

# EP

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للبيئة



اللجنة التنفيذية للصندوق المتعدد الأطراف  
لتنفيذ بروتوكول مونتريال  
الاجتماع السادس والسبعون  
مونتريال، 9 - 13 مايو/أيار 2016

## مقترح مشروع: مصر

تتألف هذه الوثيقة من تعليقات أمانة الصندوق وتوصيتها بشأن مقترح المشروع التالي:

### الرغوي

يوئنديبي

- مشروع تدليلي بشأن خيارات منخفضة التكاليف للتحويل إلى تكنولوجيات غير المواد المستنفدة للأوزون في رغوي البولوريثان للمستخدمين الصغار جدا

ورقة تقييم المشروع – مشروعات متعددة السنوات  
مصر

عنوان المشروع	الوكالة الثنائية/المنفذة
(أ) مشروع تدليلي بشأن خيارات منخفضة التكاليف للتحويل إلى تكنولوجيات غير المواد المستنفدة للأوزون في رغاوي البولوريثان للمستخدمين الصغار جدا	يوننديبي

وكالة التنسيق الوطنية:	وكالة الشؤون البيئية، وحدة الأوزون الوطنية
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أحدث البيانات المبلغ عنها بشأن استهلاك المواد المستنفدة للأوزون التي يعالجها المشروع  
ألف: بيانات المادة 7 (بأطنان قدرات استنفاد الأوزون، 2014، في مارس/أذار 2016)

المواد الهيدروكلوروفلوروكربونية	320.3
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باء: البيانات القطاعية للبرنامج القطري (بأطنان قدرات استنفاد الأوزون، 2014، في مارس/أذار 2016)

الهيدروكلوروفلوروكربون-22	174.5
الهيدروكلوروفلوروكربون-123	0
الهيدروكلوروفلوروكربون-141ب	123.1
الهيدروكلوروفلوروكربون-142ب	9.5
الهيدروكلوروفلوروكربون-141ب الموجود في البوليولات المستوردة سابقة الخلط	13.2

استهلاك المواد الهيدروكلوروفلوروكربونية المتبقي المؤهل للتمويل (بأطنان قدرات استنفاد الأوزون)	310.61
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تخصيصات خطة الأعمال في السنة الحالية	التمويل بالدولار الأمريكي	أطنان إزالة قدرات استنفاد الأوزون
(أ)	غير متاح	غير متاحة

عنوان المشروع:	استخدام المواد المستنفدة للأوزون في المؤسسة (بأطنان قدرات استنفاد الأوزون):
استخدام المواد المستنفدة للأوزون التي يتعين إزالتها (بأطنان قدرات استنفاد الأوزون):	غير متاح
المواد المستنفدة للأوزون التي يتعين إدخالها (بأطنان قدرات استنفاد الأوزون):	4.4
مدة المشروع (شهور):	غير متاح
المبلغ المبدئي المطلوب (دولار أمريكي):	12
تكاليف المشروع النهائية (دولار أمريكي):	340,000
التكاليف الرأسمالية الإضافية:	275,000
مخصصات الطوارئ (10 في المائة):	20,000
تكاليف التشغيل الإضافية:	0
مجموع تكاليف المشروع:	295,000
الملكية المحلية (%):	غير متاح
عنصر التصدير (%):	غير متاح
المنحة المطلوبة (دولار أمريكي):	295,000
فعالية التكاليف (دولار أمريكي/كغم):	7.40
تكاليف دعم الوكالة المنفذة (دولار أمريكي):	20,650
مجموع تكاليف المشروع التي يتحملها الصندوق المتعدد الأطراف (دولار أمريكي):	315,650
حالة تمويل الجهة النظيرة (نعم/لا):	لا
مراحل رصد المشروع مشمولة (نعم/لا):	نعم

\* جميع التطبيقات. الاستهلاك في رغاوي الزرش.

توصية الأمانة	النظر فيه بصورة فردية
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## وصف المشروع

### خلفية

1- قدم برنامج الأمم المتحدة الإنمائي، في الاجتماع الخامس والسبعين، مشروعاً تديلياً بشأن خيارات منخفضة التكاليف للتحويل إلى تكنولوجيات غير المواد المستنفدة للأوزون في رغاوي البولوريثان للمستخدمين الصغار جداً، بمبلغ 340 000 دولار أمريكي، زائد تكاليف دعم الوكالة البالغة 23 800 دولار أمريكي كما قدم أصلاً<sup>1</sup> وبعد مناقشة في فريق اتصال أنشئ للنظر في جميع المشروعات المنفذة للتدليل على التكنولوجيات منخفضة إمكانية الاحترار العالمي المقدمة إلى الاجتماع الخامس والسبعين، قررت اللجنة التنفيذية تأجيل النظر في المشروعات التديلية السبعة، بما في ذلك مشروع الرغاوي في مصر، إلى الاجتماع السادس والسبعين (المقرر 42/75).

2- وبالنسبة عن حكومة مصر، أعاد برنامج الأمم المتحدة الإنمائي تقديم المشروع التديلي المذكور أعلاه إلى الاجتماع السادس والسبعين، بمبلغ 340 000 دولار أمريكي، زائد تكاليف دعم الوكالة البالغة 23 800 دولار أمريكي.

### أهداف المشروع

3- يشمل قطاع الرغاوي عدداً كبيراً من المستخدمين الصغار جداً الذين يمارسون عمليات الإرغاء اليدوية، مما يثير مشاكل بشأن الصحة والسلامة المهنية المتعلقة بعدم وجود ضوابط بشأن الانبعاثات أو الحماية الشخصية. وعادة ما تقدم المساعدة التقنية في إطار الصندوق المتعدد الأطراف لإزالة الهيدروكلوروفلوروكربون-141ب المستخدم من قبل المستخدمين الصغار جداً بسبب مستويات استهلاكهم المنخفضة جداً من المواد الهيدروكلوروفلوروكربونية (أي 100-200 كغم في السنة). وفي حالة خطة إدارة إزالة المواد الهيدروكلوروفلوروكربونية في مصر، حصلت شركات النظم على تمويل لجملة أمور منها توفير معدات الرغاوي الأساسية التي يمكن أن يستأجرها المستخدمون الصغار جداً لإزالة استهلاكهم من المواد الهيدروكلوروفلوروكربون-141ب. غير أنه لم يقدم أي تمويل للبحث والتطوير للتطبيقات الجديدة في قطاع الرغاوي.

4- ويقترح المشروع التديلي تطوير وحدة منخفضة التكاليف لتوزيع الرغاوي تعمل بكباس هواء لا يعتمد على الطاقة الكهربائية، لتطبيقات الصب في الموقع، أو بدلاً من ذلك، استكشاف الخيارات المتاحة لتقليل تكاليف أجهزة توزيع الرغاوي المتاحة حالياً في السوق والتي يمكن أن يستخدمها المستخدمون الصغار جداً. ويقترح المشروع التديلي أيضاً استكشاف خيار نظم التعبئة المسبقة لرغاوي البولوريثان المغلقة بإحكام، والتي لها عمر افتراضي طويل، ويمكن استخدامها عند الطلب (وهي مستخدمة حالياً في كولومبيا والمكسيك والولايات المتحدة الأمريكية لبعض التطبيقات).

### تنفيذ المشروع

5- يتطلب تطوير وحدة منخفضة التكاليف لتوزيع الرغاوي اختيار جهة تقوم بالاستيراد أو التجميع أو مقدم خدمات لأجهزة توزيع الرغاوي؛ واستعراض المعدات القائمة وتقييم التعديلات المطلوبة؛ وإصدار طلب لتقديم مقترحات لتصنيع جهاز جديد لتوزيع الرغاوي منخفض التكاليف؛ والتحقق من جهاز التوزيع وتحسينه، وتنظيم حلقة عمل لعرض النتائج.

6- ويتطلب تطوير نظم التعبئة المسبقة الكاملة للبولوليولات اختيار شركة نظم على استعداد للمشاركة في المشروع؛ وتقييم النظم المتاحة في مصر ثم بلدان المادة 5 الأخرى التي لديها شركات نظم معنية برغاوي البولوريثان؛ وتركيب مرفق إنتاج محلي في شركة النظم المختارة؛ وإجراء تجارب واختبارات في شركة أو شركتين من شركات الرغاوي؛ وتنظيم حلقة عمل لعرض النتائج.

7- وتم تحديد العديد من موردي المعدات المحتملين وشركات النظم المحتملة لتقديم العروض.

<sup>1</sup> UNEP/OzL.Pro/ExCom/75/45

8- ومن المتوقع إنجاز المشروع في 12 شهرا.

### تكاليف المشروع

9- تقدر التكاليف الإجمالية للمشروع، كما قدمت أصلا، بمبلغ 340 000 دولار أمريكي كما هو موضح في الجدول 1.

### الجدول 1- تكاليف المشروع المقترحة

التكاليف (دولار أمريكي)	الوصف	النشاط
30,000	الخبير المحلي	إدارة المشروع
30,000	الخبير الدولي	
10,000	دورة دراسية تقنية بشأن المعدات	تحديد القدرة المحلية
10,000	دورة دراسية عن الكيمياء	
50,000	تحسين المعدات القائمة	تطوير معدات الإنتاج وإعداد النماذج
50,000	تطوير معدات جديدة	
25,000	تطوير نظم معبأة مسبقا	
20,000	تحسين المعدات القائمة	التحقق/التقييم الميداني
20,000	معدات جديدة	
10,000	نظم معبأة مسبقا	
25,000	مشتركة لجميع النهج الثلاثة	حلقة عمل نشر التكنولوجيا
30,000	تكاليف فحص السلامة واستعراض الأقران والتحضير	استعراض الأقران/استعراض السلامة/التحضير
30,000	(10 في المائة (تم تدوير الرقم)	مخصصات الطوارئ
<b>340,000</b>		<b>المجموع</b>

### تعليقات الأمانة وتوصيتها

#### التعليقات

10- مقارنة بمقترح المشروع المقدم إلى الاجتماع الخامس والسبعين، فإن المقترح المقدم إلى الاجتماع السادس والسبعين يوفر مبررا إضافيا للموافقة على المشروع بموجب المقرر 40/72، والتزاما من حكومة مصر بخصم كمية إضافية من الهيدروكلوروفلوروكربون-141ب من استهلاك المواد الهيدروكلوروفلوروكربونية المتبقي المؤهل للتمويل. ولاحظت الأمانة مع التقدير الجهود التي بذلها برنامج الأمم المتحدة الإنمائي في تصميم مشروع من شأنه أن يوفر مساعدة مباشرة للمستخدمين الصغار جدا في قطاع الرغاوي، بدون تمويل للإعداد من الصندوق المتعدد الأطراف.

11- ولسهولة الرجوع إليه، يرد أدناه ملخص لنتائج المناقشات بين الأمانة وبرنامج الأمم المتحدة الإنمائي بشأن المشروع التبادلي المقدم إلى الاجتماعين الخامس والسبعين والسادس والسبعين:

(أ) فيما يتعلق بالمبرر الإضافي لتقديم هذا المقترح والموافقة عليه، أوضح برنامج الأمم المتحدة الإنمائي أن المشروع سيسهم في الاستخدام الأكثر كفاءة لنظم الرغاوي منخفضة إمكانية الاحترار العالمي (مثل فورمات الميثيل والميثيلال) من خلال تحسين المعدات والنظم، واستهداف المستخدمين الصغار جدا الذين لا يحصلون في كثير من الأحيان على مساعدة مباشرة من الصندوق المتعدد الأطراف. وفي حين أنه لا يمكن ضمان ألا يختار المستخدمون الصغار جدا نظم رغاوي عالية إمكانية الاحترار العالمي، فإن توافر نظم رغاوي منخفضة إمكانية الاحترار العالمي وأرخص سيتيح خيارا أفضل للمستخدمين الصغار جدا؛

- (ب) أوضح برنامج الأمم المتحدة الإنمائي أن جهاز توزيع الرغاوي الجديد سيصمم برؤوس خلط مبسطة وخراطيم أقصر، وكباس مدمج فيه، وبخزانات مرتبطة به للمواد الكيميائية، وبتكلفة إجمالية أقل من 10 000 دولار أمريكي. ولذلك، فإن المشروع لديه القدرة على توفير أجهزة توزيع الرغاوي منخفضة التكلفة للاستخدام في البلدان التي لديها مستخدمين صغار جدا؛
- (ج) فيما يتعلق باختيار المؤسسة التي سيتم فيها تنفيذ المشروع، أوضح برنامج الأمم المتحدة الإنمائي أنه على الرغم من أن بعض المصنعين قد أعربوا بالفعل عن اهتمامهم الأولي بتطوير المعدات، فلا يمكن في الوقت الحالي اختياره المؤسسات نظرا لأن الاختيار سيخضع لعملية تقديم عطاءات؛
- (د) فيما يتعلق بتحسين نظم الرغاوي القائمة، أشار برنامج الأمم المتحدة الإنمائي إلى أنه سيكون محددًا للمستخدمين الصغار جدا الذين لديهم عمليات إرغاء صغيرة وتتطلب كميات قليلة فقط من نظم الرغاوي. وبالتالي فإن المشروع يتوخى تصنيع عبوات مغلقة بإحكام وصغيرة ذات عمر افتراضي يصل إلى سنتين؛ وعند الحاجة، يمكن ثقب العبوات لاستخدامها. ولا تشمل المساعدة المقدمة حاليا لشركات النظم في مصر على إمكانية تطبيق هذه الابتكارات؛
- (هـ) فيما يتعلق بتكاليف المشروع،<sup>2</sup> قام برنامج الأمم المتحدة الإنمائي بتعديل ميزانية المشروع من 340 000 دولار أمريكي إلى 295 000 دولار أمريكي كما هو موضح في الجدول 2.

### الجدول 2- تكاليف المشروع المعدلة

التكاليف (دولار أمريكي)	الوصف	النشاط
30,000	الخبير المحلي	إدارة المشروع
30,000	الخبير الدولي	
7,500	دورة دراسية تقنية بشأن المعدات	تحديد القدرة المحلية
7,500	دورة دراسية عن الكيمياء	
50,000	تحسين المعدات القائمة	تطوير معدات الإنتاج وإعداد النماذج
50,000	تطوير معدات جديدة	
25,000	تطوير نظم معبأة مسبقا	
20,000	تحسين المعدات القائمة	التحقق/التقييم الميداني
20,000	معدات جديدة	
10,000	نظم معبأة مسبقا	
0	مشتركة لجميع النهج الثلاثة	حلقة عمل نشر التكنولوجيا
25,000	تكاليف فحص السلامة واستعراض الأقران والتحضير	استعراض الأقران/استعراض السلامة/التحضير
20,000	(10 في المائة) (تم تدوير الرقم)	مخصصات الطوارئ
<b>295,000</b>		<b>المجموع</b>

12- وكان مقترح المشروع المقدم إلى الاجتماع الخامس والسبعين يشمل إزالة 2.4 طن من قدرات استنفاد الأوزون (22.7 طن متري)، في حين أن الإزالة الواردة في المقترح المقدم إلى الاجتماع السادس والسبعين زادت إلى 4.4 طن من قدرات استنفاد الأوزون (40.0 طن متري) مع التزام الحكومة بخصمها من استهلاك المواد الهيدروكلوروفلوروكربونية المتبقي المؤهل للتمويل في إطار المرحلة الثانية من خطة إدارة إزالة المواد الهيدروكلوروفلوروكربونية في مصر. ويرد مقترح المشروع، بصيغته المعدلة، في المرفق الأول بهذه الوثيقة.

### الخلاصة

13- تلاحظ الأمانة أنه في حين أن تنفيذ هذا المشروع يمكن أن يعود بفائدة على المستخدمين الصغار جدا لنظم الرغاوي من خلال خفض تكاليف أجهزة توزيع الرغاوي وتوفير نظم رغاوي منخفضة إمكانية الاحتراز العالمي

<sup>2</sup> من خلال المقرر 21/74(ج)، طُلب من الوكالات الثنائية والمنفذة ترشيد تكاليف المشروعات التبدلية لإتاحة الفرصة للموافقة على عدد أكبر من المشروعات التبدلية في إطار التمويل المتاح والبالغ 10 ملايين دولار أمريكي، بما يتماشى مع المقرر 40/72. ومواصلة استكشاف مصادر تمويل إضافية. 72/40

ومعبأة مسبقا يمكن أن تستخدم بسهولة عند الحاجة، فإن المقترح لا يثبت بدقة بدائل جديدة منخفضة إمكانية الاحترار العالمي للمواد الهيدروكلوروفلوروكربونية لأنه يستخدم بالفعل تكنولوجيا متاحة تجاريا. وتلاحظ الأمانة أيضا أن برنامج الأمم المتحدة الإنمائي عدل التكاليف الإجمالية للمشروع من 340 000 دولار أمريكي إلى 295 000 دولار أمريكي، وأن الحكومة تلتزم بخصم 4.4 طن من قدرات استنفاد الأوزون من الهيدروكلوروفلوروكربون-141ب من استهلاك مصر المتبقي المؤهل للتمويل خلال النظر في المرحلة الثانية.

## التوصية

14- قد ترغب اللجنة التنفيذية في النظر فيما يلي:

- (أ) المشروع التبدلي بشأن خيارات منخفضة التكاليف للتحويل إلى تكنولوجيات غير المواد المستنفدة للأوزون في رغاوي البولوريثان للمستخدمين الصغار جدا في مصر، في سياق مناقشتها بشأن مقترحات المشروعات التبدلية لبدائل محتملة منخفضة إمكانية الاحترار العالمي للمواد الهيدروكلوروفلوروكربونية كما هو موضح في الوثيقة المعنونة نظرة عامة على القضايا التي تم تبينها أثناء استعراض المشروعات (UNEP/OzL.Pro/ExCom/76/12)؛
- (ب) الموافقة على المشروع التبدلي بشأن خيارات منخفضة التكاليف للتحويل إلى تكنولوجيات غير المواد المستنفدة للأوزون في رغاوي البولوريثان للمستخدمين الصغار جدا في مصر، بمبلغ 295 000 دولار أمريكي، زائد تكاليف دعم الوكالة البالغة 20 650 دولارا أمريكيا لبرنامج الأمم المتحدة الإنمائي، بما يتماشى مع المقرر 40/72؛
- (ج) حث حكومة مصر وبرنامج الأمم المتحدة الإنمائي على إكمال المشروع كما هو مخطط في 12 شهرا وتقديم تقرير نهائي شامل بعد إكمال المشروع مباشرة؛
- (د) خصم 4.40 طن من قدرات استنفاد الأوزون من المواد الهيدروكلوروفلوروكربونية من استهلاك المواد الهيدروكلوروفلوروكربونية المتبقي المؤهل للتمويل في إطار المرحلة الثانية من خطة إدارة إزالة المواد الهيدروكلوروفلوروكربونية في مصر.

**Annex I**

**COUNTRY: Egypt**

**IMPLEMENTING AGENCY: UNDP**

**PROJECT TITLE: Demonstration of Low Cost Options for the Conversion to non-ODS Technologies in PU Foams at Very Small Users (VSUs)**

**PROJECT IN CURRENT BUSINESS PLAN: Based on ExCom Decision 72/40**  
**SECTOR: Foams**  
**Sub-Sector: Rigid and Integral Skin PU Foams**  
**ODS USE IN SECTOR: 227.95 ODP (including 98.34 ODP as polyols)**  
**BASELINE ODS USE: 484.61 ODP**  
**PROJECT IMPACT (ODP targeted): 4.4 ODP (demonstration project)**  
**PROJECT DURATION: 12 months**  
**PROJECT COSTS: US\$ 295,000**  
**LOCAL OWNERSHIP: 100%**  
**EXPORT COMPONENT: n/a**  
**REQUESTED MLF GRANT: US\$ 295,000**  
**IMPLEMENTING AGENCY SUPPORT COST: US\$ 20,650**  
**TOTAL COST OF PROJECT TO MLF: US\$ 315,650**  
**COST-EFFECTIVENESS: 7.4 US\$/kg**  
**PROJECT MONITORING MILESTONES: Included**  
**NTL. COORDINATING AGENCY: Egypt Environmental Affairs Agency (EEAA),  
National Ozone Unit**

## **PROJECT SUMMARY**

The objective of this project is support very small PU users in a cost-effective way by:

- optimizing, validating and disseminating easy to use low cost PU metering equipment and
- introducing pre-packaged systems

While the earmarked technologies will be applicable to VSUs anywhere in the world, the country selected for implementation is Egypt. Egypt is a Party to the Vienna Convention and the Montreal Protocol and ratified the London, Copenhagen and Montreal amendments. The country is fully committed to the phaseout of HCFCs and willing to take the lead in assessing and implementing new HCFC phaseout technologies, particularly in the foam sector—as it did for CFCs in 1992 when it submitted and completed the first foam sector investment projects ever under the MLF. Egypt has local PU system houses that frequently combine importations and distributions for major international chemical and equipment manufacturers with local blending for SMEs. In addition, most international PU chemicals suppliers are represented with offices or their own system houses. Its existing HCFC phaseout program has a section dedicated to VSUs that is in need for the outcome of this demonstration project but will not require additional investment funding. Similar projects in Brazil, Mexico and Nigeria are also in need to address its VSU customers.

### **IMPACT OF PROJECT MONTREAL PROTOCOL OBLIGATIONS RELATED TO VSUs**

This project is a pilot project aimed to optimize PU sector technologies and will contribute indirectly to the fulfillment of Montreal Protocol obligations in any country with a VSU subsector. In Egypt, Mexico and Nigeria this will facilitate existing, approved programs and NOT lead to additional funding—just better implementation because, if successfully validated, the optimized technology will contribute to availability of better and cost-effective phaseout options.

**Prepared by: Bert Veenendaal**

**Date: March, 2016**



**PROJECT OF THE GOVERNMENT OF EGYPT  
DEMONSTRATION OF LOW COST OPTIONS FOR THE CONVERSION TO NON-ODS  
TECHNOLOGIES IN PU FOAMS AT VERY SMALL USERS (VSUs)**

## **1. PROJECT OBJECTIVES AND RATIONALE**

The objectives of this project are to:

- Optimize and validate low cost chemical and equipment options for ODS phaseout at VSUs;
- Demonstrate these in downstream operations;
- Transfer the technology to interested system houses and other users around the world, and
- Use the outcome in existing projects thus, at no additional costs, improving the success of these projects.

## **2. CONTEXT**

### **2.1 MARKETS/APPLICATIONS**

While VSUs are not limited in applications—rather in size—there are typical applications. They are:

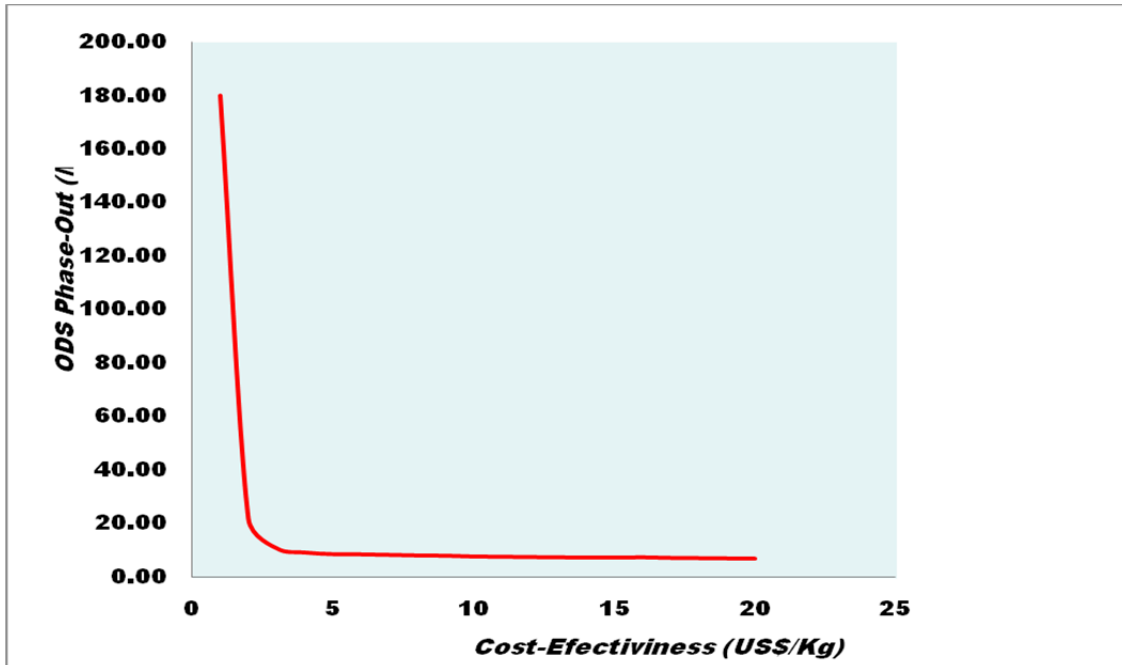
- |                        |  |
|------------------------|--|
| For Rigid PU Foam      | <ul style="list-style-type: none"><li>- boat insulation</li><li>- repair of existing insulation</li><li>- home insulation improvement</li><li>- making disposable molds (mostly in ceramic applications)</li><li>- marine fenders</li><li>- concrete replacement</li></ul> |
| For Integral Skin Foam | <ul style="list-style-type: none"><li>- bicycle saddles</li><li>- safety coatings in exercise equipment</li><li>- fenders</li><li>- furniture parts</li></ul>  |

### **2.2 PREVIOUS WORK WITH VSUs**

MLF projects are since 1993 subject to Cost-Effectiveness (C/E) Thresholds. These thresholds are not taking consumption volumes into account and therefore are frequently difficult to meet by very small users (VSUs). Many VSUs practice hand-mix, an operation deemed an industrial hygienic concern as no emission control or personal protection is used. These companies need low cost/easy to use equipment that meets applicable limits on cost-effectiveness. Others use infrequently PU foams and have problems with inventories in view of the relatively short life time of existing systems (3-6 months).

A first attempt to deal fairly and effectively with small users (SMEs) was a 1995 study by UNDP called "*Determination of Cost-Effective Phaseout Approaches for Enterprises with relatively Small ODS Use*". The Multilateral Fund Secretariat (MFS) prepared, based on this study, Document 17/55 (June 30, 1995) called "Strategy Paper for Small Foam producing Enterprises". It recommended dividing projects by size and foam category; to assign to large and medium sized enterprises specific C/E thresholds and to make the approval of small projects subject to specific cost containment procedures. This would have addressed the issue. However, the study was not accepted at that time and was never transformed into a formal policy. Nevertheless, anybody who reads the document and is familiar with approval procedures will recognize later use of many of the proposed elements.

The cost effectiveness increases exponentially when the consumption decreases as following graph shows:



Following approaches have been tried by UNDP to obtain cost containment when dealing with SMEs:

- Management : Use local experts; work with group projects
- Technology : Evaluate and validate new technologies
- Equipment : Use more retrofit; develop low-cost equipment
- Trials/Tests : Get suppliers involved
- IOCs : Regardless of the technology applied, calculate IOCs based on the lowest cost (validated) technology

The largest success has been creating ODS projects using PU System Houses as project managers. This approach provided not only local project management but also larger economy of scale and supplier-arranged trials/tests.

The validation of new technologies was almost equally successful. UNDP conducted in the foam sector ten (10) demonstration projects to evaluate new—or to modify existing—technologies. Through this program, methyl formate (MF) and methylal (ML)—both oxygenated hydrocarbons or HCOs—are already approved in over 10 countries -- Brazil, Cameroon, Dominican Republic, Egypt, El Salvador, Nigeria, Russia, South Africa and Trinidad-Tobago and in several of these countries by now successfully completed. One system house in Mexico offers successfully preblended hydrocarbons, including smaller users in sprayfoam. While some of the demonstrated technologies suffer under economic constraints, such as high license fees (supercritical CO<sub>2</sub>) or high operating costs (HFOs) the program in general has saved the MLF millions of dollars in project costs.

Attempts to decrease equipment costs had mixed results. UNDP has, as part of CFC as well as HCFC phaseout plans, consistently searched for lower cost equipment as described in detail above. Such attempts had mixed results:

- Retrofit of equipment has significantly decreased costs when using water, MF or ML technologies (Mexico, Dominican Republic, El Salvador);
- Renting out equipment to very small users (VSUs) failed because of frequent mishandling of equipment as well as chemicals (Egypt, Mexico);
- An attempt to import low cost equipment in one country (Colombia) failed because of lack of training and local equipment service;

- An attempt to lower costs of ISF equipment in Mexico was very successful but still is off UNDP's goal and requires further fine-tuning;
- Infrequent use leads to aging issues with chemicals.

### 2.3 PROPOSED EFFORTS RELATED TO THIS DEMONSTRATION PROJECT

a) One issue identified by UNDP was that all Pour-in-Place (PIP) equipment is based on sprayfoam equipment—being relatively low cost equipment and easily fitted for PIP operations. However, such spray-foam equipment has features that are not needed for PIP operations such as:

- High pressure pumps
- Long supply hoses, and misses features such as:
- Built-in compressor
- Two phase electrical hook-up
- Chemical tanks

UNDP therefore looked in the market for equipment that would fit better the purpose of PIP applications. Equipment found suitable—albeit not ideal—was equipment from Pumer/Brazil (see picture below):



**Pumer-1000 DT medium pressure injector**

While this dispenser cuts the current price of a PIP dispenser considerably, it still does not meet several of UNDP's criteria:

- It is still too expensive
- It has medium injection pressure rather than the desired low pressure
- It has no built-in compressor

UNDP has had discussions with the manufacturer and believes that further economizing and adaptation will be possible. Other companies have offered to prepare bids based on UNDP's design criteria which are

- Better efficiency in the use of chemicals;
- Economizing (cost reduction) of existent equipment or
- Developing new, low cost equipment;

- Easy in operation and maintenance
- Ready to use with just a two phase electrical connection.

b) For integral skin equipment a similar program will be based on a previous attempt to economize equipment in Mexico for that particular purpose:



**Low cost ISF Foam Dispenser, developed by Zadro/Mexico**

For this application, different properties are required:

- Variable chemical ratios
- Gear pumps allowing high viscosity
- Heating for chemicals

In addition, in both cases, the issue of local maintenance needs to be addressed. Emphasis will be put on local, sustainable capacity for training and equipment service to ensure the required level of sustainability of results.

c) Another issue is infrequent use of chemicals such as for setting poles for fences, electricity, etc. This application requires small, pre-determined amounts of chemical to set a pole—much like cement but much faster in solidifying. Because of irregular, in field use, users in this application have problems with chemical life time—now typically 3-6 months. A life time of at least one year is desired. UNDP located a US company that manufactures prepackaged chemicals for pole setting applications with a life time of up to 2 years and intends to bring this technology to existing system house in, initially, Egypt but later in any country that has system houses and is interested.

#### **2.4. Estimated Potential Project Impact**

Depending of the stage of development and the size of a country, VSUs' market share in foam applications can range from 5%--such as Egypt—to more than 30%-- such as Nigeria.

Indeed, the Egyptian HPMP mentions that “from available information it has been determined that “Micro Users” (=VSUs) account for 22.3 t HCFC-141b and, assuming an average use of 250 kg/y per company, include up to 100 companies.”

The current demonstration project will contribute to a complementary phase-out of 4.4 ODP tons at VSUs unaccounted in HPMP-I and now being identified as additional VSUs under HPMP-II preparation process.

Other countries such as Brazil, India, Mexico and Nigeria will have much larger VSU sub-sectors and many more VSUs and the outcomes of this demonstration program are essential to ensure smooth HPMP implementation in VSU sector.

The amount of HCFC-141b phase-out that may benefit from this project, or the number of VSUs that would apply the solutions proposed in sections A, B and C of the previous section 2.3 would be very hard to estimate, but may very well amount to over 600 metric tons of HCFC-141b and thousands of VSU enterprises globally.

## **2.5 CHOICE OF HCFC REPLACEMENT TECHNOLOGY**

Foam dispensers in general—but small, low cost ones in particular—are based on blending two reactive components: isocyanate, and polyol blend. The polyol blend includes polyol as main component but also other, minor, components such as blowing agent(s), stabilizer, catalysts etc. When blended, this leads to a controlled blowing and polymerization reaction, resulting in polyurethane foam.

The foam dispenser poses in principle no restriction on the type of blowing agent. This implies that any HCFC replacement can be used. However, there are safety considerations to be taken into account. Based on such considerations, flammable systems have in general been avoided unless special safety features have been incorporated. However, one cannot take the flammability of a pure component to predict the flammability of a blend or mixture. If the blowing agents are water, methyl formate (up to 5.5%), methylal (up to 5%), HFCs or HFOs—or combinations of these—then the blend is non-flammable. If the blend contains hydrocarbons (HCs) then the result is as a rule flammable. Methyl formate and methylal blends, if properly prepared, can thus be treated the same way as water, HFCs and HFOs. As blends are prepared by System Houses these have to take safety precautions when blending the original components.

A new development might change this situation: preblending of HCs at system house level. Up to recently, the normal procedure would be that the end processor had to blend hydrocarbons in-house. UNDP discovered exceptions in the market where the end processor, to save the costly preblending installation, received preblended HC systems (Bayer) or injected HCs directly in the mixing head (Elastogran/BASF). UNDP analyzed both approaches in a previous pilot project in Egypt and concluded that both approaches are feasible and can save costs. One system house in Mexico has taken up this approach and is investigating its use, along with commercial refrigeration and panel applications, in sprayfoam and small injections ("pour-in-place" or PIP) with remarkable good and safe results. The equipment has to be pneumatic or, in case of electric, explosion proof. As this project envisions to include pneumatic equipment, it will therefore include this substance in the HCFC replacement technologies that will be evaluated on the selected equipment.

## **3. PROJECT DESCRIPTION**

The concept of this project is to develop:

- Easy-to-use and maintain low-cost foam dispensing units for PIP Rigid Foam applications that include air compressors and is relying on two phase electrical power;
- Low-cost variable ration foam dispensers for integral skin applications Alternatively, look into lowering the costs of existing low-cost equipment already on the market; and
- For infrequent PU users, make available the option of prepackaging PU systems that are sealed, have a long lifetime and can be used upon demand.

The implementation of the equipment part of the project will be staged as follows:

1. The selection of an importer/installer/service provider – based on an open call bidding via requests for proposals (latter giving better flexibilities with previously untried approaches);
2. Review of existing offerings of low-cost equipment followed by negotiations with selected providers on required modifications and potential cost savings – on modifications it currently roughly estimated to be

below US\$ 10,000 per PIP simplified machine (below US\$ 10,000 for ISF and US\$ 5,000 for RPF machine with modifications in electronics, removal of spray function and less hosing, gun cleansing mechanisms with simplified mixing heads and better local service for sustained operations), but yet to be tested on the actual costs below this target threshold;

3. Selection of equipment to be validated;
4. Purchase and validate the most promising equipment (1-2 different dispensers);
5. Workshop to present the outcome(s).

Interested equipment suppliers that can potentially meet requirements from the project are listed below as prospective bidders to provide such services (selection is subject to universal UN procurement procedures which apply to projects under implementation):

- Pumer	Belo Horizonte	Brazil	RPF only
- Cannon	Milano	Italy	ISF and RPF
- Zadro	Guadalajara	Mexico	ISF only
- Tec Mac	Milano	Italy	ISF and RPF
- FSI	St. Louis	USA	RPF only

The implementation of the chemical part of the project is envisioned as follows:

1. Selection of a system house willing to cooperate on this approach;
2. Identification of existing prepackaged systems with stable storage life-time/easy component perforation when in need for field application. One making these is “Foam Supplies, Inc. (FSI) in the USA but there might be more companies on the global market. Evaluate this technology at the selected system house;
3. If successful, install a local component facility and/or assembly facility;
4. Conduct trials/tests to assure that the equipment is suitable for the earmarked ODS phaseout technologies;
5. Include the outcome in the mentioned workshop in technology section.

VSUs currently use the — unprotected — hand-mix approach, opening and blending from containers delivered by system houses and mixing these with a stick or electrical mixer. The main issue is, of course, the unprotected use of PU chemicals, but also the issue of lifetime of the chemicals is important. Systems normally have a lifetime of 3-6 months and VSUs frequently exceed this. In addition, they do not properly protect chemicals from humidity, thus further lowering life time.

The project foresees the manufacture of small, properly sealed packages that, when needed, are punctured and used. This avoids exposure to emission and skin. That is not the case with current smaller system houses’ deliveries in, 200 l drums. Previous experience taught that local, knowledgeable service and availability of spare parts are essential to success. Therefore, the consideration for local production/assembly of selected equipment is essential. Likewise, prepackaged systems have only a chance in the market when produced and marketed —or at least backed-up—by a local system house.

While the project includes trials/tests, these will be conducted to the extent possible at system house development facilities and with one or two selected customers. Industrialization should take place through National Phaseout Plans.

It should be noted that these plans for Egypt and Mexico have already funds dedicated to VSUs. More specifically, it should be emphasized that the results of this pilot project will be immediately applicable in already approved VSU projects in Mexico, Brazil, Egypt and Nigeria without rising costs to MLF (currently designed approach of renting equipment to VSUs does not work), as well as in future such programmes in other countries, as such optimized equipment can be then purchased from ready developer at lower cost.

In summary, a successful cost reduction program requires following features:

- An effective local commercial operation providing importation, sales as well as after sales support;



### MILESTONES FOR PROJECT MONITORING

TASK	MONTH*
(a) Receipt of funds	2
(b) Project document signatures	3
(c) Bids prepared and requested	5
(d) Contracts Awarded	6
(e) Equipment Delivered	8
(f) Training Testing and Trial Runs	10
(g) Completion	11
(h) Dissemination/reporting	12

\* As measured from project approval

The project document includes the customary implementation and milestones achievement plan and meets decision 72/40 requirement to be completed in one year. The project will be backed by two missions from assigned international expert during its lifetime of 12 months, and from UNDP MPU office to ensure progress is achieved in accordance with plan of actions.

With the team present on the ground (HPMP team) the daily supervision will be ensured. With respect to the equipment development process, since it being simpler than the three-way injection machine with SAIP in the previous project, it is not seen as a major barrier in delaying the project's outcomes.

## 6. PROJECT JUSTIFICATION

### 6.1 CONFORMANCE WITH APPLICABLE POLICIES

The project is submitted in response to ExCom Decision 72/40. The relevant part of this decision states as follows, and the way UNDP has addressed them are added in **bold**.

*(i) The following criteria would be applied when selecting projects:*

*a. The project offered a significant increase in current know-how in terms of a low-GWP alternative technology, concept or approach or its application and practice in an Article 5 country, representing a significant technological step forward;*

**While the first part of the condition recommends that the demonstration should relate to a low-GWP alternative, the second part of the sentence also allows for “applications and practices representing a significant technological step forward”. This demonstration clearly falls under the latter category as described in paragraphs 2 and 3 above. As mentioned, it will save a significant amount of funds to the MLF by addressing very small users (VSUs).**

**That said, the project will also result in a conversion of HCFCs to low-GWP solutions in VSUs. While in theory, they may shift to HFCs, these alternatives would typically be more expensive than if they were to go to solutions involving low-GWP. It is anticipated in fact that a vast majority of the VSUs – if given the proposed technology solutions of this demonstration – would select water-blown technology, while others may use methyl formate, methylal, HFOs, etc. There would therefore be a positive climate impact, albeit hard to quantify. Having said that, the use of HCs for foams in VSUs is very unlikely due to safety concerns.**



*b. The technology, concept or approach had to be concretely described, linked to other activities in a country and have the potential to be replicated in the medium future in a significant amount of activities in the same sub-sector;*

**Paragraphs 2 and 3 above provide a detailed description of the context and the proposed approach, and linkages to the replication of VSUs in other article-5 countries are provided.**

*c. For conversion projects, an eligible company willing to undertake conversion of the manufacturing process to the new technology had been identified and had indicated whether it was in a position to cease using HCFCs after the conversion;*

**Despite being a demonstration project, certain complementary phase-out is expected. New equipment and systems will be developed with equipment suppliers, to be then used in a system house in Egypt, to ensure proper implementation of the VSU component which otherwise is likely to fail in other similar VSU programmes.**

**That said, section 2.4 above tries to estimate the potential impact that this project may have in Egypt and worldwide, if it succeeds to address the VSU problematic being tackled in this demonstration.**

*d. The project proposals should prioritize the refrigeration and air-conditioning sector, not excluding other sectors;*

**This demonstration falls into the latter category (VSUs in foams). While the first category of project proposals seem to allow to test newer technologies in selected enterprises before these can be replicated elsewhere, the current proposal reaches out to very small users level with low GWP solutions to comprehensively cover PU foam sector from largest to smallest companies. This ensures a full sector coverage which in UNDP view is considered the intended end result of testing new non-ODS/low GWP technologies as in foams so in other sectors.**

*e. They should aim for a relatively short implementation period in order to maximize opportunities for the results to be utilized for activities funded by the Multilateral Fund as part of their stage II HCFC phase-out UNEP/OzL.Pro/ExCom/72/47 36 management plans (HPMPs);*

**Implementation time for this project is considered 12 months as required by the decision 72/40.**

*f. The project proposals should promote energy efficiency improvements, where relevant, and address other environmental impacts;*

**The relevance of this aspect for foam projects may be linked to the insulation value as compared to HCFCs baseline, and incremental improvements could be achieved.**

**The other fact that the use of high-pressure spray foam equipment would be replaced by low-pressure simplified machines may result in some energy savings, but these would be minor and hard to quantify in a short timescale of a demo project. The use of small-packaged systems of chemicals would result in a decrease of chemical waste and unwanted chemical emissions as well.**

**While the current window for these projects prefers demonstration projects for the HVAC sector, it does clearly not exclude other sectors. Therefore UNDP requests to consider this project in the foam sector based on:**

- **UNDP's success rate in demonstration projects for this sector that has led to**
  - **Lower project costs (MF, ML, pre-blended/direct injected HCs with low GWPs)**
  - **New or modified ODS phaseout technologies that decrease cost thresholds**
- **Despite of past successes, there is still need to find solutions for very small users (VSUs);**

- **There is a need to redirect funds already approved and earmarked for VSUs that were based on approaches that proved untenable such as the provision of rental of equipment through system houses – this will help spread the existing low GWP technologies in this sector to a wider clientele to ensure more comprehensive uptake of these on national levels.**

**The projects includes some elements that could be seen as project preparation but most of that preparation—i.e. the basic outline of requirements for systems as well as equipment—has been finalized and the submittal of just a project preparation request would delay the eventual outcome unnecessary.**

**The project further cannot be seen as resulting in HCFC reduction targets being not associated with direct phase-out at any recipient system house, but is more geared towards optimization of general costs of equipment and preparing easy-to-use formulations for VSUs to assist in implementation of already approved VSUs sub-projects in the mentioned countries, as well as in future programmes of this type elsewhere.**

## **6.2 SELECTION OF IMPLEMENTATION LOCATION**

Egypt has been selected for this project because it has in its HPMP a sub-project for VSUs using rental equipment for very small users. After this approach has shown in Mexico to be untenable (rental equipment is damaged by inappropriate use, despite provision of application instructions; chemical are not cleaned out, causing clogging....), UNDP plans to redirect the funds to a low equipment cost approach. However, such an approach needs a proper and comprehensive study.

Several potential importers/service providers have already been located—which will speed up the implementation. For the systems, a system house that is willing to cooperate has also been identified.

Finally, overall, provided accumulated experience with the low cost HC technology optimization via three-way injection and preparation of pre-blended HC polyols in Egypt, the main technology report was submitted expediently (decision 66/15 approved it) for consideration of the Executive Committee where this technology further recommended for replication. Follow-on political changes in the country did not allow to make a complementary investigation study on density optimization at UNDP's initiative; which is now complete and complementary report was submitted to the Executive Committee at its 75<sup>th</sup> meeting (decision 75/21). Nonetheless, with the restoration of stable situation end of 2014, UNDP is confident that the current demonstration project is implementable, aided by the fact that less complex equipment, compared to the low cost HCs, is in focus of the current project.

## **7. RISKS AND BARRIERS**

There have already been several successful attempts to address the needs of SMEs. This has led to adjustment in approaches (group projects around system houses, alternative, more affordable technologies). No approach, however, has been successful with VSUs. While this approach addresses past shortcomings such as local service, it is an uncharted way and therefore success is not secure. However, UNDP has shown in other demonstration projects that by and large, success of its approaches in more likely than not.

A potential barrier is the attitude of VSUs. For these companies, PU foam is often a very small part of their production—even a necessary evil—and changes do not always get the required attention and dedication. Working with local system house of distributors—very small users frequently do not buy directly—can reduce this barrier. Users are always considered a barrier for any project's successful implementation—in terms of not inclined to change, lacking financial means, not looking for additional work, etc. VSUs are not different. MLF-financed projects are designed to counter that attitude with a mixture of Government regulations, technical support and financial assistance. This is the case with MF, ML and low-cost HCs programmes.

VSUs are included in foam sector plans in programmes such as Mexico, Egypt, Nigeria and other countries, and the outcomes of this proposed project will help address HCFC consumption in such approved and future funded foam

sector plans here in the former group there are now challenges discovered with the rental of equipment to VSUs as described in the current project document. This sector was accepted as eligible by the MLF Secretariat and then by the Executive Committee in approving such sector plans, and it needs, based on current HPMP implementation experience, a better approach from the chemical and equipment side, as proposed in this project.

If no remedies are obtained such as being proposed in this project, the situation in current sector plans will be left unaddressed with resulting non-compliance prospects.

## **8. REPORTING**

A final report can be expected 12 months after project approval. Interim reporting will follow existing reporting guidelines.