HPMP). The request for Jordan is submitted for additional funding for the refrigeration sector where funds of US $30,000 were approved at the 60th Meeting. The World Bank justified this request by indicating that there is more than one enterprise in this sector that will be covered in the project preparation exercise. The information supporting these requests is presented in the submitted work programme amendments attached to this document.

Secretariat's comments

7. The Secretariat reviewed the World Bank's submissions in detail and sought clarification where necessary. The Secretariat found that the information submitted for each of the countries listed above, and the funding requested is consistent with decision 56/16.

Secretariat's recommendation

8. The Secretariat recommends blanket approval for the requests for the preparation of the investment activities for the HFC phase-out management plan in Jordan and Thailand at the funding levels indicated in Table 1 of document UNEP/OzL.Pro/ExCom/61/26.

SECTION B: ACTIVITIES RECOMMENDED FOR INDIVIDUAL CONSIDERATION

B1. Technical Assistance

Global: Resource mobilization for HCFC phase-out co-benefits study US $250,000

Project description

9. The World Bank submitted a request to the 57th, 58th, 59th and 60th Meetings for a technical assistance project for mobilizing resources to maximize climate benefits of HCFC phase-out, at a funding level of US $250,000. This request is being resubmitted by the World Bank for the Committee's consideration at this meeting. The proposal includes a concept note describing the objectives, activities, as well as expected results of this project. As the project was not considered in full detail at the previous meetings, the proposal was resubmitted by the World Bank without any changes to that presented at the 60th Meeting.

10. The table below provides a breakdown of the US $250,000 as requested by the World Bank:

Element	Description	US$
Potential volume of carbon dioxide equivalent emission reduction	Review of current HCFC applications and available non-HCFC alternatives; market analysis on penetration of various alternatives (high and low GWP) and estimates on benefits from improved energy performance (taking into account ongoing work of TEAP and OORG)	35,000
Barriers associated with conversion of HCFC technology with baseline energy and resource efficiency to low GWP alternatives with improved energy and resource efficiency	Industrial survey in a selected number of Article 5 countries and Article 2 countries that are major technology providers for each HCFC application	50,000
Consumption and production of HCFCs	Industrial survey focusing on chemical producers in both Article 5 and non-Article 5 countries; market analysis to project trends	10,000
Potential funding resources	Review of existing activities or projects funded by various funding mechanisms; review of existing CDM and non-CDM methodologies; interview with prospective beneficiaries in Article 5 countries; identification of potential sources of financing; development of approaches and project model for securing such resources	55,000
Development of funding criteria/standards/methodologies	Development of tools for capturing co-financing resources outside the MLF	70,000
Stakeholder consultation meetings	3 consultation meetings	30,000
Total		**250,000**

Secretariat's comments

11. Decision XIX/6 paragraph 11(b) of the Nineteenth Meeting of the Parties provided guidance to the Executive Committee to give priority to, *inter alia*, "substitutes and alternatives that minimize other impacts on the environment, including on the climate, taking into account global-warming potential, energy use and other relevant factors", when looking into HCFC phase-out projects. The Executive Committee has so far approved funds for over 160 countries for HPMP preparation. There is an expectation that the HPMPs submitted to the Executive Committee for approval should consider and include financial incentives and opportunities for co-financing, in accordance with decision 54/39. These

elements for co-financing could be relevant for ensuring that HCFC phase-out results in benefits in accordance with paragraph 11(b) of decision XIX/6 as mentioned above.

12. The Secretariat notes that with the results of the study proposed by the World Bank being available in 2010 or even later, it may only assist countries by providing guidance to the agencies in the implementation of stage 1 of the HPMP, and in examining their options for co-financing for the preparation of stage 2, as appropriate. In addition, it also notes that there is so far no guidance from the Executive Committee on how climate benefits of HCFC phase-out are to be costed, and whether these costs could be considered as incremental costs under the Multilateral Fund.

Secretariat's recommendation

13. The Executive Committee may wish to consider the request for technical assistance for mobilizing resources to maximize climate benefits of HCFC phase-out, based on the proposal presented, and any discussions on the special funding facility that took place at the 30th OEWG.

Annex I

INSTITUTIONAL STRENGTHENING PROJECT PROPOSALS

Tunisia: Renewal of institutional strengthening

Summary of the project and country profile	
Implementing Agency:	World Bank
Amounts previously approved for institutional strengthening (US $):	
Phase I: Oct-92	285,312
Phase II: Jul-98	186,700
Phase III: Apr-03	242,667
Phase IV: Apr-06	247,270
Phase V: Jul-08	247,270
Total	1,209,219
Amount requested for renewal (Phase VI) (US $):	185,453
Amount recommended for approval for Phase VI (US $):	18,5453
Agency support costs (US $):	13,909
Total cost of institutional strengthening Phase VI to the Multilateral Fund (US $):	199,362
Equivalent amount of CFC phase-out due to institutional strengthening Phase Vi at US $12.1/kg (ODP tonnes):	n/a
Date of approval of country programme:	1996
ODS consumption reported in country programme (1996) (ODP tonnes):	609
Baseline consumption of controlled substances (ODP tonnes):	
(a) Annex A Group I (CFCs) (Average 1995-1997)	870.1
(b) Annex A Group II (Halons) (Average 1995-1997)	104.3
(c) Annex B Group II (Carbon tetrachloride) (Average 1998-2000)	2.9
(d) Annex B Group III (Methyl chloroform) (Average 1998-2000)	0.1
(e) Annex E (Methyl bromide) (Average 1995-1998)	8.3
Latest reported ODS consumption (2009) (ODP tonnes) as per Article 7:	
(a) Annex A Group I (CFCs)	16.6
(b) Annex A Group II (Halons)	0
(c) Annex B Group II (Carbon tetrachloride)	0
(d) Annex B Group III (Methyl chloroform)	0
(e) Annex E (Methyl bromide)	6.6
(f) Annex C Group I (HCFCs)	44.3
Total	67.5
Year of reported country programme implementation data:	2009
Amount approved for projects (US $):	8,542,383
Amount disbursed (as at December 2009) (US $):	7,418,679
ODS to be phased out (ODP tonnes):	1,208.8
ODS phased out (as at December 2009) (ODP tonnes):	1,208.8

1. Summary of activities and funds approved by the Executive Committee:

	Summary of activities	**Funds approved (US $)**
(a)	Investment projects:	5,361,636
(b)	Institutional strengthening:	1,209,219
(c)	Project preparation, technical assistance, training and other non-investment projects:	1,971,528
	Total:	8,542,383

Progress report

2. The Government of Tunisia ends its current phase of the institutional strengthening (IS) project with the achievement of a major milestone – the complete phase-out of Annexes A and B substances by the required Article 5-country deadline of 1 January 2010. The basis of this success was primarily the policy impetus provided by the National Ozone Unit (NOU) in the ANPE (Agence Nationale de Protection de l'Environnement), which ensured that CFC quotas were kept well below targets up through 2009 and that halon was phased out several years in advance.

3. Surveys and studies undertaken through the national ODS phase-out Plan (NPP) in 2008 and early 2009 to identify areas of required investment and technical assistance also delivered the clear message to the private sector of the impending phase-out and complemented Government policies. In the 2008-2010 period, the NOU took the lead in establishing implementation arrangements under the NPP and directing its implementation. It oversaw the completion of the 2006 and 2007 consumption verification audit for both CFC and halon in 2009 and ensured that the auditor had proper access to Customs data. In the latter part of phase V of the IS, the ANPE organized information and awareness raising meetings for all importers of HCFCs and HCFC products in the context of accelerated HCFC phase-out (Decision XIX/6 of the Parties). Forms were developed and distributed to these stakeholders for capturing levels of imports and HCFC uses. As of 1 January 2010, all new imports were captured in these forms, as well as an indication of the purchasers of this HCFC in the Tunisian market. This is a significant step for laying the necessary foundation for future HCFC policies, including quotas.

4. The Tunisian NOU within the ANPE also ensured that its regular work programme was implemented in 2008 through mid-2010. This included not only implementation of the quota system and management of the licensing system but monitoring of sectors and enterprises and reporting to the Ozone and Multilateral Fund Secretariats.

Plan of action

5. Phase VI of the Tunisia IS will concentrate on both sustaining the phase-out of substances in Annexes A and B and on gradually putting into place new mechanisms, projects and approaches to manage the impending HCFC consumption controls under the Montreal Protocol, as well as to manage methyl bromide consumption for fumigation. In terms of sustaining the CFC and halon phase-out achieved in 2009, the NOU in ANPE will have as a central goal the completion of its NPP by the end of 2011. The NOU will ensure that the remaining national ODS phase-out plan activities are geared towards sound management of installed ODS and ODS stocks, curbing demand for ODS in the servicing sector and enforcement. This will involve coordinating with related ministries and agencies and leading on technical assistance and training activities for the sectors and customs officers.

6. During phase VI of the IS, the NOU will build on the initiatives it took in early 2010 with HCFC importers that require reporting on import quantities and uses of HCFCs, which will form the basis for an eventual quota system. The NOU will be heavily involved in its HPMP development process and on identifying new investment projects to enable the country to meet 2013 and 2015 HCFC obligations. Finally, regular activities comprising annual monitoring, reporting and public awareness activities will be an integral part of phase VI of the IS.

Annex II

VIEWS EXPRESSED BY THE EXECUTIVE COMMITTEE ON RENEWALS OF INSTITUTIONAL STRENGTHENING PROJECTS SUBMITTED TO THE 61st MEETING

Tunisia

1. The Executive Committee has reviewed the terminal report presented with the institutional strengthening project renewal request for Tunisia. The Committee commends the Government of Tunisia for having successfully met its phase-out commitments under the Montreal Protocol and its performance targets under the Executive Committee multi-year agreement for the national ODS phase-out plan as of 1 January 2010. It notes with appreciation the efforts made by the Government of Tunisia to ensure sustained phase-out of Annex A substances through the implementation of the national ODS phase-out plan while actively reaching out to stakeholders concerning new HCFC phase-out obligations through public and private sector consultations. The Executive Committee encourages Tunisia to continue on the successful path of control and phase-out of ODS through its policy promulgation, monitoring, enforcement and public awareness raising activities and also encourages the timely completion of the national ODS phase-out plan for Tunisia.

2010 WORK PROGRAM AMENDMENT

PRESENTED TO THE 61st MEETING of the EXECUTIVE COMMITTEE

WORLD BANK IMPLEMENTED MONTREAL PROTOCOL OPERATIONS

10 May, 2010

WORK PROGRAM FOR WORLD BANK-IMPLEMENTED MONTREAL PROTOCOL OPERATIONS

1. This proposed work program for Bank-Implemented Montreal Protocol Operations is prepared on the basis of the World Bank 2010 Business Plan also being submitted to the 61st meeting of the Executive Committee. The proposed 2010 Business Plan consists of investment and non-investment activities to ensure Article 5 partner countries' full compliance with the 2010 complete phase-out of CFCs, halon, and CTC, and also includes activities identified as necessary to assist Article 5 countries to meet their first two HCFC reduction targets (i.e., freeze in 2013 and 10% reduction in 2015).

2. The value of deliverables contained in the proposed 2010 World Bank Business Plan, including investment and non investment activities, totals US $73.17 million, including agency support costs. Funds will be used to support both new and previously approved activities which combined, will capture an estimated 14,050 ODP tonnes in 2010.

3. The proposed 2010 Business Plan includes deliverables of 9 investment activities in 8 countries, totaling roughly US $69.44 million. These include annual work programs for 5 previously approved multi-year projects and 4 new HCFC sector phase-out plans.

4. The proposed 2010 Business Plan allocates US $2.15 million (roughly 3% of the total investment deliverables for the year) to support national and sector phase-out plans in Antigua & Barbuda, Thailand, Tunisia and Turkey, as well as India CFC production closure projects. The Business Plan also allocates US $67.29 million (roughly 97% of total investment deliverables for the year) to support national and sectoral HCFC phase-out work in China, Indonesia and Sri Lanka.

5. In 2010, requests to support implementation of previously approved phase-out and sector plans will include subsequent funds for: i) approved CFC phase-out plans in Antigua and Barbuda, Thailand and Tunisia; ii) a commercial refrigeration sector plan for Turkey and iii) an accelerated CFC production closure in India.

6. The proposed 2010 Business Plan includes requests to extend support for implementation of two existing institutional strengthening projects in the Philippines and Tunisia, totaling US$0.369 million.

7. The proposed 2010 Business Plan also includes a request to carry out a comprehensive study on resource mobilization to maximize climate benefits from HCFC phase-out. The concept note for this proposed activity, along with a breakdown of costs associated with conducting this proposed study, is included in Annex I.

8. A further request included in the proposed 2010 Business Plan involves organization of a workshop and preparation of a comprehensive study on Technology Options to Meet Accelerated HCFC Phase–out Obligations, a joint initiative to be carried out in partnership with UNEP.

9. The proposed 2010 Work Program, which is being submitted for consideration at the 61st Meeting of the Executive Committee, includes six (6) project preparation funding requests:

i. four (4) for preparation of HCFC phase-out sector plans;
ii. a funding request for the renewal of the institutional strengthening program for Tunisia; and,
iii. one (1) for a global initiative, which proposes initiation of a comprehensive study on resource mobilization to maximize climate benefits from HCFC phase-out.

10. Brief descriptions of the six project preparation funding requests are included in Table 1.

Table 1: Project Preparation Funding Requests Submitted for Consideration of the 60th Meeting of the Executive Committee

Country	Request (US$)*	Duration	Description
Jordan	30,000	July 2010 – July 2011	Supplementary funds for preparation of HCFC refrigeration sector plan (commercial)
Thailand	100,000	July 2010 – July 2011	HCFC Foam Sector Plan (consumption of 59 ODP T)
Thailand	100,000	July 2010 – July 2011	HCFC Refrigeration Sector Plan (consumption of 45 ODP T)
Thailand	100,000	July 2010 – July 2011	HCFC A/C Sector Plan (consumption of 156 ODP T)
Tunisia	185,453	July 2010 – December 2011	Institutional Strengthening renewal
Global	250,000	July 2010 – November 2011	Resource Mobilization for HCFC Phase-out Co-benefits Study
Support Costs	57,409		
Total	**822,862**		

Annex I
DRAFT CONCEPT NOTE
RESOURCE MOBILIZATION FOR
MAXIMIZING CLIMATE BENEFITS OF HCFC PHASE-OUT

BACKGROUND

The Montreal Protocol on Substances that Deplete the Ozone Layer has been considered as one of the most successful global environmental treaties as it has proven to be an effective instrument in bringing down consumption and production of the most potent ozone depleting substances (ODS) by more than 400,000 Mt within the last two decades[1]. Consumption and production of CFCs, halons, and CTC will be completely phased out in less than 12 months, except for a limited quantity for essential usages.

As most ODS are high global warming gases, phase-out of CFCs, halons, and CTC has also brought climate benefits. The Montreal Protocol in the last two decades has resulted in avoided emissions of high global warming gases equivalent to 25 billion tons of CO2 equivalent in comparison with 2 billion tons of CO2 equivalent to be achieved under the firs the commitment period of the Kyoto Protocol[2].

However, phasing out of these potent ODS has resulted in an increasing demand for high global warming gases including gases regulated under the Kyoto Protocol[3]. For example, the demand for HFC-134a, which is a primary alternative for CFC in new refrigeration and air-conditioning applications, was more than 133,000 Mt in 2002[4] and could exceed 400,000 Mt by 2015[5]. In the short term, replacing CFCs, which have significant higher global warming values than HFCs, resulted in significant climate benefits as mentioned above. With continuing growth in the demand for refrigeration and air-conditioning equipment particularly in developing countries, however, continuing dependence on HFCs could eventually pose significant burden to the climate in the long run.

The ozone and climate communities recognize the linkage between their efforts in protecting the ozone layer and the climate. Increasing efforts have been asserted in order to ensure synergy between the two associated global conventions. When the Parties of the Montreal Protocol decided in 2007 to accelerate the phase-out of HCFCs[6], it was recognized that selection of alternative technologies for HCFCs should take into consideration climate impact and benefits. However, the accelerated phase-out of HCFCs

[1] 2007 Consolidated Progress Report, Multilateral Fund Secretariat, July 2008.
[2] Velder and al. 2007. The Importance of the Montreal Protocol in Protecting Climate, Vol 104. PNAS,
[3] Emissions of greenhouses regulated under the first commitment period of the Kyoto Protocol (2008-2012) are CO_2, CH_4, N_2O, HFCs, PFCs and SF_6.
[4] Consumption of HCFCs grew at an average growth rate of more than 20% a year from 1995 – 2001. Consumption continues to grow at almost the same rate from 2002 – 2007.
[5] IPCC/TEAP Special Report: Safeguarding the Ozone Layer and the Global Climate System Chapter 11
[6] HCFCs are controlled by the Protocol since 1994 as "Annex C" substances. In 2007, The Parties of the Montreal Protocol negotiated an accelerated schedule of phase-out by ten years for all Parties for HCFCs. Developing countries have agreed to phase-out HCFCs by 2030.

could result in an unintentional growth of HFC demand as it was the case for CFC phase-out; therefore, efforts should be made to ensure that more consideration be given to low GWP alternatives despite the fact that some alternatives will require higher investment capital[7].

Under the current regulatory frameworks, neither the Montreal Protocol, nor the Kyoto Protocol is systematical covering the costs associated with a transition to low GWP technologies. The Kyoto Protocol is covering the mitigation of emissions, while the concern will be at the production and consumption levels. The Montreal Protocol has proven to be an effective instrument to deal with phasing out of ODS at the production and consumption levels; however, HFCs, which is primarily replacing ODS in the air-conditioning sector are regulated under the Kyoto Protocol, a protocol that has demonstrated, through the Clean Development Mechanism, the effectiveness of market instrument to leverage funding for technology transfer in developing countries[8]. Elements from both conventions can therefore be analyze and compared to preempt the increase in the demand of HFCs or high GWP gases.

OBJECTIVES

The objective of this study is to explore options for preempting an increase in the demand of HFCs or any other high global warming gases as a result of HCFC phase-out in developing countries. The study will review and examine potential financing mechanisms available for financing the transition to low GWP alternatives, including a scheduled phase-down of HFCs in developing countries and transition economies. This study will focus on direct emissions of chemical; however, it recognized that actions to reduced indirect emissions indirect emissions, such as energy efficiency improvement, can have a significantly higher impact that focusing strictly on chemical used[9]. Therefore, the proposed study will also addressed technologies limitations and tradeoff between energy efficiency gains and low GWP gases in order to maximize overall energy benefits.

HCFCS PHASE-OUT SCHEDULE OF THE MONTREAL PROTOCOL

As per Article 7 data reporting requirements under the Montreal Protocol, the total consumption of HCFCs, mainly HCFC-141b, HCFC-142b, and HCFC-22, of all developing country Parties in 2006 is approximately 352,000 MT. Consumption of other HCFCs (for example, HCFC-123) represents only a small fraction in the HCFC consumption of most developing countries. It is expected that consumption of HCFCs would continue to grow if there were no Montreal Protocol obligations as demand for

[7] Use of certain low alternative may result in higher capital due to toxicity and/or flammability of product and necessity to ensure that manufacturing facilities, production and servicing personnel are trained and equipped with necessary safety equipment.

[8] The State and Trends of the Carbon Market 2008, World Bank, 2008 reported a cumulative committed investment to CDM projects activities over 2002-2007 of about US$59 billion, for an average leverage ratio of 3.8.

[9] I IPCC/TEAP Special Report: Safeguarding the Ozone Layer and the Global Climate System Chapter 11.

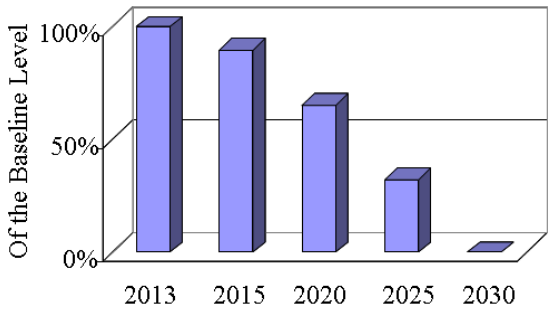
refrigeration and air-conditioning, and better insulation, in developing countries is growing at a rapid pace. Based on the aggregate HCFCs consumption trends of developing countries in the previous years, a growth rate of 9 - 10% per annum could be expected. By applying a 9% growth rate to the demand of each type of HCFCs, the total demand of HCFCs in developing countries could reach up-to 2.78 million tons level in 2030. The breakdown of HCFC demand in 2030 is shown in Table 1.

Table 1. Demand of HCFCs (MT) Under Business-as-Usual Scenario in Developing Countries

HCFC/Year	2010	2015	2020	2025	2030
HCFC-141b	171,445	242,008	372,360	572,921	881,510
HCFC-142b	45,070	63,620	97,887	150,611	231,734
HCFC-22	324,594	458,191	704,983	1,084,704	1,668,951
Total	541,108	763,818	1,175,229	1,808,236	2,782,195

Actual demand of HCFCs is expected to be much lower than the business-as-usual scenario as the Montreal Protocol requires Article 5 countries to freeze their HCFC consumption by 2013 and followed by interim reduction steps leading to a complete phase-out by 2030, except a small quantity for meeting the servicing tail up to 2040.

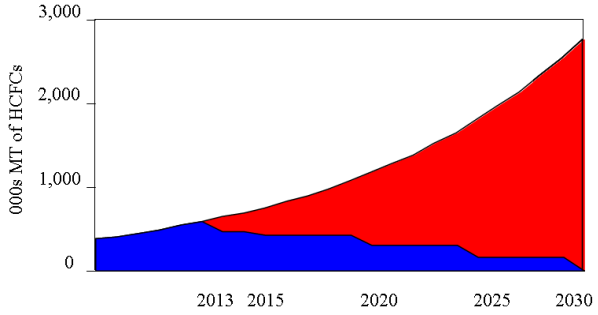
Fig. 1. HCFC Allowance Production and Consumption Schedule in Developing Countries



With the accelerated HCFC phase-out schedule of the Montreal Protocol, a total HCFC consumption of 21 million MT could be avoided during the period 2013 – 2030[10]. This avoided consumption would result in early introduction of alternatives. Climate impacts or benefits are, therefore, dependent on the choices of alternatives to be adopted by Parties of the Montreal Protocol.

[10] For illustration purposes, it is assumed that the same demand growth for the BAU scenario and the same reduction schedule are applied to each HCFC.

Fig. 2 Estimated consumption of HCFCs and alternatives for 2013 – 2030



If the avoided consumption (the red area in Fig. 2) is replaced by low GWP alternatives, the total climate benefits from the accelerated HCFC phase-out schedule (excluding impacts from improved or inferior energy efficiency performances) could be as high as 30.5 Gt of CO_2 equivalent by 2030[11]. As early phase-out of HCFC-22 also results in avoided production of byproduct HFC-23, the accelerated HCFC phase-out schedule contributes therefore to additional indirect emission reductions of 5.6 Gt of CO_2 equivalent associated with avoided production of HFC-23[12].

NON-HCFC ALTERNATIVES

Major applications of HCFC-22, HCFC-141b, and HCFC-142b in developing countries are in the refrigeration, air-conditioning, and foam sectors. Alternatives to these HCFC applications include HFCs, which have high global warming potential values, and hydrocarbons (HC), CO_2 and ammonia, which have lower GWP values. Currently available non-HCFC alternatives for various applications are summarized in Appendix 1.

Selection of alternatives depends on the desired product quality and safety. For example, hydrocarbons, which are flammable, may not be desirable for certain applications. Certain alternatives may also compromise product quality (such as insulation performance of insulation foam products.

CLIMATE IMPACT OF HCFC PHASE-OUT

The ozone depleting substances (HCFCs) are also high global warming gases, the phase-out of these chemicals presents an opportunity to maximize climate benefits, including energy efficiency gains and uses of low GWP alternatives. Alternatives currently available for replacing HCFCs consist of high global warming gases such as HFCs, low GWP gases such as hydrocarbons, CO2 and ammonia.

[11] Assuming that HCFCs are replaced by only low GWP alternatives.

[12] Assuming 3% byproduct HFC-23 in the HCFC-22 production, refer to HCFC Phase-out under the Montreal Protocol - Introductory Note on a Programmatic Approach, Montreal Protocol Operations, World Bank, 2008

Selection of these substances would have to take into account a number of factors ranging from desired product qualities, flammability, toxicity, and associated costs of using such alternatives, including energy consumption and servicing aspects.

In terms of climate benefits, the selection of alternative gases, should not only focus on low GWP of alternatives, but should also cover energy efficiency benefits that could be gained over the lifetime of the equipment. This is particularly true for the foam products, air-conditioning and refrigeration equipment that are generally made with a small quantity of HCFCs, but are characterized by long product lifetime. Alternatives could be categorized according their energy efficiency potential and GWP of the products (refer to appendix 2).

ADDITIONALITY OF CLIMATE BENEFITS ASSOCIATED WITH ACCELERATED HCFC PHASEOUT

To meet the accelerated HCFC phase-out schedule stipulated by the Montreal Protocol, major policies and actions must be undertaken to minimize the current demand of HCFCs and future dependence on HFCs. Restricting manufacturing of new HCFC-based equipment is also another important measure to avoid the build-up of HCFC demand for servicing this equipment in the future. Restricting production of new HCFC-based equipment and products could be applied to existing manufacturers or manufacturing capacity by providing them with incentives for early conversion. Establishment of new manufacturing capacity based on HCFC technologies should also be prohibited.

Recovery, recycling and reuse of HCFCs, particularly HCFC-22 which represents more than 80% of the total consumption in most developing countries, would assist countries to meet their Montreal Protocol obligations. Since the Montreal Protocol defines consumption as production plus import and minus export, recycled HCFC-22 would replace the need for production and/or import of virgin HCFC-22 which in turn assists countries in meeting their consumption limit.

Replacement of HCFC-based equipment would also contribute to significant reduction in HCFC demand. Given that HCFC-based equipment or products (e.g., air-conditioning equipment, insulation foams, and etc.) have a long product life, early replacement of these items could be costly and not financially viable. Based on experience from CFC phase-out, early replacement of HCFC-based equipment or products could be viable when new products are more energy (and resource) efficient. As there have been a number of projects addressing this issue, this option will not be addressed in this proposed study.

As pointed out earlier, replacement of HCFCs in most applications could be done via both low and high GWP alternatives. In most cases, applications of low GWP technologies in the foam and refrigeration sectors could result in lower product costs. However, because of related toxicity and/or flammability issues of these low GWP alternatives, higher capital investments are required to ensure that manufacturing facilities, production and servicing personnel are trained and equipped with necessary safety equipment. Conversion costs could be prohibitive, particularly for small-and-medium scale enterprises.

The CFC phase-out experience clearly demonstrates that while cyclopentane is available as a foam blowing agent, all small-and-medium scale enterprises opt for HCFC-141b as initial investments are much lower. Hence, the preferred choice for phasing out of HCFC in the foam sector for small-and-medium scale enterprises could as well be HFCs, rather than cyclopentane. Common HFCs for foam blowing applications include HFC-134a, HFC-152a, HFC-245fa, HFC-365mc, and HFC-227ea. These chemicals have GWP many times higher than hydrocarbon alternatives (with GWP of less than 25) (Appendix 3).

Similarly, HCFC-22 refrigerant in the refrigeration and air-conditioning applications could be replaced by either low or high GWP refrigerants (i.e, hydrocarbons, ammonia, carbon dioxide, and HFCs). For developing countries in particular where the demand of residential air-conditioners is rapidly increasing, selection of appropriate alternatives to HCFC-22 refrigerant would render significant climate benefits. Currently, HFC-410A, which has a high GWP value, seems to be an alternative of choice. Extensive research and development has been put in place to improve energy efficiency of new HFC-410A residential air-conditioners. Providing that similar energy efficiency could be achieved by hydrocarbon technology, replacing HCFC-22 with hydrocarbon refrigerant could contribute additional benefits to the climate since GWP of hydrocarbon refrigerant are more than 100 times lower than HFC-410A. However, safety concerns on the flammability of hydrocarbons could prevent a large-scale adoption of this technology. Extensive training of production and servicing personnel may be required in order to employ this technology safely. More awareness for end-users is also equally important in order to educate consumers of the safe use of these products.

Recovery and recycling of HCFC-22 during servicing and maintenance of refrigeration and air-conditioning equipment is considered as an eligible activity for funding from the Multilateral Fund. Thus far, the Multilateral Fund has allocated significant resources to support establishment of recovery and recycling networks in almost all developing country Parties of the Montreal Protocol. In addition, training on better containment (reducing leak, recovery and recycling, and reuse) has also been one of the core activities funded by the Multilateral Fund.

Experience from CFC recovery and recycling, thus far, is not encouraging. Implementation of recovery and recycling practice is more desirable financially when servicing equipment with a large refrigerant charge size. For example, recovery and recycling of refrigerants in large industrial and commercial refrigeration systems and in large chillers are common. However, recovery and recycling of CFCs from mobile air-conditioning equipment and domestic refrigerators have not shown a similar success as the price of CFCs and the quantity of CFCs that could be recovered from each unit are low.

It is expected that the economic of recovery and recycling HCFC-22 from residential air-conditioning units would probably be similar to recovery and recycling of CFCs from mobile air-conditioning equipment and domestic refrigerators. A combination of the low price of HCFC-22 and a small charge size of HCFC-22 in each piece of equipment, and

high transaction costs to implement recovery and recycling HCFC-22, makes the recovery and recycling practice less financial attractive to most service technicians.

Potential climate benefits of recovery and recycling HCFC-22 warrants further consideration as it leads to a lower requirement for production of virgin HCFC-22. Excluding the direct GWP associated with HCFC-22, recovery and recycling of one MT of HCFC-22 reduces emission of 30 kg of byproduct HFC-23 from production of one MT of virgin HCFC-22 or about 420 MT of CO_2 equivalent. This significant climate benefits render opportunity to mobilize additional resources to lower high transaction costs of implementing the recovery and recycling practice experienced by service technicians.

PROPOSED STUDY

As indicated above, HCFC phase-out could result in an increased use of HFCs . In order to maximize benefits of both ozone layer protection and climate protection, a synchronized strategy for managing the use of HCFCs and phasing-down HFCs could assist Parties to the Montreal Protocol to develop a conducive environment for climate friendly technologies. This would also assist industries in developing countries to avoid two-steps conversion to low GWP technologies (from HCFC to HFC and to low GWP alternatives). To support market penetration of low GWP technologies, financial incentives within and outside the Multilateral Fund should be considered in order to offset higher costs, if any, of adoption of low GWP technologies. In addition, consumption and production of HFCs including those produced as byproducts of other chemical processes will also be considered.

Since all Parties to the Montreal Protocol are now in the process of developing their HCFC phase-out strategies, it is an opportune time for Parties to also consider their HFC strategy as part of their response to the call for more consideration of other environmental benefits, particularly the climate benefits, when phasing out HCFCs. Based on the business-as-usual scenario, it is obvious that the need for HFCs equipment or products (e.g., air-conditioning and insulation foam products) will continue to grow in spite of the HCFC phase-out schedule under the Montreal Protocol. Hence, to minimize the growth of HFCs the choice of technologies to be made by existing manufacturing facilities of those products currently produced with or containing HCFCs not only has to be considered, but also the choice of technologies for facilities to be established in the future in order to meet the demand of these products.

OBJECTIVES OF THE STUDY

While HCFC phase-out renders two climate benefit opportunities: (i) improved energy efficiency; and (ii) use of lower GWP chemicals, the proposed study will focus on resource mobilization to support the latter, but will addressed technologies limitations and tradeoff between energy efficiency gains and low GWP gases.

The study will focus on resource mobilization to support projects aiming at reducing use of HFCs[13] as a result of HCFCs phase-out and reducing HFCs as a byproduct from HCFC production.

SCOPE OF THE STUDY

The study will investigate: (i) review of tradeoff between energy efficiency gains and low GWP gases; (ii) costs and barriers associated with conversion of HCFC technology with to low GWP alternatives; (iii) volume of HFCs and equivalent in carbon dioxide equivalent associated with the consumption and production in developing countries and transition economies including those produced as byproducts of other chemical processes; and (iiv) potential funding resources (e.g., Multilateral Fund, Carbon Market, Carbon Partnership Funds, Clean Technology Fund, and etc.) to support adoption of better HCFC containment practice, and climate friendly technologies (v) recommendations (or development of a) for a funding methodologies such as approaches to evaluate and setting the baseline consumption and production of HFCs, etc. In addition, the study will investigate effective modalities for implementing these activities in order to ensure seamless synergy between the MLF funded activities and activities funded by resources outside the MLF.

Based on experience from CFC phase-out, it is anticipated that HCFC phase-out will involve a large number of beneficiaries. Moreover, HCFC phase-out strategies and HFC strategies may require not only investment and technical assistance activities but also a combination of policy and timely investment interventions to ensure cost-effective means of achieving the targets. Experiences from implementation of CFC phase-out activities in the last two decades clearly demonstrate effectiveness of sectoral or national approaches whereby policy and investment activities are carried out in chronology. Similarly, the climate community also recognizes the need to scale up its CDM activities. Recently, a program of activity approach has been adopted by the CDM Board.

There are some similarities between the sectoral or national approaches under the Multilateral Fund and the CDM program of activity approach. The study will review these different approaches and offer recommendations to synchronize implementation modalities as well as to synchronize, to the extent possible, monitoring and verification procedures that may be required by the MLF mechanism, CDM mechanism, and other potential funding mechanisms.

STUDY APPROACH

The study will entail a desk review of the on-going study on HCFC alternatives and their climate benefits being conducted by UNEP TEAP under the auspices of the Montreal Protocol, the cost study being carried out by the Multilateral Fund, all applicable CDM methodologies, proposed approaches under negociations by the climate community, funding mechanisms outside UNFCCC and MP such as the Clean Technology Carbon

[13] It includes HFCs used as a result of CFC phaseout and possibly HCFC phase-out. For example, the study will explore financing opportunities for replacing HFC-134a MACs with low GWP alternatives.

Partnership Funds, Clean Technology Fund and others. Findings of the desk review will lead to recommendations or development of a funding methodologies for potential funding sources. The study will also include workshops to inform developing countries of findings of the study, which will lead to identification of potential pilot projects in a few developing countries.

TIMEFRAME

Detailed terms of reference for this study will be submitted for the consideration of the Executive Committee at its 61st Meeting in July 2010. The study will then take about 12 months to complete. The final report of the study will be submitted to the ExCom at its 65th Meeting in November 2011.

Appendix 1: Non-HCFC Alternative Matrix

Sector	Sub-sector	HCFCs Currently Used	Alternative Options
Foam	XPS	HCFC 22/HCFC 142b (blends), HCFC 22, HCFC 142b	CO_2, CO_2/Ethanol, CO_2/HCs; HFC 134a
	Polyurethane Spray	HCFC 141b, minor use of HCFC 141b/HCFC 22	HFC, CO_2 (CO_2 not preferred option if superior thermal insulation performance is required.)
	Domestic refrigerators/freezers	HCFC 141b, minor use of HCFC 141b/HCFC 22	HFC, HC (Small enterprises use HFCs)
	Commercial refrigerators/freezers	HCFC 141b	HFC, HC, CO_2 (Adhesion problem with CO_2)
	Sandwitch panels - continuous	HCFC 141b	HFC, HC
	Sandwitch panels - discontinuous	HCFC 141b	HFC, HC
	Insulated pipes	HCFC 141b	HFC, HC
	Integral skin foams	HCFC 141b	HFC 134a, CO_2, HC
Refrigeration	Supermarket refrigerators	HCFC 22	R-404A, CO_2, HCs and Ammonia (R-717)
	Industrial refrigeration	HCFC 22	R-717, CO_2
	Transport refrigeration	HCFC 22	HFC 134a, R-404A, R-410A
Air-conditioning	Air-conditioning	HCFC 22	R-410A, HCs, CO_2
	Water -heating heat pumps	HCFC 22	HFC 134a, R-410A, CO_2
	Chillers	HCFC 22	HFC 134a

Source: OORG Presentations, OORG Meeting, October 2008, Washington DC
Note: R-404A and R-410A are HFC blends.

Appendix 2: Selection of HCFC's Alternatives and Climate Considerations

In terms of climate benefits, it could be described that the available alternatives in the consumption sector can be categorized according to Figure 3. These four regions represent:

- Region I – Low GWP alternatives with improved energy and resource efficiency or thermal insulation property of the final products;
- Region II – High GWP alternatives with improved energy and resource efficiency or thermal insulation property of the final products;
- Region III – Low GWP alternatives with inferior energy and resource efficiency or thermal insulation property of the final products when compared with HCFC products;
- Region IV – High GWP alternatives with inferior energy and resource efficiency or thermal insulation property of the final products when compared with HCFC products.

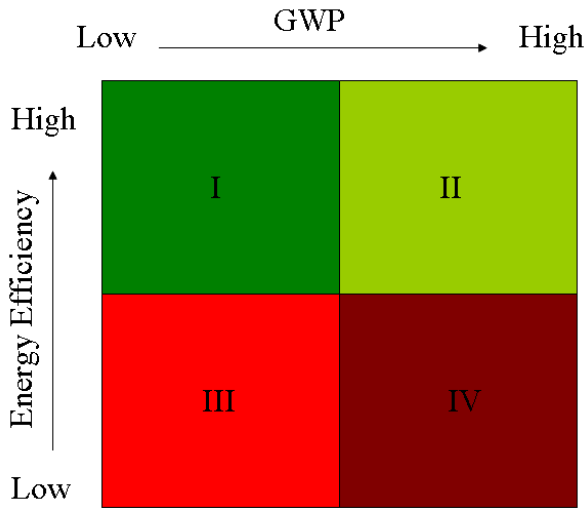


Fig. 3 Characteristics of Non-HCFC Alternatives

Foam products, air-conditioning and refrigeration equipment, are made with a small quantity of HCFCs. However, they have a long product lifetime. Therefore, any alternatives of HCFCs that fall in Regions III and IV are not desirable. For example, replacing HCFCs with low GWP alternatives (Region III) but resulting in low energy efficiency or insulation property, could result in higher energy consumption during the lifetime of these products. Emissions of carbon dioxide during the lifetime of the products normally are many times higher than the difference between the GWP values of HCFCs and alternatives used for manufacturing or maintaining these products. Alternatives in Region IV are even less desirable.

Appendix 3: GWP of HCFCs and HFC alternatives[14]

Substance	GWP
HCFC-22	1,700
HCFC-141b	630
HCFC-142b	2,000
HFC-134a	1,300
HFC-152a	140
HFC-245fa	820
HFC-365mc	840
HFC-227ea	2,900
HFC-23	14800
R-410A (HFC Blends)	2,100
R-404A (HFC Blends)	3,900
R-407C (HFC Blends)	1,800

Note: R-404A, R-407C, and R-410A are HFC blends

[14] 2006 UNEP Technical Options Committee Refrigeration, A/C and Heat Pump Assessment Report

Appendix 4: Preparation Cost Breakdown

Element	Description	US$
Potential Volume of Carbon Dioxide Equivalent Emission Reduction	Review of current HCFC applications and available non-HCFC alternatives; market analysis on penetration of various alternatives (high and low GWP) and estimates on benefits from improved energy and resource performance (taking into account ongoing work of TEAP and OORG)	35,000
Barriers Associated with Conversion of HCFC Technology with Baseline Energy and Resource Efficiency to Low GWP Alternatives with Improved Energy and Resource Efficiency	Industrial survey in a selected number of Article 5 countries and Article 2 countries that are major technology providers for each HCFC application	50,000
Consumption and Production of HCFCs	Industrial survey focusing on chemical producers in both Article 5 and non-Article 5 countries; market analysis to project trends	10,000
Potential Funidng Resources	Review of existing activities or projects funded by various funding mechanisms; review existing CDM and non-CDM methodologies; interview with prospective beneficiaries in Article 5 countries; identification of potential sources of financing; development of approaches and project model for securing such resources	55,000
Development of Funding Criteria/Standards/Methodologies	Development of tools for capturing co-financing resources outside the MLF	70,000
Stakeholder Consultation Meetings	3 consultation meetings	30,000
Total		**250,000**