الأمم المتحدة

EP

برنامج الأمم المتحدة للبيئة

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**اللجنـة التنفيـذيـــة للصنـدوق المـتعـدد الأطـراف**
**لتنفيـــذ بروتوكـول مونتريـال**
**الاجتمـــاع التاسـع و الخمســون**
مينـاء غـالب ، مصر، 10-14 نوفمبر/ تشرين الثاني 2009

# التعديلات على برنـــامج عمـــل البنـــك الدولـــي

# لعام 2009

## تعليقات وتوصيات أمانة الصندوق

1 يطلب البنك الدولي موافقة اللجنة التنفيذية على مبلغ 315 000 دولار أمريكي للتعديلات على برنامج عمله لعام 2009 بالإضافة إلى تكاليف دعم الوكالة البالغة 23 625 دولارا أمريكيا.

2 وترد النشاطات المقترحة في تعديلات البنك الدولي على برنامج عمله في الجدول 1 أدناه:

الجدول 1: التعديلات على برنامج عمل البنك الدولي

| البلد | النشاط/ المشروع | المبلغ المطلوب (بالدولارات الأمريكية) | المبلغ الموصي به (بالدولارات الأمريكية) |
|---|---|---|---|
| **القسم ألف: النشاطات الموصى بها للموافقة الشاملة** | | | |
| **ألف-1 الإعداد لمشروع خطة لإدارة إزالة المواد الهيدروكلوروفلوروكربونية (العنصر الاستثماري)** | | | |
| الفلبين | الإعداد للأنشطة الاستثمارية في قطاع تكييف الهواء | 65 000 | 65 000 |
| | المجموع الفرعي للقسم ألف-1 | 65 000 | 65 000 |
| **القسم باء: النشاطات الموصى بالنظر فيها بصورة إفرادية** | | | |
| **باء-1 المساعدة التقنية:** | | | |
| عالمي | تعبئة الموارد لمعالجة المنافع المناخية المشتركة من إزالة المواد الهيدروكلوروفلوروكربونية | 250 000 | * |
| | المجموع الفرعي للقسم باء-1 | 250 000 | |
| مجموع القسمين ألف وباء | | 315 000 | 65 000 |
| تكاليف دعم الوكالة (7,5 في المائة لإعداد المشروعات والتعزيز المؤسسي والنشاطات الأخرى التي تزيد عن 250 000 دولار أمريكي، و9 في المائة للنشاطات الأخرى التي تقل عن 250 000 دولار أمريكي. | | 23 625 | 4 875 |
| المجموع: | | 338 625 | 69 875 |

*مشروع للنظر فيه بصورة إفرادية أو منتظر

## القسم ألف: النشاطات الموصي بها للموافقة الشاملة

### ألف-1 مشروع لتمويل الإعداد:

الفلبين: إعداد مشروعات للاستثمار في خطة إدارة إزالة المواد الهيدروكلوروفلوروكربونية (قطاع تبريد الهواء بالمنازل): 000 65 دولار أمريكي.

### وصف المشروع

3 طلب البنك الدولي مبالغ إضافية لإعداد أنشطة الاستثمار بالنيابة عن حكومة الفلبين التي تمت الموافقة على تمويل إعداد خطة إدارة إزالة المواد الهيدروكلوروفلوروكربونية بها في الاجتماع الخامس والخمسين بواقع 195.000 دولار أمريكي. وقدم البنك الدولي في طلبه معلومات عن استهلاك البلد من المواد الهيدروكلوروفلوروكربونية والقطاع الذي يلتمس تمويل الإعداد للاستثمار فيه على وجه التحديد. وقدم أيضا معلومات عن الكيفية التي سيتم بها ربط هذه الخطة القطاعية بخطة شاملة لإدارة إزالة المواد الهيدروكلوروفلوروكربونية نظرا لوجود وكالات متعددة تعمل في مختلف القطاعات في هذا البلد.

**تعليقات الأمانة**

4 استعرضت الأمانة طلب البنك الدولي بالتفصيل ولاحظت أن هذا النشاط غير مدرج في خطة أعمال البنك الدولي لعام 2009 التي تمت الموافقة عليها في الاجتماع السابع والخمسين. وطلبت إيضاحا بشأن هذه المسألة، وأبلِغت بأن هذا طلب خاص من البلد بما أنه غير مستحق لأكثر من 000 200 دولار أمريكي لإعداد المشروعات للعنصر الاستثماري من خطة إدارة إزالة المواد الهيدروكلوروفلوروكربونية ، تمشيا مع المقرر 16/56 واستنادا إلى استهلاك الفلبين البالغ 180,2 من قدرات استنفاد الأوزون في عام 2007. ولاحظت الأمانة في استعراضها أنه يجري طلب مبالغ مماثلة لقطاع الرغاوي ولقطاع التبريد (فيما عدا تكييف الهواء بالمنازل)، وأن المبلغ الإجمالي المطلوب يتمشى مع استحقاق البلد بموجب المقرر 16/56. كما لاحظت أن البلد قد تشاور مع الوكالات المختلفة التي تتعاون في عملية إعداد خطة إدارة إزالة المواد الهيدروكلوروفلوروكربونية، وأن ثمة تفاهما واضحا بشأن تقسيم المسؤوليات بالنسبة لكل وكالة. ورأت الأمانة أيضا أنه رغم عدم إدراج هذا الطلب في خطة أعمال الوكالة، يمكن أن تنظر فيه اللجنة التنفيذية لعدم وجود أي مسائل متعلقة بالسياسات مقترنة بهذا الطلب ولأنه يتمشى مع المقرر 16/56.

**توصية الأمانة**

5 توصي الأمانة بالموافقة الشمولية على طلب إعداد الأنشطة الاستثمارية لقطاع تكييف الهواء بالمنازل المقترن بخطة إدارة إزالة المواد الهيدروكلوروفلوروكربونية في الفلبين، بقيمة 000 65 دولار أمريكي.

## القسم باء: نشاطات يوصى بالنظر فيها بصورة إفرادية

### باء-1 المساعدة التقنية

عالمي: تعبئة الموارد لإزالة المواد الهيدروكلورفلورو كربونية والمنافع المناخية المشتركة 000 250 دولار أمريكي

**وصف المشروع**

6 قدم البنك الدولي إلى الاجتماعين السابع والخمسين والثامن والخمسين طلبا يتعلق بمشروع لتقديم المساعدة التقنية بغرض تعبئة الموارد لتحقيق أقصى منافع مناخية مشتركة من إزالة المواد الهيدروكلوروفلوركربونية، وذلك بمستوى تمويل قدره 000 250 دولار أمريكي. ويعيد البنك الدولي تقديم هذا الطلب للنظر فيه في هذا الاجتماع. ويتضمن المشروع مذكرة مفاهيم تصف الأهداف والنشاطات فضلا عن النتائج المتوقعة لهذا المشروع. وأعاد البنك الدولي تقديم هذا المقترح بدون أي تغييرات على المقترح المقدم في الاجتماع الثامن والخمسين.

7 ووفقا لما ذكره البنك الدولي، يعتزم المشروع استكشاف الخيارات لاستباق الزيادة في الطلب على المواد الهيدروفلوروكربونية أو أي غازات أخرى ترتفع فيها إمكانية إحداث الاحترار العالمي في قطاع الاستهلاك نتيجة لإزالة المواد الهيدروكلوروفلوروكربونية في البلدان النامية. وسوف تستعرض الدراسة وتفحص الآليات المحتملة المتوافرة لتمويل الانتقال إلى البدائل التي تنخفض فيها إمكانية إحداث الاحترار العالمي، بما في ذلك تحديد جدول زمني لإجراء خفض تدريجي في المواد الهيدروفلوروكربونية في البلدان النامية والبلدان التي تمر اقتصاداتها بمرحلة انتقال. كما سيتناول المشروع قيود التكنولوجيا، وعملية المبادلة بين المكاسب المتحققة في كفاءة الطاقة والغازات التي تنخفض فيها إمكانية إحداث الاحترار العالمي لزيادة المزايا في مجال الطاقة بصفة عامة إلى أقصى حد.

8 وسوف تفحص الدراسة (1) التكاليف والمعوقات المرتبطة بتحويل تكنولوجيا المواد الهيدروكلوروفلوروكربونية إلى بدائل تنخفض معها إمكانية إحداث الاحترار العالمي؛ (2) حجم المواد الهيدروفلوروكربونية والبدائل الأخرى من حيث معادلها من ثاني أكسيد الكربون المرتبط باستهلاك وإنتاج المواد الهيدروكلوروفلوروكربونية في البلدان النامية، بما في ذلك المنتجات الفرعية للعمليات الكيميائية الأخرى؛ (3)

مصادر التمويل المحتملة (أي الصندوق المتعدد الأطراف واتفاقية الأمم المتحدة الإطارية لتغير المناخ، وسوق الكربون المتداول، وصناديق شراكة الكربون، وصندوق التكنولوجيا النظيفة وغير ذلك) لدعم تطبيق الممارسة الأفضل لاحتواء المواد الهيدروكلوروفلوروكربونية، والتكنولوجيات غير الضارة بالمناخ. كما ستقدم توصية لتمويل بعض الأساليب مثل النهج الخاصة بتقييم وتحديد خط أساس استهلاك وإنتاج المواد الهيدروفلوروكربونية، وجدولة خفضها. وعلاوة على ذلك، سيبحث المشروع الطرائق الفعالة لتنفيذ هذه النشاطات لضمان التآزر بين النشاطات الممولة في إطار الصندوق المتعدد الأطراف وتلك التي يمكن تمويلها من مصادر التمويل الأخرى.

9 ويشير البنك الدولي إلى أنه سوف يعد أولا شروطا مفصلة للتكليف بهذه الدراسة تمهيدا لتقديمها إلى اللجنة التنفيذية للنظر فيها بعد اتخاذ قرار بشأن تعبئة الموارد. وستستخدم شروط التكليف أساسا لهذه الدراسة التي يلتمس تمويلها، وسوف يستغرق الانتهاء منها نحو 12 شهرا. وسوف يقدم التقرير النهائي للدراسة إلى اللجنة التنفيذية فور الانتهاء منه.

10 ويقدم الجدول التالي تفاصيل مبلغ الـ 250 000 دولار أمريكي الذي طلبه البنك الدولي:

| العنصر | الوصف | دولار أمريكي |
|---|---|---|
| الحجم المحتمل لخفض الانبعاثات المعادلة لثاني أكسيد الكربون | استعراض الاستخدامات الحالية للمواد الهيدروكلوروفلوروكربونية والبدائل المتاحة من غير هذه المواد، وتحليل السوق بشأن تغلغل مختلف البدائل (المرتفعة والمنخفضة في إمكانية إحداث الاحترار العالمي)، وتقديرات المنافع العائدة من تحسين أداء الطاقة (مع مراعاة العمل الجاري في إطار لجنة خبراء التقييم التقني والاقتصادي، وفريق موارد عمليات الأوزون) | 35 000 |
| المعوقات المرتبطة بتحويل تكنولوجيا المواد الهيدروكلوروفلوروكربونية بخط الأساس للطاقة وكفاءة الموارد إلى بدائل منخفضة في إمكانية إحداث الاحترار الاعلمي مع تحسين كفاءة الطاقة والموارد | استقصاء صناعي في عدد مختار من بلدان المادة 5 والمادة 2 التي هي من البلدان الموردة الرئيسية للتكنولوجيا لكل استخدام من استخدامات المواد الهيدروكلوروفلوروكربونية | 50 000 |
| استهلاك وإنتاج المواد الهيدروكلوروفلوروكربونية | استقصاء صناعي يركز على منتجي المواد الكيميائية في كل من بلدان المادة 5 والبلدان غير العاملة بالمادة 5؛ تحليل السوق للتنبؤ بالاتجاهات | 10 000 |
| موارد التمويل المحتملة | استعراض النشاطات أو المشروعات الحالية الممولة من مختلف آليات التمويل؛ استعراض منهجيات آلية التنمية النظيفة وغير الخاصة بهذه الآلية؛ إجراء مقابلات مع المنتفعين المحتملين في بلدان المادة 5؛ تحديد المصادر المحتملة للتمويل؛ وضع نهج ونموذج مشروع لضمان هذه الموارد. | 55 000 |
| وضع معايير/ مواصفات/ منهجيات للتمويل | إعداد أدوات لتوفير موارد التمويل المشترك من خارج الصندوق المتعدد الأطراف | 70 000 |
| عقد اجتماعات تشاورية مع أصحاب المصلحة | 3 اجتماعات تشاورية | 30 000 |
| **المجموع** | | **250 000** |

**تعليقات الأمانة**

11 تقدم الفقرة 11(ب) من المقرر 6/XIX الصادر عن الاجتماع التاسع عشر للأطراف توجيها للجنة التنفيذية لإسناد الأولوية، ضمن جملة أمور، لـ"توخي بدائل ومواد استعاضة تقلل من الآثار الأخرى على البيئة، بما في ذلك على المناخ، مع مراعاة احتمالات الاحترار العالمي واستخدام الطاقة وسائر العوامل الأخرى ذات الصلة"، لدى النظر في مشروعات إزالة المواد الهيدروكلوروفلوروكربونية. ووافقت اللجنة التنفيذية خلال اجتماعها الرابع والخمسين على مجموعة من المبادئ التوجيهية لإعداد خطط إدارة إزالة المواد الهيدروكلوروفلوروكربونية، ووافقت خلال اجتماعيها الخامس والخمسين والسادس والخمسين على مبالغ لعدد 115 بلدا لإعداد خطط إدارة إزالة المواد

الهيدروكلوروفلوروكربونية. وتتضمن المبادئ التوجيهية التي ووفق عليها في المقرر 39/54 ترتيبا لبلدان المادة 5 للنظر في الحوافز المالية وفرص التمويل المشترك في خططها النهائية الخاصة بإدارة إزالة المواد الهيدروكلوروفلوروكربونية، وهو ترتيب يمكن أن يفيد في ضمان أن تسفر عملية إزالة هذه المواد عن منافع وفقا لما جاء في الفقرة 11 (ب) من المقرر 6/XIX على النحو المشار إليه أعلاه.

12 وتلاحظ الأمانة أيضا أنه عندما تتوافر نتائج الدراسة التي اقترحها البنك الدولي في 2010 أو حتى بعدها، قد لا تساعد هذه النتائج البلدان إلاّ في تقديم التوجيه للوكالات بشأن تنفيذ المرحلة الأولى من خطة إدارة إزالة المواد الهيدروكلوروفلوروكربونية، وفي دراسة خياراتها بشأن التمويل المشترك للتحضير للمرحلة الثانية حسب مقتضى الحال. وعلاوة على ذلك تلاحظ أيضا أنه لايتوافر حتى الآن توجيه من اللجنة التنفيذية بشأن كيفية حساب تكاليف المزايا المناخية من إزالة المواد الهيدروكلوروفلوروكربونية وما إذا كان يمكن اعتبار هذه التكاليف تكاليف إضافية بموجب الصندوق المتعدد الأطراف.

13 وقد ناقشت اللجنة التنفيذية خلال اجتماعها السابع والخمسين إقامة مرفق لإدرار دخل إضافي من القروض وغير ذلك من المصادر (الوثيقة UNEP/OzL.Pro/ExCom/57/64)/ وقررت بموجب المقرر 37/57 أن تقدم الأمانة تحليلا آخر لهذا المرفق للنظر من جانب اللجنة خلال اجتماعها الثامن والخمسين.

14 اتخذت اللجنة التنفيذية في اجتماعها الثامن والخمسين المقرر 37/58، الذي يشمل إرجاء النظر في هذا المقترح ومقترح آخر مماثل إلى اجتماع مقبل. ولذلك لم يناقش هذا المقترح في الاجتماع الثامن والخمسين. وتلاحظ الأمانة أن إعادة تقديم هذا الاقتراح إلى الاجتماع التاسع والخمسين لكي تنظر فيه اللجنة التنفيذية يتمشى مع المناقشات في إطار البند 11 من جدول الأعمال، ورقة مفاهيم لاحقة بشأن مرفق تمويل خاص لدخل إضافي من القروض والمصادر الأخرى. وتلاحظ الأمانة أيضا أن اللجنة التنفيذية في المقرّر 37/58 قبلت أيضا عرض البنك الدولي تقديم بيان بشأن "الآليات، مثل الالتزامات المسبقة، لتناول التمويل الإضافي والجمع بين اعتمادات الصندوق المتعدد الأطراف وتمويل الكربون".

**توصية الأمانة**

15 قد ترغب اللجنة التنفيذية في نظر هذا الاقتراح في ضوء المعلومات المقدمة أعلاه وفي المناقشات الخاصة بالبند 11 من جدول الأعمال، ورقة مفاهيم لاحقة بشأن مرفق تمويل خاص لدخل إضافي من القروض والمصادر الأخرى.

# 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

[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.

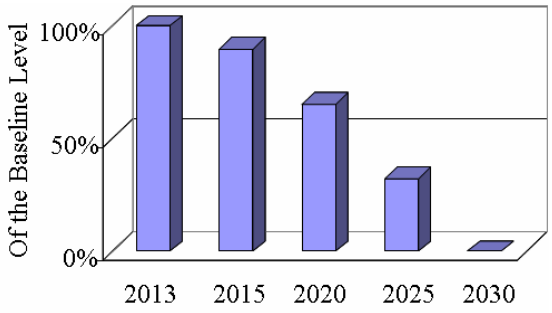
consumption of most developing countries. It is expected that consumption of HCFCs would continue to grow if there were no Montreal Protocol obligations, as demand for refrigeration and air-conditioning, and better insulation in developing countries is growing at a rapid pace. Based on the aggregate 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

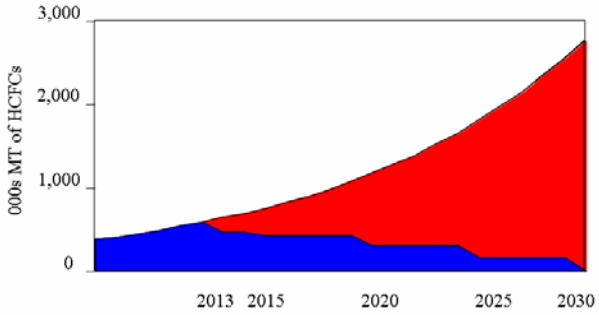



With the accelerated HCFC phase-out schedule of the Montreal Protocol, a total HCFC consumption of 21 million MT could be avoided during the period 2013-2030.[10] This avoided consumption would result in early introduction of alternatives. Climate impacts

[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 58$^{th}$ 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 62$^{nd}$ 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.

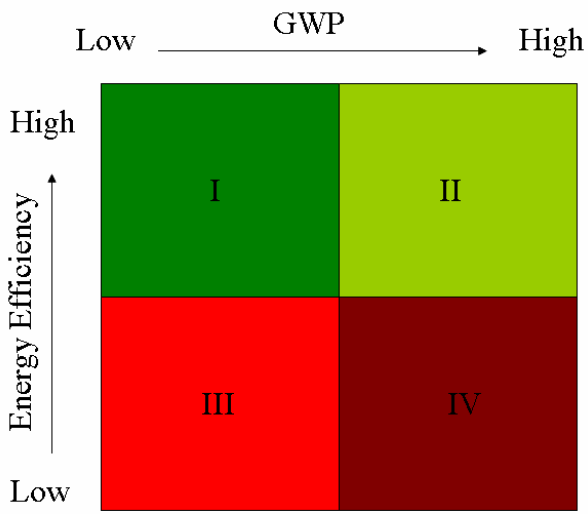



Fig. 3 Characteristics of Non-HCFC Alternatives

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** |