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执行蒙特利尔议定书
多边基金执行委员会
第五十九次会议
2009 年 11 月 10 日至 14 日，埃及迦里卜港

世界银行 2009 年工作方案修正案

基金秘书处的评论和建议

1. 世界银行请执行委员会为其 2009 年工作方案修正案核准 315,000 美元，外加机构支助费用 23,625 美元。

2. 世界银行工作方案修正案提议的活动列示于下表 1：

表 1：世界银行工作方案修正案

国家	活动/项目	申请数额 (美元)	建议数额 (美元)
A 部分：建议一揽子核准的活动			
A1. 氟氯烃淘汰管理计划的项目编制（投资部分）			
菲律宾	编制空调行业的投资活动	65,000	65,000
	A1 小计：	65,000	65,000
B 部分：建议个别审议的活动			
B1. 技术援助：			
全球	为淘汰氟氯烃和获得气候共同惠益调集资源	250,000	*
B1 小计:		250,000	
A 部分和 B 部分共计		315,000	65,000
机构支助费用 (7.5 %用于项目编制和体制建设及超过 250,000 美元的其他活动；9%用于低于 250,000 美元的其他活动)：		23,625	4,875
共计：		338,625	69,875

*供个别审议或待定的项目。

A 部分：建议一揽子核准的活动

A1. 项目编制供资:

菲律宾：编制氟氯烃淘汰管理计划的投资项目（国内空调行业）：65,000 美元

项目说明

3. 世界银行代表菲律宾政府申请向投资活动的编制工作追加供资，第五十五次会议核准菲律宾用于编制氟氯烃淘汰管理计划的供资为 195,000 美元。世界银行在其提案中提供了该国氟氯烃消费及正在寻求投资准备资金的具体行业方面的资料。由于多家机构在菲律宾各种行业开展工作，报告还提供了如何将本行业计划与全面氟氯烃淘汰管理计划联系起来的资料。

秘书处的评论

4. 秘书处详细审查了世界银行的提案，注意到本活动未载入第五十七次会议核准的 2009 年世界银行业务计划。它试图澄清这个问题，并已被告知这是菲律宾的具体申请，依照第 56/16 号决定和 2007 年菲律宾 180.2 ODP 吨的消费量，该国有权享有至多 200,000 美元，用于氟氯烃淘汰管理计划投资部分的项目编制。秘书处在其审查时注意到还为泡沫行业和制冷行业申请了类似供资（除国内空调行业外），并且所寻求的总金额符合该国根据第 56/16 号决定所接受资助的资格。它还注意到该国与在氟氯烃淘汰管理计划编制过程中的各种合作机构协商，对各个机构的职责划分有清楚的认识。秘书处还认为尽管该申请未载入世界银行的业务计划，但由于它未涉及任何政策问题并且符合第 56/16 号决定，执行委员会可予以审议。

秘书处的建议

5. 秘书处建议一揽子核准的供资为 65,000 美元，用于编制菲律宾氟氯烃淘汰管理计划所涉的国内空调行业的投资活动。

B 部分： 建议个别审议的活动

B1. 技术援助

<u>全球：为淘汰氟氯烃和获得气候共同惠益调集资源：250,000 美元</u>

项目说明

6. 世界银行向第五十七和五十八次会议提交了一份供资额为 250,000 美元的技术支助项目，以调集资源将淘汰氟氯烃的气候惠益最大化。世界银行再次提出该要求，以供本次会议审议。该提案还载有一份概念说明，阐释了这一项目的各项目标、活动及预期成果。世界银行再次提交的这一提案与第五十八次会议的提案没有任何变化。

7. 根据世界银行的说明，该项目旨在探索各种选择办法，用于率先防止由于发展中国家淘汰氟氯烃而导致消费行业的氢氟碳化物的需求，或任何其他全球升温潜能值高的气体出现增长。该研究将审查和研究为向全球升温潜能值低的替代品进行过渡的潜在融资机制，包括发展中国家及经济转型期国家计划淘汰氢氟碳化物。该项目还将解决能效收益与全球升温潜能值低的气体之间的技术限制和权衡问题。

8. 研究将探讨：（一）氟氯烃技术向全球升温潜能值低的替代品进行转换所涉的费用和障碍；（二）与发展中国家氟氯烃的消费和生产相关的氢氟碳化物数量和其他替代品的 CO_2 当量，其中包括其他化学流程的副产品；（三）用于支助采用更好遏制氟氯烃的做法和无害环境技术的潜在供资来源（即多边基金、气候公约、碳交易市场、碳伙伴关系、清洁技术基金等）。它还将提供有关供资方法的建议，如评价和设定氢氟碳化物的基准消费量和

生产量以及计划减少量的方法。此外，该项目还将调查执行这些活动的有效形式，以确保多边基金资助的活动与可能由其他供资来源资助的活动之间的协同增效作用。

9. 世界银行指出，一旦采纳关于资源调动的决定，他们将首次为提交执行委员会审议的研究报告设定详细的工作范围。该工作范围将作为本次研究寻求何种供资的基础，并将需要 12 个月来完成。最终研究报告完成之后将立即提交执行委员会。

10. 下表提供了世界银行申请的 250,000 美元的款项明细。

要素	说明	美元
潜在的二氧化碳当量的减排数量	审查当前的氟氯烃装置和现有的无氟氯烃替代品；对于各种替代品的渗透性（全球升温潜能值高和低）进行市场分析，并估计能效改进后产生的惠益（将技术和经济评估小组以及臭氧业务专家组进行的工作考虑在内）	35,000
具有基准能源和资源效率的氟氯烃技术转换为具有改进的能源和资源效率的全球升温潜能值低的替代品的相关障碍	对选定的一些作为各氟氯烃应用的主要技术供应商的第 5 条国家和第 2 条国家进行行业调查	50,000
氟氯烃的消费量和产量	开展以第 5 条国家和非第 5 条国家的化学品生产商为重点的行业调查；针对项目趋势进行市场分析	10,000
潜在的供资来源	审查由各种供资机制资助的现有活动或项目；审查现有的清洁发展机制和非清洁发展机制方法；与第 5 条国家预期的受益人进行会谈；确定潜在的融资来源；制定保障这类资源的方法和项目模式	55,000
供资标准/方法的制定	开发获得多边基金以外共同融资资源的工具	70,000
利益攸关者协商会议	三次协商会议	30,000
总计		250,000

秘书处的评论

11. 第十九次缔约方会议第 XIX/6 号决定第 11(b)段向执行委员会提供了指导，其中特别要其在研究氟氯烃淘汰项目时，“给予那些将环境的其他影响（包括气候影响）最小化的替代品以优先考虑，并将全球升温潜能值、能源使用和其他相关要素考虑在内”。执行委员会第五十四次会议商定了一套氟氯烃淘汰管理计划编制准则，并在第五十五和五十六次会议上核准了 115 个国家的氟氯烃淘汰管理计划的编制供资。第 54/39 号决定商定的准则包括，要求第 5 条国家考虑财务激励措施以及在其氟氯烃最终淘汰管理计划中共同融资的机会，这可关系确保氟氯烃淘汰工作产生上述第 XIX/6 号决定第 11(b)段所述的惠益。

12. 秘书处还注意到，世界银行提议的研究结果在 2010 年或在这之后可用，它仅在氟氯烃淘汰管理计划第一阶段的执行过程中以及在审查第二阶段编制工作的共同融资选择办法时酌情向各机构提供指导，以此来帮助各个国家。此外，秘书处还注意到，迄今执行委员会未就氟氯烃淘汰的气候惠益需要多少花费以及这些费用是否可以视为多边基金下的增量成本进行指导。

13. 执行委员会第五十七次会议讨论了从贷款和其他来源获得补充收入的机制（UNEP/OzL.Pro/ExCom/57/64 号文件），并在第 57/37 号决定中决定秘书处提供有关该机制的进一步分析报告，以供委员会第五十八次会议审议。

14. 执行委员会第五十八次会议通过的第 58/37 号决定载有将该提案和其他类似提案推迟到今后会议以供审议的内容。因此，第五十八次会议未讨论该提案。秘书处注意到，该提案再次提交执行委员会第五十九次会议审议，符合议程项目 11，即从借款和其他来源获得补充收入的特别融资机制的讨论内容。秘书处还注意到执行委员会第 58/37 号决定还认可世界银行主动提出派出一名该银行财政部代表，“说明诸如事先承付等处理额外融资以及把多边基金资金与碳融资混合起来的各种机制。”

秘书处的建议

15. 谨建议执行委员会根据上述信息并根据议程项目 11“关于从借款和其他来源获得补充收入的特别筹资机制的进一步概念文件”开展的讨论，来审议该提案。

2009 WORK PROGRAM AMENDMENT

PRESENTED TO THE 59th MEETING OF THE EXECUTIVE COMMITTEE

WORLD BANK IMPLEMENTED MONTREAL PROTOCOL OPERATIONS

September 23, 2009

WORK PROGRAM AMENDMENT FOR WORLD BANK-IMPLEMENTED MONTREAL PROTOCOL OPERATIONS

1. The World Bank 2009 – 2011 Business Plan and the 2009 Work Program were submitted for the consideration of the 57th Meeting of the Executive Committee (ExCom) in March 2009. The 2009 -2011 Business Plan includes, among others, three renewals of existing institutional strengthening projects, one global study on resource mobilization to maximize climate benefits from HCFC phase-out, four demonstration projects, and three pilot ODS disposal projects.

2. The funding requests for preparation of the global study on resource mobilization, four demonstration projects, and three pilot ODS disposal projects were made as part of the 2009 Work Program submission for the consideration of the 57th Meeting of the ExCom.

3. At the 57th Meeting of the ExCom, project preparation funds for three demonstration projects for China, and two pilot ODS disposal projects for Indonesia and the Philippines, were approved. The proposed pilot ODS disposal project for Mexico was subsequently approved at the 58th Meeting of the ExCom.

4. With regard to the proposed global study on resource mobilization to maximize climate benefits from HCFC phase-out, the ExCom decided that the activity should be maintained in the World Bank 2009 – 2001 Business Plan. The funding request to prepare this study as presented in the 2009 Work Program was not approved at the 57th Meeting as this proposal should be considered along with the on-going analysis of the Multilateral Fund Secretariat on the facility for additional income from loans and other sources. The funding request for this activity was resubmitted for the ExCom's consideration at the 58th Meeting of the ExCom. Since the ExCom's deliberation on the new funding facility is still on-going, the consideration on the proposed global study on resource mobilization was deferred. Therefore, the Bank is resubmitting this request as part of its 2009 Work Program Amendment for the consideration of the 59th ExCom Meeting.

5. This World Bank 2009 Work Program Amendment proposes funding requests to support the following activities: (i) project preparation funds for development of an air-conditioning sector plan for the Philippines; and (ii) preparation funds for conducting the global study on resource mobilization.

6. Descriptions of four work program activities are included in Table 1.

Table 1: Project Preparation Funding Requests Submitted for Consideration of the 59th Meeting of the Executive Committee

Country	Request (US$)	Duration	Description
Philippines	65,000	January –	Development of a phase-out plan for the air-conditioning sector

		December 2010	and any other sectors to be identified by the HPMP preparation.
Global	250,000	January – December 2010	Resource Mobilization for HCFC Phase-out Co-benefits (Concept Note and cost breakdown included in Annex I)
Support Cost	23,625		
Total	**338,625**		

Annex I
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 uses.

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, in comparison with the 2 billion tons of CO2-equivalent to be achieved under the first commitment period of the Kyoto Protocol.[2]

However, phasing out of these potent ODS has resulted in increasing demand for several high global warming gases, including gases regulated under the Kyoto Protocol.[3] For example, the demand for HFC-134a, 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 a 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

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[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.

recognized that selection of alternative technologies for HCFCs should take into consideration climate impact and benefits. However, the accelerated phase-out of HCFCs could result in an unintentional growth of HFC demand as 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 systematically 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 are primarily used to replace 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 instruments to leverage funding for technology transfer in developing countries.[8] Elements from both conventions can therefore be analyzed and compared to preempt an increase in the demand for HFCs or high GWP gases.

OBJECTIVES

The objective of this study is to explore options for preempting an increase in the demand for 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 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 chemicals; however, it recognizes that actions to reduce indirect emissions, such as energy efficiency improvement, can have a significantly higher impact than focusing strictly on chemical use.[9] Therefore, the proposed study will also addresse technologies limitations and the 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 of all developing country Parties in 2006, mainly HCFC-141b, HCFC-142b, and HCFC-22, is approximately 352,000 MT. Consumption of other HCFCs (for example, HCFC-123) represents only a small fraction of the HCFC

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

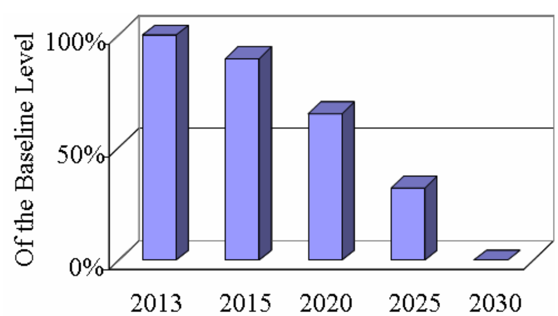
consumption of most developing countries. It is expected that consumption of HCFCs would continue to grow if there were no Montreal Protocol obligations, as demand for refrigeration and air-conditioning, and better insulation in developing countries is growing at a rapid pace. Based on the aggregate HCFCs consumption trends of developing countries in previous years, a growth rate of 9-10% per annum could be expected. By applying a 9% growth rate to the demand for each type of HCFCs, the total demand for HCFCs in developing countries could reach a level of as much as 2.78 million tons in 2030. The breakdown of projected HCFC demand in 2030 is shown in Table 1.

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

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

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

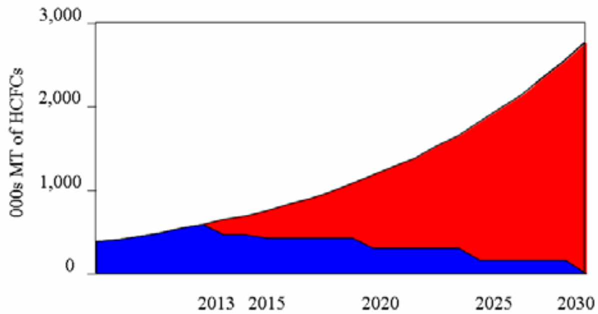


With the accelerated HCFC phase-out schedule of the Montreal Protocol, a total HCFC consumption of 21 million MT could be avoided during the period 2013-2030.[10] This avoided consumption would result in early introduction of alternatives. Climate impacts

[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.

or benefits are, therefore, dependent on the choices of alternatives to be adopted by Parties to the Montreal Protocol.

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.

[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

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.

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

[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.

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 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 58th Meeting in July 2009. The study will then take about 12 months to complete. The final report of the study will be submitted to the ExCom at its 62nd Meeting in November 2010.

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.

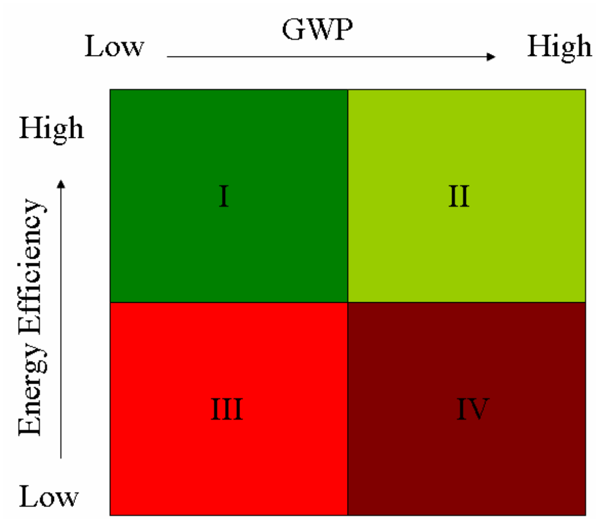


Fig. 3 Characteristics of Non-HCFC Alternatives

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**