



**Programme des
Nations Unies pour
l'environnement**



Distr.
GÉNÉRALE

UNEP/OzL.Pro/ExCom/84/63
27 novembre 2019

FRANÇAIS
ORIGINAL: ANGLAIS

COMITÉ EXÉCUTIF
DU FONDS MULTILATÉRAL AUX FINS
D'APPLICATION DU PROTOCOLE DE MONTRÉAL
Quatre-vingt-quatrième réunion
Montréal, 16 – 20 décembre 2019

**RAPPORT SUR LES PROGRAMMES D'ENCOURAGEMENT DESTINÉS AUX
UTILISATEURS FINANCÉS AU TITRE DES PLANS DE GESTION
DE L'ÉLIMINATION DES HCFC (DÉCISION 82/54)**

Contexte

1. Le Comité exécutif à ses 80^e et 81^e réunions a soulevé des points relativement aux programmes d'encouragement destinés aux utilisateurs qui visent à favoriser la reconversion des appareils de réfrigération et de climatisation à des technologies de remplacement des HCFC, projets inclus dans plusieurs demandes de tranche de financement au titre des plans de gestion de l'élimination des HCFC (PGEH). Ces préoccupations concernaient notamment le manque de détermination des gouvernements et utilisateurs finaux pour ce qui est de donner leur appui à l'adoption des technologies de remplacement à faible potentiel de réchauffement de la planète (PRP) choisies, les lacunes sur le plan du cofinancement nécessaire pour payer les reconversions, le manque de formation associée aux reconversions, et le faible niveau de viabilité. Le Comité a ultérieurement approuvé les tranches de financement, notamment aux conditions suivantes : offrir, entre autres, une formation adéquate aux techniciens en entretien de manière à renforcer la viabilité des programmes d'encouragement destinés aux utilisateurs, prendre les mesures voulues pour que les utilisateurs finaux assurent un cofinancement pour participer aux programmes.

2. Le Comité à sa 82^e réunion, à la demande d'un membre, a retiré de la liste des projets pour approbation globale des demandes de tranche au titre de PGEH qui connaissaient des problèmes en rapport avec les programmes d'encouragement. À l'issue d'une discussion à ce sujet, le Comité a prié le Secrétariat :

- a) De compiler des informations sur les programmes d'encouragement destinés aux utilisateurs (aussi appelés, entre autres, projets de démonstration, projets pilotes, programmes d'encouragement et autres) financés au titre des PGEH;

- b) De remettre un rapport comprenant :
 - i) De l'information sur les activités approuvées, telles que les quantités à éliminer, le financement, le cofinancement à fournir, le nombre de bénéficiaires, le secteur et l'assistance technique connexe;
 - ii) L'état des programmes, y compris des informations sur les retards, s'il y a lieu; et
 - iii) Les décisions du Comité exécutif d'intérêt pour la reconversion des utilisateurs, car elles ont rapport aux programmes d'encouragement des utilisateurs approuvés dans le cadre des PGEH (décision 82/54).

Portée du document

3. Suite à la décision 82/54, le Secrétariat a préparé le présent document qui comporte trois parties et une recommandation :

- a) Décisions du Comité exécutif se rapportant aux reconversions des utilisateurs finaux;
- b) Renseignements sur les activités approuvées relatives aux utilisateurs finaux, y compris les quantités à éliminer, le financement, le cofinancement à fournir, le nombre de bénéficiaires, le secteur et l'assistance technique connexe, ainsi que l'état des programmes, dont l'information sur les retards;
- c) Observations du Secrétariat;
- d) Recommandation.

4. Le document renferme par ailleurs les deux annexes suivantes :

- Annexe I Données fournies par les agences bilatérales et les agences d'exécution, par pays
- Annexe II Récapitulation des politiques du Fonds multilatéral concernant les activités des utilisateurs finaux

Méthodologie employée pour la collecte des données

5. En vue de la préparation du présent document, le Secrétariat a effectué une analyse détaillée de toutes les phases I et II de PGEH des pays visés à l'article 5 approuvées jusqu'ici, et de tous les rapports périodiques et plans de mise en œuvre de tranche qui ont été examinés par le Comité exécutif. Cela a permis au Secrétariat de relever 66 activités menées au titre des programmes d'encouragement destinés aux utilisateurs.

6. Comme l'information sur ces programmes n'avait pas été communiquée de manière systématique, le Secrétariat a préparé un document modèle renfermant les éléments demandés dans la décision 82/54 b) i) (c.-à-d., objectif et description du projet; quantités à éliminer; financement du Fonds et cofinancement à fournir par les utilisateurs; nombre de bénéficiaires, secteur et assistance technique associée), qu'elle a distribué. La question a été soulevée lors de la réunion de coordination interagences¹ et les agences bilatérales et les agences d'exécution ont pu fournir des renseignements supplémentaires sur la mise en œuvre des projets des utilisateurs finaux.

¹ Montréal, 9-11 octobre 2019.

7. Les agences bilatérales et d'exécution ont ensuite fourni des détails qui figurent à l'annexe I du présent document. Le Secrétariat s'est réjoui de ces contributions, qui constituent le fondement de l'analyse contenue dans le présent document.

Décisions du Comité exécutif sur les reconversions des utilisateurs finaux

8. Étant donné que plusieurs des substances réglementées au titre du Protocole de Montréal sont utilisées par tous les pays pour l'entretien des appareils de réfrigération et de climatisation, le Comité exécutif a prêté une attention particulière aux activités relatives à ce secteur depuis la création du Fonds multilatéral.

9. Les questions se rapportant aux programmes d'encouragement destinés aux utilisateurs finaux dans le secteur de l'entretien des appareils de réfrigération, intéressent le Comité depuis sa 26^e réunion, au cours de laquelle il a demandé au Secrétariat, de concert avec les agences d'exécution, une note sur les circonstances dans lesquelles le Comité exécutif pourrait examiner des projets d'adaptation d'appareils de réfrigération commerciale présentés par les pays visés à l'article 5, et sur les méthodes de calcul des surcoûts de tels projets (décision 26/38).

10. Conformément à la décision 26/38, le Comité exécutif a examiné un document sur les circonstances autorisant l'examen des projets d'élimination des SAO dans le secteur de la réfrigération à usage commercial,² à partir desquelles le Comité a adopté les lignes directrices se rapportant aux utilisateurs finaux pour la reconversion dans le secteur de la réfrigération à usage commercial. Ces lignes directrices déterminaient les circonstances qui doivent prévaloir avant que les activités de reconversion des utilisateurs finaux puissent recevoir la priorité, notamment : des mesures de contrôle de la production et des importations de CFC et de matériels à base de CFC sont en place et effectivement appliquées; la majeure partie de la consommation résiduelle de CFC est destinée au secteur de l'entretien des appareils de réfrigération; les données détaillées sur le profil de toutes les consommations résiduelles ont été mises à la disposition du Comité exécutif; et soit aucune autre activité possible ne permettrait au pays de s'acquitter de ses obligations de contrôle des CFC, soit le prix de détail des CFC par rapport aux frigorigènes de remplacement a été élevé pendant une période minimale de neuf mois et on prédit qu'il continuera d'augmenter (décision 28/44).

11. À partir de là, un nombre limité de demandes de financement pour la reconversion des appareils de réfrigération à usage commercial ont été soumises et évaluées au cas par cas, la priorité étant accordée à la reconversion des magasins frigorifiques dans les secteurs de l'agriculture et des pêches et les autres secteurs de chaîne alimentaire importants pour les économies des pays concernés.

12. Le Comité exécutif à sa 31^e réunion a conclu ses débats sur les lignes directrices sur les plans de gestion des frigorigènes, en traitant les besoins des pays à faible volume de consommation (FVC), dont la consommation totale de CFC se situait dans le secteur de l'entretien des appareils de réfrigération (même si des lignes directrices sur les pays qui ne sont pas des pays FVC ont également été fournies); en vertu de la décision 31/48 (sur les plans de gestion des frigorigènes), les pays visés à l'article 5 pourraient inclure des programmes d'incitation à la réadaptation des appareils de réfrigération.

13. Le Comité exécutif à sa 32^e réunion a examiné trois propositions concernant les programmes d'incitation visant à encourager la réadaptation des équipements de réfrigération. Ces propositions utiliseraient la plus grande partie ou la totalité du financement mis à la disposition des pays avec des plans de gestion des frigorigènes déjà approuvés, ne couvriraient pas toutes les entreprises du pays, et n'élimineraient pas suffisamment de substances pour permettre aux pays de respecter leurs obligations en matière de conformité, sans l'appui d'autres mesures. À l'issue d'une discussion, le Comité a décidé que les propositions relatives à des programmes d'incitation visant à encourager la réadaptation des

² UNEP/OzL.Pro/ExCom/28/47

équipements de réfrigération peuvent être soumises dans le cadre d'un PGF, étant entendu que l'agence d'exécution intéressée devra tenir des consultations avec le pays et les autres agences d'exécution responsables de la mise en œuvre des autres volets du PGEH; le pays en question aura pleinement connaissance de l'ensemble des activités d'investissement ou autres qui pourraient être disponibles; et le moment choisi pour réaliser l'activité proposée sera adapté aux circonstances du pays (décision 32/28).

14. Depuis lors, des programmes d'encouragement destinés aux utilisateurs finaux ont été intégrés aux plans nationaux d'élimination des CFC, qui dans de nombreux cas ont aidé à réduire l'utilisation de CFC-12, par l'introduction de mélanges directs ou de R-600a, en particulier pour les appareils de réfrigération domestiques et les petits appareils de réfrigération à usage commercial.

15. Avec l'accélération de l'élimination des HCFC, de nombreux pays visés à l'article 5 ont inclus dans leur PGEH des propositions pour la reconversion des utilisateurs finaux ou le remplacement d'appareils à base de HCFC (surtout des climatiseurs résidentiels) par de l'équipement utilisant des frigorigènes à faible PRP. Lors de la 72^e réunion, le Secrétariat a attiré l'attention du Comité exécutif sur une proposition présentée par un pays visé à l'article 5 qui avait institutionnalisé un programme pour la reconversion de l'équipement à base de HCFC-22 aux frigorigènes à base d'hydrocarbure (HC), où les risques avaient été évalués et gérés et une norme pour l'élaboration et l'utilisation sécuritaire des appareils à base de HC avait été appliquée. À partir de cette proposition, le Comité a décidé d'inclure la disposition suivante dans les tranches de PGEH, les projets ou activités qui proposent la reconversion des appareils à base de HCFC à des frigorigènes inflammables ou toxiques : « lorsqu'un pays s'engage à adapter des équipements de réfrigération et de climatisation à base de HCFC à des frigorigènes inflammables ou toxiques et aux activités d'entretien s'y rapportant, il le fait en étant entendu qu'il assume toutes les responsabilités et tous les risques qui s'y rapportent » (décision 72/17). Cette disposition a été renforcée par l'ajout du texte suivant : « et les reconversions devraient être faites uniquement en conformité avec les protocoles et les normes pertinentes » (décision 73/34).

16. Également lors de sa 72^e réunion, le Comité exécutif a conclu les débats sur la réduction des répercussions nocives sur le climat de l'élimination des HCFC dans le secteur de l'entretien des appareils de réfrigération, à partir des documents préparés par le Secrétariat.³ Le Comité a ainsi encouragé les pays visés à l'article 5 de prendre en considération durant la mise en œuvre de leur PGEH la concentration des activités du secteur de l'entretien dans la réfrigération sur la formation des techniciens, les bonnes pratiques, la manipulation sécuritaire des frigorigènes, le confinement, la récupération, le recyclage et la réutilisation des frigorigènes récupérés plutôt que la conversion (décision 72/41 c)iii).

17. Dans les décisions récentes visant à renforcer les éléments d'incitation fondés sur les circonstances nationales, le Comité exécutif a prié les agences bilatérales et les agences d'exécution de fournir un plan de mise en œuvre détaillé pour les programmes d'encouragement destinés aux utilisateurs, y compris le cofinancement des bénéficiaires, proposé dans la phase II des PGEH, en vue d'optimiser l'efficacité des PGEH (décisions 80/58 h)i) et 82/59 h)(i)).

Renseignements sur les activités relatives aux utilisateurs finaux approuvées

18. À partir d'une analyse des renseignements communiqués par les agences bilatérales et d'exécution, le Secrétariat a noté que 38 des 66 activités relatives aux utilisateurs étaient destinées au départ à la reconversion des appareils à base de HCFC à des frigorigènes inflammables à faible PRP. Toutefois, en raison de plusieurs facteurs à l'échelle du pays, et à la lumière des décisions adoptées par le Comité exécutif, en particulier les décisions 72/17, 72/40 et 73/34, ces activités telles que proposées au départ ont été soit reportées ou remodelées de manière à privilégier d'autres activités dans le secteur de l'entretien des appareils de réfrigération. La plus grande part du financement associé à ces activités a été principalement reconsacrée au renforcement des établissements de formation ou à l'intensification des

³ UNEP/OzL.Pro/ExCom/70/53/Rev.1 et UNEP/OzL.Pro/ExCom/72/42

programmes de formation sur les pratiques exemplaires à l'intention des techniciens en réfrigération. La réaffectation des activités relatives aux utilisateurs finaux figure dans les rapports périodiques sur les tranches correspondants au titre des phases I et II des PGEH.

19. Le tableau 1 ci-après présente l'état d'avancement des activités relatives aux utilisateurs finaux, au moment de la 84^e réunion.

Tableau 1. Récapitulation des activités relatives aux utilisateurs finaux au titre du PGEH approuvé pour les pays visés à l'article 5

Agence	Total	Mises en œuvre	Réorientées
PNUD	19	13	6
PNUE	10	2	8
ONUDI	25	8	17
Banque mondiale	1	-	1
France	1	1	-
Allemagne	10	4	6
Total	66	28	38

20. En ce qui a trait aux 28 activités relatives aux utilisateurs finaux mises en œuvre, le Secrétariat a établi les trois catégories distinctes suivantes :

- a) Programmes d'encouragement destinés aux utilisateurs visant à reconvertir ou remplacer l'équipement à base de HCFC;
- b) Projets de démonstration des technologies de remplacement à l'installation de l'utilisateur;
- c) Programmes de réduction des fuites à l'intention des utilisateurs finaux.

Programmes d'encouragement destinés aux utilisateurs visant à reconvertir ou remplacer l'équipement à base de HCFC

21. Au total, 15 projets sont en cours de mise en œuvre dans le cadre de programmes d'encouragement destinés aux utilisateurs visant à reconvertir ou remplacer l'équipement à base de HCFC. Malgré quelques variations, l'approche principale consiste à reconvertir ou remplacer l'équipement existant à base de HCFC en vue d'utiliser des HFC (principalement du HFC-32) ou des frigorigènes naturels (c.-à-d., R- 290 ou ammoniac). Ces reconversions ou remplacements ont surtout eu lieu chez des utilisateurs finaux privés dans le secteur des climatiseurs de salle, aucun cofinancement n'étant assuré par les bénéficiaires.

22. Dans la plupart de ces projets, le Fonds multilatéral couvre une partie du coût de la reconversion (ou du remplacement), dans une proportion de 25 à 50 %, selon les circonstances propres au pays, aux bénéficiaires et à l'application. Dans un cas, le projet offrait un incitatif préétabli pour le remplacement des appareils à base de HCFC (c.-à-d., de 120 \$US pour un climatiseur de 9 000 BTU/h à 250 \$US pour un climatiseur de 24 000 BTU/h), le solde étant pris en charge par le bénéficiaire. Le tableau 2 récapitule les données provenant des rapports soumis par les agences sur les programmes d'encouragement destinés aux utilisateurs visant à reconvertir ou remplacer l'équipement à base de HCFC.

Tableau 2. Programmes d'encouragement destinés aux utilisateurs visant à reconverter ou remplacer l'équipement à base de HCFC

Pays*	Agence	Sous-secteur/ Application	Technologie de rempla- cement	Coût (SUS)		Reconversions/ remplacements		Élimi- nation des HCFC (tm)	Date d'achèvement
				Approuvé	Cofinan- cement	Prévus	Jusqu'ici		
Bhoutan	PNUD	Climatiseurs de salle/ climatiseurs commerciaux	PRP<675	79 000	7 982	65	15	0,03	18 août
Brunéi Darussalam	PNUD	Climatiseurs de salle/gros climatiseurs	HFC-32/ R-290	33 500	s.o.	35	s.o.	s.o.	20 décembre
Cambodge	PNUD	Climatiseurs de salle	HFC-32 R-290	350 000	s.o.	900	69	0,14	24 décembre
Croatie	ONUDI	Appareils de réfrigération et de climatisation à usage commercial et industriel	HFC/ R- 290/ R-717	360 000	870 000	10	32	2,22	15 décembre
Cuba	PNUD	Appareils de réfrigération et de climatisation à usage commercial	R-404A	350 000	s.o.	500	715	s.o.	20 décembre
Fidji	PNUD	Climatiseurs de salle/pêches	Plusieurs	48 500	s.o.	33	s.o.	s.o.	20 décembre
Ghana**	PNUD	Appareils de réfrigération commerciaux	R-407C	38 000	160 295	13	4	0,46	17 septembre
Madagascar	ONUDI	Climatiseurs de salle	R-290	120 000	s.o.	6	s.o.	s.o.	20 mai
Malaisie	PNUD	Climatiseurs de salle/ climatiseurs commerciaux	Plusieurs	98 000	110 000	4	83	0,20	17 avril
Maldives	PNUD	Climatiseurs de salle/pêches	HFC-32/ R-438A	220 000	369 443	765	150	1,50	20 novembre
Népal	PNUD	Climatiseurs de salle/ Appareils de réfrigération et de climatisation à usage commercial et industriel	HFC-32	36 000	111 607	18	24	0,08	20 décembre
Sri Lanka	PNUD	Climatiseurs de salle	HFC-32	60 866	166 410	204	199	0,52	20 décembre
Togo	ONUDI	Climatiseurs de salle	R-290	90 000	s.o.	3	s.o.	s.o.	21 décembre
Total				1 883 866	1 795 737	2 556	1 292	5,15	

(*) Les activités relatives aux utilisateurs finaux au Kenya et au Mozambique ont été récemment approuvées, mais les renseignements sur la mise en œuvre ne sont pas encore disponibles.

(**) Un programme fournissant les outils nécessaires pour les ateliers d'entretien en vue de faciliter la reconversion des climatiseurs du HCFC-22 au R-290 respectant des directives de sécurité rigoureuses appliquées par le ministère de l'Environnement n'a pas été inclus, car il ne s'adresse pas directement aux utilisateurs finaux.

23. Ces projets ont été appuyés par une formation à l'intention des techniciens sur l'utilisation de la technologie de remplacement, des ateliers montrant comment utiliser la technologie de remplacement, et des activités de sensibilisation destinées aux utilisateurs finaux, techniciens et fournisseurs et importateurs

d'équipement et de frigorigènes. Certains projets ont bénéficié de règlements, comme des interdictions futures d'importer de nouveaux climatiseurs à base de HCFC, ou l'approbation par le service incendie de l'utilisation de frigorigènes inflammables dans les applications de réfrigération et de climatisation. Dans un cas où le pays était situé à l'intérieur de l'Union européenne, l'adoption précoce à l'échelle locale des règlements de l'Union européenne concernant l'élimination des HCFC, associée à l'augmentation des prix des HCFC, a fait que d'autres utilisateurs finaux de HCFC ont suivi la même procédure de reconversion ou de remplacement de leurs installations.

24. Alors que la plupart des projets relatifs aux utilisateurs finaux sont en cours, les avantages supplémentaires qui ont été communiqués par les agences bilatérales et d'exécution sont les suivants : consommation réduite d'énergie par les nouveaux systèmes, possibilité de démontrer les nouvelles technologies aux intervenants nationaux, et importation de technologies de remplacement dans les pays. Par exemple, dans un pays, tous les utilisateurs finaux ont reconverti ou remplacé leur équipement à base de HCFC suite au projet, pour les raisons suivantes : obligations juridiques d'éliminer les HCFC avant les dates prévues à l'origine, accroissement substantiel des prix des HCFC, et disponibilité d'un financement environnemental à l'appui des reconversions et des adaptations. Dans tous les autres cas, on dispose de renseignements limités sur la mesure dans laquelle d'autres utilisateurs ont également reconverti ou remplacé leurs appareils à base de HCFC à leurs frais, suite aux projets.

25. Voici certains des problèmes relevés lors de la mise en œuvre de ces projets :

- a) Manque de disponibilité des technologies de remplacement sélectionnées à faible PRP et difficultés liées au recensement des fournisseurs de technologie sur les marchés locaux. Dans certains cas, la mise en œuvre des programmes d'encouragement, par le biais d'une procédure de sélection concurrentielle, n'a pas été possible en raison du nombre restreint de fournisseurs;
- b) Manque d'intérêt des utilisateurs finaux, parce que l'incitation était insuffisante pour défrayer les coûts initiaux supplémentaires des technologies de remplacement à faible PRP ou les frais d'exploitation et d'entretien supérieurs des appareils de réfrigération et de climatisation utilisant cette technologie (p. ex., dans un cas, le coût des climatiseurs à base de HFC-32 surpassait l'incitation reçue);
- c) Procédures longues et compliquées pour obtenir l'approbation des autorités concernées afin d'introduire les appareils de réfrigération et de climatisation utilisant des frigorigènes inflammables;
- d) Méfiance vis-à-vis de l'équipement utilisant des frigorigènes inflammables, en raison des risques élevés perçus;
- e) Manque de frigorigènes de remplacement à faible PRP pour la reconversion de l'équipement dans certaines applications. Par exemple, dans le cas des pêches, la plupart des bateaux ont entre 25 et 35 années de service, et connaissent de fréquents problèmes de fuite et d'entretien; pour le moment, aucune solution viable à faible PRP ne peut leur être appliquée.

Projets visant à démontrer des technologies de remplacement

26. Au total, 12 projets sont en cours d'exécution en vue de démontrer des technologies de remplacement. L'approche adoptée consiste généralement à reconvertir ou remplacer un appareil de réfrigération ou de climatisation ou un nombre limité d'entre eux, utilisés dans un établissement public ou privé, en vue de montrer comment utiliser de manière sécuritaire les solutions à faible PRP proposées (c.-à-d., R-290, CO₂). Dans ce type de projet, le Fonds multilatéral couvre les coûts d'un nombre limité

d'appareils reconvertis ou remplacés, et les établissements bénéficiaires fournissent une contribution en nature, surtout sous forme technique pour l'installation, l'entretien et le suivi de l'équipement. Le tableau 3 récapitule l'information extraite des rapports soumis par les agences sur les projets de démonstration mis en œuvre.

Tableau 3. Projets de démonstration des technologies de remplacement

Pays*	Agence	Sous-secteur/ Application	Technologie de rempla- cement	Coût (US\$)		Reconversions/ remplacements		Élimi- nation des HCFC (tm)	Date d'achèvement
				Approuvé	Cofinan- cement	Prévus	Jusqu'ici		
Chili	PNUD	Supermarchés	CO ₂ transcritique	485 863	2 482 790	5	2	3,30	18 décembre
Costa Rica*	PNUD	Chambres froides	CO ₂ /NH ₃	524 000	419 000	1	1	1,31	18 janvier
Équateur	ONUDI	Chambres froides	R-290	s.o.	s.o.	1	1	0,03	19 novembre
Grenades	PNUE	Climatiseurs de salle	R-290	9 000	-	2	2	s.o.	18 décembre
Iran (République islamique d')	Allema- gne	Supermarchés	R-290	415 000	-	2	3	s.o.	14 décembre
Maurice	Allema- gne	Supermarchés	R-744	200 000	-	1	1	s.o.	28 décembre
Maurice	Allema- gne	Supermarchés/ chaînes d'appro- visionnement	R-290/ R-744	250 000	-	s.o.	s.o.	s.o.	30 décembre
Saint- Vincent-et- les- Grenadines	PNUE	Climatiseurs commerciaux	HC	99 800	-	2	2	s.o.	26 décembre
Turquie	ONUDI	Chambres froides; supermarchés	CO ₂ /NH ₃ R-448A/ R-290 HFO-1233zd	380 000	s.o.	3	1	0,09	21 décembre
Venezuela (République bolivarienne du)	ONUDI	Climatiseurs commerciaux (refroidisseurs)	R-290	s.o.	s.o.	1	1	0,008	18 novembre
Total				2 363 663	2 901 790	18	14	4,72	

* Renseignements du rapport final du projet de démonstration. D'autres projets de démonstration ont été relevés, dont des supermarchés en Argentine (le rapport final sera soumis à la 85^e réunion) et en Géorgie (aucune information sur la mise en œuvre disponible).

27. Ces projets de démonstration ont été soutenus par des formations fournies aux techniciens, principalement pour qu'ils se familiarisent avec la technologie de remplacement introduite, les activités de sensibilisation et d'autres activités d'appui pour assurer la disponibilité des technologies de remplacement sur les marchés locaux. Par exemple, un pays a soutenu le projet de démonstration en intégrant un rabais pour chaque tonne de capacité de refroidissement des HCFC-22 et du R-410A remplacé par de l'équipement à base de HFC-32, alors que deux autres pays ont adopté de nouveaux règlements et normes pour l'utilisation en toute sécurité des frigorigènes de remplacement introduits et l'entretien des appareils associés.

28. Les autres avantages déclarés par les agences bilatérales et d'exécution sont les suivants : savoir-faire acquis par les entreprises locales sur le plan de l'application des méthodes d'évaluation des risques et l'utilisation d'appareils consommant des frigorigènes inflammables; consommation réduite d'énergie par les nouveaux appareils (jusqu'à 30 % dans un cas); et possibilité de montrer de nouvelles technologies aux intervenants dans les pays, en ouvrant les marchés locaux à ces technologies.

29. On dispose de renseignements limités sur la mesure dans laquelle les autres utilisateurs finaux ont également reconverti ou remplacé leurs appareils à base de HCFC à leurs propres frais, suite aux projets; il y a aussi peu d'information sur les problèmes survenus pendant la mise en œuvre de ces projets.

Programmes de réduction des fuites chez les utilisateurs finaux

30. Dans un seul pays, le projet de l'utilisateur final a mis l'accent sur l'amélioration des pratiques de confinement pour les appareils existants à base de HCFC dans deux supermarchés, en remplaçant notamment les anciennes pièces inefficaces et en utilisant de meilleurs joints, soupapes, raccords de tuyauterie et autres composants. Cette pratique a mené à des économies d'énergie et à une baisse de la demande de HCFC. Les coûts associés à l'équipement et aux outils (p. ex., détecteur de fuites, pompe à vide, et accessoires pour l'équipement de brasage et de réfrigération), à l'ingénierie et aux formations ont été couverts par le Fonds multilatéral, alors que le supermarché bénéficiaire a pris en charge les services des techniciens, les produits consommables et les outils d'entretien.

31. La mise en œuvre du projet a permis de réduire les taux annuels de fuite de HCFC-22 de 130 % de la charge de frigorigène à zéro; les coefficients de performance du système ont été améliorés jusqu'à 13,4 %; et la consommation d'énergie a été réduite. Le projet a bénéficié de formations sur les meilleures pratiques offertes au personnel technique du supermarché. En outre, au titre du PGEH pour ce pays visé à l'article 5, 4 800 autres techniciens ont été formés sur les pratiques exemplaires relatives notamment à la conception de systèmes étanches, à la détection des fuites, au brasage, à la récupération et au recyclage, à l'enregistrement des données et à l'entretien préventif prévu. Aucune mesure réglementaire spécifique n'a été appliquée, étant donné que le projet avait pour objectif de démontrer les meilleures pratiques dans le secteur de l'entretien des appareils de réfrigération.

32. Soulignons certains des problèmes survenus au cours de la mise en œuvre du projet :

- a) Manque de disponibilité des composants et de l'équipement, comme le système fixe de détection et de suivi des fuites;
- b) Nombre limité de fournisseurs intéressés à participer aux appels d'offres et à offrir du matériel, conformément aux spécifications et exigences techniques du projet (l'appel d'offres a dû être publié plusieurs fois, ce qui a retardé le projet);
- c) Retard dans la livraison de l'équipement, ce qui a donné lieu au retrait de deux supermarchés sélectionnés au départ.

Observations du Secrétariat

33. Les projets se rapportant aux programmes d'encouragement destinés aux utilisateurs ont été approuvés surtout pour les pays FVC entre 2010 et 2013; dans le cas des pays qui ne sont pas des pays FVC, le nombre de projets approuvés au titre du programme d'encouragement destiné aux utilisateurs a été limité. Étant donné le financement disponible au titre des plans du secteur de l'entretien (y compris les programmes d'encouragement destinés aux utilisateurs) pour les phases I et II des PGEH,⁴ il est difficile d'évaluer l'évolutivité de l'adoption de technologies de remplacement à faible PRP mises en avant dans les programmes d'encouragement destinés aux utilisateurs, sauf dans les situations où l'utilisation des HCFC est identifiée dans une application donnée (p. ex., utilisation de HCFC-22 dans les pêches),⁵ ou lorsqu'un ou plusieurs utilisateurs finaux décident d'adopter la technologie de remplacement

⁴ Décision 60/44 pour la phase I des PGEH et décision 74/50 pour la phase II des PGEH.

⁵ Les programmes de reconversion du secteur des pêches connaissent une situation difficile en rapport avec la disponibilité de technologies de remplacement sûres à base de frigorigène à faible PRP.

dans leurs installations après avoir démontré son efficacité (p. ex., technologie à base de R-744 dans les supermarchés).

34. Les facteurs de marché se rapportant en particulier à la disponibilité de l'équipement fonctionnant avec des frigorigènes sans SAO à PRP élevé (p. ex., HFC-134a, R-404A dans les applications de réfrigération; ou R-410A et R-407C dans des systèmes de climatisation),⁶ et le manque de réglementation limitant l'introduction de nouveaux appareils à base de HCFC couverts par les programmes d'encouragement destinés aux utilisateurs, constituent un problème pour ce qui est d'obtenir la pénétration voulue des programmes d'encouragement sur les marchés.

35. La baisse de la disponibilité des HCFC, avec les plans d'élimination accélérée de ces substances (p. ex., élimination des HCFC d'ici 2025, au lieu de 2030, comme cela est proposé aux phases I et II des PGEH de plusieurs pays visés à l'article 5), alliée à la mise en œuvre des programmes d'encouragement destinés aux utilisateurs favorisant l'adoption de technologies de remplacement à faible PRP, pourrait donner lieu à des réductions plus rapides de la consommation des HCFC et à l'introduction de technologies à faible PRP.

36. La disponibilité limitée d'options technologiques sans HCFC à faible PRP dans les applications de réfrigération et de climatisation a une incidence sur l'évolutivité de ces programmes. Jusqu'à présent, les options se rapportant aux différentes applications de réfrigération et de climatisation couvertes au titre des programmes d'encouragement sont encore en cours d'élaboration; la disponibilité d'options présentant un bon rapport coût-efficacité sur les marchés locaux est encore limitée (p. ex., climatiseurs à base de HFC-32/R-290 ou équipement de réfrigération à usage commercial à base de R-744). La situation évolue avec la plus grande disponibilité d'équipement à base de frigorigènes à faible PRP dans certaines applications sur les marchés locaux; les activités relatives à l'Amendement de Kigali (p. ex., activités de facilitation) ont également joué un rôle dans l'adoption de ces technologies au cours des dernières années (c.-à-d., plus ou moins les deux dernières années).

37. À partir des expériences dans plusieurs pays visés à l'article 5 relativement à la reconversion de réfrigérateurs domestiques à base de CFC et d'appareils de réfrigération autonomes à usage commercial au cours de la période finale de l'élimination des CFC et au début de la période d'approbation de la phase I des PGEH, l'un des principaux objectifs des programmes d'encouragement inclus était la reconversion de l'équipement de réfrigération à base de HCFC pour des applications spécifiques de climatisation et de réfrigération. Toutefois, au cours des premières phases de mise en œuvre, ces incitations ont été soit reportées ou revues de manière à privilégier d'autres activités, comme des formations supplémentaires à l'intention des techniciens ou l'acquisition d'équipement ou d'outils d'entretien à l'appui des ateliers de réparation et/ou des établissements nationaux, pour les raisons suivantes :

- a) Complexité accrue associée aux pratiques et processus industriels pour les reconversions sécuritaires à faible PRP de l'équipement conçu pour les frigorigènes ininflammables, y compris des formations rigoureuses et des activités de renforcement des capacités des techniciens sur le matériel de reconversion, et le processus de certification des techniciens pour ces reconversions;
- b) Procédure longue et compliquée de modification du cadre réglementaire pour suivre l'adoption en toute sécurité de la reconversion de l'équipement à base de HCFC à des frigorigènes inflammables;

⁶ Avec l'Amendement de Kigali en vigueur depuis le 1^{er} janvier 2019 et l'augmentation du nombre de pays qui deviennent Parties à l'amendement, le secteur de l'équipement de réfrigération et de climatisation à base de frigorigènes à faible PRP connaît une croissance plus élevée; cette croissance est également signalée dans le rapport récent du Groupe de l'évaluation technique et économique sur l'efficacité énergétique.

- c) Disponibilité d'options de reconversion à des frigorigènes à PRP élevé (p. ex., R-407C pour des climatiseurs à base de HCFC-22), ainsi que de l'équipement à base de frigorigène à PRP élevé;
- d) Décisions de politique adoptées par le Comité exécutif afin d'éviter les pratiques non sécuritaires lors de la mise en œuvre de reconversions en utilisant des frigorigènes inflammables dans des appareils conçus à l'origine pour l'utilisation de frigorigènes ininflammables (p. ex., décisions 72/17, 72/40 et 73/34).

38. En vertu du scénario du statu quo, les facteurs de marché favoriseraient l'adoption de nouveaux appareils à base de frigorigènes sans HCFC à PRP élevé (p. ex., climatiseur à base de R-410A; appareils de réfrigération commerciale autonomes à base de HFC-134a ou de R-404A (en remplacement de l'équipement à base de HCFC)). Le manque de politiques et de règlements à l'échelon national destinés à limiter l'utilisation de nouveaux appareils à base de HCFC et à encourager l'adoption de technologies de remplacement à faible PRP influe sur l'incidence générale des programmes d'encouragement. Les règlements et autres mesures favorisant l'adoption de solutions à faible PRP, y compris celles envisagées au titre des programmes d'encouragement, ainsi que les mesures liées à l'élimination des HCFC, pourraient accroître l'impact de ces programmes.

39. Le cofinancement des bénéficiaires au titre des programmes d'encouragement destinés aux utilisateurs a varié entre 50 et 85 %. Ces niveaux de cofinancement démontrent l'engagement des bénéficiaires pour ce qui est d'adopter les technologies de remplacement voulues au titre du programme; ils ne garantissent toutefois pas l'évolutivité de la technologie adoptée, étant donné que les programmes n'ont démontré que l'efficacité des technologies de remplacement pour un nombre limité d'utilisateurs finaux. Les liens de ces programmes avec les autres programmes ayant abouti au remplacement de l'équipement (p. ex., programme de remplacement des réfrigérateurs domestiques au Brésil mis en œuvre avec le soutien des services publics d'électricité; programme de remplacement des appareils au Mexique), pourrait permettre l'évolutivité de ces programmes (et, de plus, accroître les quantités de HCFC-22 récupéré des appareils remplacés), en soulignant que ces programmes devraient être conçus pour inclure l'adoption de frigorigènes à faible PRP pour l'équipement.

40. Les formations et les activités de renforcement des capacités à l'intention des techniciens pour l'adoption de technologies de remplacement à faible PRP sont offertes au titre des programmes d'encouragement destinés aux utilisateurs et des programmes de formation compris dans les activités du secteur de l'entretien au titre des PGEH. Le renforcement accru des capacités permet d'accroître la confiance chez les intervenants en ce qui a trait à l'adoption des technologies de remplacement. Dans certains cas, le soutien équipement fourni aux établissements techniques avait appuyé l'adoption sécuritaire des technologies de remplacement à faible PRP.

41. Dans un pays, le programme d'encouragement a mis l'accent sur la réduction des fuites dans les supermarchés et a permis de réduire sensiblement les fuites de HCFC-22 et d'améliorer l'efficacité de l'équipement en matière de refroidissement. La reproduction de cette expérience dans d'autres pays visés à l'article 5 comprend le renforcement des capacités des utilisateurs finaux et des techniciens associés en vue d'effectuer l'évaluation détaillée des fuites d'appareils de réfrigération à usage commercial utilisés dans les supermarchés, et l'adoption de pratiques exemplaires pour la réduction des fuites et la récupération et la réutilisation des HCFC.

Recommandation

42. Le Comité exécutif pourrait souhaiter :

- a) Prendre note du document UNEP/OzL.Pro/ExCom/84/63 contenant le rapport sur les programmes d'encouragement financés au titre des plans de gestion de l'élimination des HCFC (PGEH) approuvés (décision 82/54);
- b) Envisager des programmes d'encouragement destinés aux utilisateurs au titre des phases existantes ou futures de PGEH, au cas par cas, en prenant en compte le cadre politique limitant l'utilisation de substances réglementées au titre du Protocole de Montréal et favorisant l'adoption de la technologie de remplacement proposée au titre des programmes d'encouragement, et l'évolutivité de la technologie de remplacement proposée en fonction des conditions de marché locales;
- c) Demander aux agences bilatérales et d'exécution, au moment de soumettre les programmes d'encouragement indiqués au sous-paragraphe b) ci-dessus :
 - i) De concevoir les programmes d'encouragement destinés aux utilisateurs pour les applications de réfrigération et de climatisation spécifiques, dans la mesure du possible, qui accéléreraient l'élimination des substances réglementées utilisées dans ces applications et qui favoriseraient l'adoption précoce de la technologie de remplacement proposée;
 - ii) D'élaborer des règlements et autres mesures, au besoin, limitant l'utilisation des substances réglementées et favorisant l'adoption précoce de la technologie de remplacement proposée dans les applications sélectionnées;
 - iii) De fournir des renseignements sur le niveau réel de cofinancement par tous les utilisateurs bénéficiaires qui participent au programme d'encouragement et de décrire les actions qu'ils mettraient en œuvre pour promouvoir l'adoption de la technologie proposée;
 - iv) D'inclure d'une façon efficace et économique les activités de formation et de renforcement de capacités et l'assistance technique pour l'adoption de la technologie de remplacement proposée, en tenant compte des synergies avec les programmes de formation mis en œuvre au titre des PGEH approuvés;
 - v) De prévoir l'incidence des programmes d'encouragement sur le plan de l'élimination des substances réglementées et de l'introduction des frigorigènes de remplacement;
- d) Demander aux agences bilatérales et d'exécution de présenter des rapports détaillés sur les programmes d'encouragement existants, dès que ceux-ci ont été achevés, y compris les mesures prises pour promouvoir l'adoption de la technologie de remplacement, à partir desquels le Secrétariat pourrait établir des fiches techniques qui pourraient être utilisées au cours de la mise en œuvre du projet.

Annexe I

DÉCISIONS RELATIVES À LA MISE EN ŒUVRE DES RECONVERSIONS ET REMPLACEMENTS D'ÉQUIPEMENT ET DES PROGRAMMES D'ENCOURAGEMENT DESTINÉS AUX UTILISATEURS AU COURS DE L'ÉLIMINATION DES CFC

1. Les lignes directrices se rapportant aux utilisateurs finaux pour la reconversion dans le secteur de la réfrigération à usage commercial adoptées par le Comité exécutif à sa 28^e réunion (décision 28/44), déterminent les circonstances qui doivent prévaloir avant que les activités de reconversion des utilisateurs finaux puissent recevoir la priorité :

- a) Des mesures de contrôle de la production et des importations de CFC et d'équipement à base de CFC sont en place et effectivement appliquées, et limitent le déploiement de nouveaux éléments contenant des CFC;
- b) La majeure partie de la consommation résiduelle de CFC du pays est destinée aux réparations et à l'entretien de l'équipement de réfrigération et de climatisation;
- c) Les données détaillées sur le profil de toutes les consommations résiduelles ont été déterminées et mises à la disposition du Comité exécutif;
- d) Soit aucune autre activité possible ne permettrait au pays de s'acquitter de ses obligations de contrôle des CFC, soit le prix de détail des CFC par rapport aux frigorigènes de remplacement a été élevé pendant une période minimale de neuf mois et on prédit qu'il continuera d'augmenter.

2. Le Comité exécutif à sa 31^e réunion a décidé que des programmes d'incitation visant à encourager les réadaptations pouvaient être soumis au titre de la décision 31/48. Ensuite, lors de la 32^e réunion, le PNUD a élaboré le concept de programmes d'incitation visant à réadapter/remplacer l'équipement de réfrigération chez les utilisateurs commerciaux et industriels et a présenté trois projets; le Comité exécutif a notamment décidé que les propositions de projets pour les programmes d'incitation visant à encourager la réadaptation de l'équipement de réfrigération pouvaient être soumises dans le cadre d'un plan de gestion des frigorigènes (PGF) sous certaines conditions (décision 32/28).

3. Trois années après les décisions prises par le Comité exécutif à ses 31^e et 32^e réunions, une évaluation de la mise en œuvre des plans de gestion des frigorigènes a été menée en 2003. Cette évaluation a traité d'essais pilotes pour la reconversion d'appareils domestiques et de petits appareils commerciaux à des hydrocarbures dans plusieurs pays visités (Ghana, Sénégal, Uruguay), qui ont été considérés comme des options potentielles pour continuer d'utiliser des réfrigérateurs à base de CFC à coût limité, après l'élimination des CFC. Celles-ci nécessitaient une formation intensive sur la sécurité des techniciens et l'adaptation des ateliers, et revendiquaient l'amélioration de l'efficacité énergétique, même si cela n'était pas documenté. La reconversion des réfrigérateurs au HFC-134a a été considérée non économiquement viable dans la plupart des cas en raison de son coût relativement élevé, du coût de l'huile-ester et des difficultés liées à la manipulation du système. À l'époque, les frigorigènes directs étaient considérés comme valant la peine d'être explorés à titre de solution de transition utile.

4. Le peu de preuves recueillies sur les reconversions des utilisateurs finaux au cours de cette évaluation a encore une fois donné à penser que les programmes d'encouragement pourraient, en principe, être efficaces si les éléments suivants étaient en place : système opérationnel et efficace d'octroi de licences pour les importations, avec des attributions de quotas, contrôle fiable du niveau de consommation de CFC, réduction ou inversion de la différence de prix entre les CFC et les frigorigènes de remplacement, introduction d'incitations économiques dans les entreprises industrielles et commerciales, et enfin et non le moindre, une croissance économique favorisant la mobilisation des fonds publics et privés pour la modernisation des investissements. L'évaluation a aussi conclu que c'était l'anticipation de

l'évolution des marchés et non la sensibilisation qui pouvait inciter le secteur privé à s'engager dans la reconversion des technologies, avec les investissements supplémentaires qui en découlent, et qu'il était nécessaire de poursuivre l'analyse des facteurs de réussite.

5. Dès 2007, 20 programmes d'encouragement destinés aux utilisateurs finaux d'appareils de réfrigération avaient été approuvés et une étude théorique ultérieure sur les programmes d'encouragement pour les reconversions avait été menée. L'étude a confirmé qu'il était possible et également essentiel pour un pays de satisfaire les conditions préalables établies par le Comité exécutif pour l'approbation des programmes d'encouragement – c.-à-d., contrôles de la production et des importations de CFC et de l'équipement à base de CFC mis en place et efficacement appliqués, alliés à l'élaboration restreinte de nouveaux éléments de CFC. L'étude a par ailleurs confirmé que sans ces conditions préalables, la collaboration étroite nécessaire avec les bénéficiaires potentiels était difficile, voire impossible à instaurer, comme certains pays ont pu en avoir l'expérience. Les retards dans les projets observés dans cette évaluation ont été surtout attribués à l'absence des conditions préalables nécessaires pour le bon démarrage des projets d'encouragement.¹

6. L'étude a montré qu'une série de substances ont été envisagées pour les programmes d'encouragement destinés aux utilisateurs, y compris la reconversion au HCFC-22, au HFC-134a, au HFC-404A, au HC ou aux frigorigènes directs HFC-406, HFC-409 et C-10M1. Les entreprises bénéficiaires du programme ont confirmé des avantages économiques notables découlant de la reconversion en raison du prix plus bas du HCFC-22 (dans tous les cas entre 20 et 52 % du prix du CFC-12). Dans les cas de la reconversion au HFC-134a ou au HFC-404A, les propriétaires d'équipement de réfrigération ont indiqué que même si le prix au kilogramme des nouvelles substances était actuellement plus élevé que celui du CFC-12, les avantages économiques associés à l'efficacité opérationnelle des nouveaux systèmes dépassaient grandement les différences de prix des frigorigènes et devraient être un incitatif pour la reconversion. La reconversion directe qui fait appel à des mélanges ternaires renfermant des HCFC avait à l'époque peu d'application dans les pays visés à l'article 5, en raison de leur faible disponibilité et de leur coût élevé, et surtout étant donné le taux élevé de fuites des appareils de réfrigération vieillissants. Presque toutes les entreprises ont déclaré que les fuites de frigorigène et les pannes fréquentes ont été réduites ou entièrement stoppées, ce qui a donné lieu à des diminutions spectaculaires des dépenses d'exploitation et à des pertes périodiques de produits entreposés.

7. Certains des facteurs qui ont incité les utilisateurs finaux à reconvertir leur équipement sont énumérés ci-après : durée de vie restante limitée de l'équipement existant et coût accru de l'entretien; augmentation du prix du frigorigène à base de CFC-12 et prix du HCFC-22 relativement bas; sensibilisation accrue des propriétaires en ce qui a trait à l'élimination des SAO et à la pénurie future de frigorigènes à base de CFC; procédures relativement simples pour accéder aux fonds au titre du programme d'encouragement; sensibilisation accrue aux avantages supplémentaires découlant de la reconversion, comme les économies d'énergie, la réduction du coût de l'entretien, la diminution des fuites et les nouvelles possibilités commerciales associées au meilleur rendement des appareils de réfrigération remplacés ou reconvertis. La reconversion de l'équipement existant a apporté les avantages suivants : prolonger la durée de vie et reporter les investissements autrement inévitables dans le secteur de la transformation alimentaire; disponibilité de technologies de remplacement et d'entrepreneurs locaux assurant des services de qualité pour le remplacement et la reconversion; et bonnes relations des consultants locaux avec les techniciens en entretien et les entrepreneurs locaux en réfrigération par l'entremise de l'association nationale de la réfrigération.

8. En 2009, l'évaluation des plans de gestion de l'élimination finale a conclu que les projets d'encouragement pour les reconversions étaient efficaces là où le prix du CFC-12 augmentait rapidement, alors que le prix des substances de remplacement avec la même disponibilité était stable. Elle a également

¹ UNEP/OzL.Pro/ExCom/52/18

constaté que la différence de prix, le niveau d'incitation et les activités relatives à l'UNO jouaient par ailleurs un rôle déterminant.²

² UNEP/OzL.Pro/ExCom/58/8

Annex II

REPORTS ON END-USERS RECEIVED FROM IMPLEMENTING AND BILATERAL AGENCIES

Group I End-user incentive schemes for conversion or replacement of HCFC-based equipment

#	Country	Implementing agency	Page
1.	Bhutan	UNDP	2
2.	Brunei Darussalam	UNDP	3
3.	Cambodia	UNDP	4
4.	Croatia	UNIDO	5
5.	Cuba	UNDP	6
6.	Fiji	UNDP	7
7.	Ghana	UNDP	8-9
8.	Madagascar	UNIDO	10
9.	Malaysia	UNDP	11
10.	Maldives	UNDP	12-13
11.	Nepal	UNDP	14
12.	Sri Lanka	UNDP	15
13.	Togo	UNIDO	16

Group II Projects to demonstrate alternative technologies

1.	Chile	UNDP	17
2.	Ecuador	UNIDO	18-19
3.	Georgia	UNDP	20
4.	Grenada	UNEP	21-22
5.	Iran (Islamic Republic of)	Government of Germany	23
6.	Mauritius	Government of Germany	24
7.	Mauritius	Government of Germany	25
8.	Saint Vincent and the Grenadines	UNEP	26
9.	Venezuela (Bolivarian Republic of)	UNIDO	27

Group III Leakage reduction programmes at end-users

1.	Brazil	Government of Germany	28-29
----	--------	-----------------------	-------

Group I: End-user incentive schemes for conversion or replacement of HCFC-based equipment

PROJECT DESCRIPTION	
Country	Bhutan
Stage of the HPMP	HPMP (2011-2025)
Implementing agency	UNDP
Project title	HCFC phase-out management plan
Subsector/application	RAC/ domestic/commercial air-conditioning
Alternative technology	Capped to GWP-675 or lower
Number of beneficiaries planned	65
HCFC-22 to be phased out (mt)	232 Kgs
Funds approved (US \$)	US\$ 79,000
Co-funding commitment (US \$)	30% was funded from project and 70% was co-financed by the beneficiaries
Planned date of completion	Completed (December 2018)
Description: The objective of the replacement incentive programme was to support and promote zero ODP and low GWP appliances. 65 units of appliances were planned for conversion out of which: 60 appliances in domestic refrigeration and air conditioning and 5 in commercial sector.	
ACHIEVEMENTS AND IMPACT	
Number of beneficiaries assisted	2 (15 units)
HCFC-22 phased out (mt)	33 Kgs.
Co-funding provided (US \$)	USD 7,892
Actual date of completion	August 2018
Main results obtained and any other environmental/economic impact achieved: The programme has initiated after four workshops with stakeholders were carried out to promote it. There was reluctance from targeted audience to replace their existing R-22 based equipment due to timing and incompatibility with public budget. The NOU targeted private sector in order to maximize project outputs. In both cases, the initial planning from beneficiaries was to install R-22/R410A units (commercially available and less costly). Two institutions (The National Animal hospital in 2017 and the Samtse Higher Secondary School in 2018) were installed with fifteen R-32 based units' heat pump and AC. The potential direct emission reduction was 24,516 CO ₂ -eq (39,096 CO ₂ -eq from baseline equipment to 14,580 CO ₂ -eq for new units).	
Reasons for delay. If the project was discontinued, please explain the reasons and indicate to what activities the funding was reallocated: Although sensitized on this incentive scheme in various workshops, meetings and trainings, the stakeholders felt 25%-30% incentive was insufficient to motivate the change of technology. The cost of newer low GWP technologies are higher than the HFC-410A-based air conditioners (seen as most common replacement for R-22 units) and even higher when compared to R-22 units, with the cost differential superseding the 25-30% incentive level. There was an urgent need to revisit the national strategy. Further, the government wanted to strengthen Refrigeration & Air-conditioning course in Technical Education for sustaining the training outputs to reduce leakage. Keeping in mind the sustainability of future training, the 83 rd ExCom has approved the reallocation of unspent funds towards other component of training and procurement.	
REPLICABILITY AND SUSTAINABILITY	
Associated technical assistance/training provided	Workshops, awareness actions, information sharing and sensitization, as well information embedded in RAC training activities
Associated policies or regulatory measures planned/promulgated, if any	Yes, the government put a ban on imports of new air-conditioners with HCFC-22 under the HPMP.
Number of additional end-users that followed the same approach as a result of the project	N/A
Comments on the reasons for success of failure of the project and recommendations: Bhutan faces a challenging scenario in terms of market penetration of low GWP-based RAC equipment, since R-290A ACs are not available and are not offered by international suppliers, and current available HFC-32 units have a cost that supersede the 30% subsidy offered under the replacement programme, making not viable to implement a large-scale replacement programme in the very short term while no further restrictions over HFC-based equipment are legally possible to be put in place. Another reason is that there is current low penetration of HCFC-22 based air-conditioners used in the government buildings, therefore there is less need to change the air-conditioners at these end-users since they did not reach end-of-life yet, while further newer installation are based on HFCs units. In the face of recognizing these challenges, upon request from the Government of Bhutan, the MLF agreed the reallocation of USD 33,817 for use of remaining funds in training/R&R activities under the HPMP.	

PROJECT DESCRIPTION	
Country	Brunei Darussalam
Stage of the HPMP	HPMP I
Implementing agency	UNDP
Project title	HCFC Phase out Management Plan Stage I
Subsector/application	Residential AC and large RAC for phasing out HCFC based equipment
Alternative technology	Zero ODP Low GWP alternates (R32, R290)
Number of beneficiaries planned	35
HCFC-22 to be phased out (mt)	85 kg
Funds approved (US \$)	US\$ 33,500 (including incentive and awareness/capacity building workshops)
Co-funding commitment (US \$)	Up to 25% from HPMP Up to 75% co-funding
Planned date of completion	Dec 2020
Description: End user replacement programme is one the component under HPMP I of Brunei. The purpose is to demonstrate and share experience on replacing R-22 based equipment in RAC sector with zero-ODP and low-GWP alternatives, with the provision of incentive (up to 25% of the cost). The activities include awareness and capacity building workshops for stakeholders (users, technicians, importers, decision makers etc.) in addition to implementation of replacement programme.	
ACHIEVEMENTS AND IMPACT	
Number of beneficiaries assisted	n/a
HCFC-22 phased out (mt)	n/a
Co-funding provided (US \$)	n/a
Actual date of completion	ongoing
Main results obtained and any other environmental/economic impact achieved: The activity has been initiated. Stakeholder meetings were conducted, however, the alternates (non-ODP, Low-GWP) identified as suitable for the sectors are mildly flammable/flammable. As per country's law, NOU requires approval of the relevant authorities to introduce these A2I/A3 refrigerants in the country. NOU is following up and still awaiting approval of relevant government agencies for allowing use of flammable refrigerants as required. The meetings are held by NOU with these relevant government agencies.	
Reasons for delay. If the project was discontinued, please explain the reasons and indicate to what activities the funding was reallocated: As above	
REPLICABILITY AND SUSTAINABILITY	
Associated technical assistance/training provided	Awareness workshops and technical workshops is being conducted for alternate technology about benefits of energy efficiency
Associated policies or regulatory measures planned/promulgated, if any	Additional Policy allowing approval of fire department for allowing use of flammable refrigerant in RAC applications
Number of additional end-users that followed the same approach as a result of the project	On going
Comments on the reasons for success of failure of the project and recommendations: This component of HPMP I is yet under implementation stage. However, learning is to ensure that policy mechanism is in place while considering alternate technology.	

PROJECT DESCRIPTION	
Country	Cambodia
Stage of the HPMP	HPMP (single stage up to 2030)
Implementing agency	UNDP
Project title	HCFC phase-out management plan
Subsector/application	Residential air conditioning
Alternative technology	R-32, R-290
Number of beneficiaries planned	900
HCFC-22 to be phased out (mt)	1,800 kg
Funds approved (US \$)	USD 350,000 (includes awareness workshops and technical workshops for stakeholders in addition to incentive for replacement programme)
Co-funding commitment (US \$)	25% would be incentive for low GWP equipment. Balance 75% will be borne by the beneficiaries
Planned date of completion	Dec 2024 (as proposed in fourth tranche request) – HPMP Project ends in 2030
Description: to demonstrate and share experience on replacing R-22 based refrigeration equipment in RAC sector with zero-ODP and low-GWP alternatives. The activity will include creating awareness in users for alternate technology. Technical workshops for technicians about the replacement programme and implementation of replacement programme.	
ACHIEVEMENTS AND IMPACT	
Number of beneficiaries assisted	69 as of July 2019 – ongoing
HCFC-22 phased out (mt)	138 kg
Co-funding provided (US \$)	n/a.
Actual date of completion	Ongoing
Main results obtained and any other environmental/economic impact achieved: HFC-32 units were introduced into the domestic market giving opportunity for Cambodia to implement the replacement programme vis-à-vis with the market penetration of the climate-friendly technology. Training/awareness to technicians/suppliers/users about non-ODS low GWP technology were implemented in order to ensure that replacement incentive programme is received well by the country. Many awareness workshops for different stakeholder groups (users, technicians, importers) had to be conducted to create awareness/capacity building for penetrating low GWP alternatives. The programme has received good response from the users. The quantity of replacements is increasing. NOU has been visiting beneficiaries that have replaced their air conditioners for monitoring purposes. Initial feedback from the users found high rates of satisfaction with the program. The programme is ongoing.	
Reasons for delay. If the project was discontinued, please explain the reasons and indicate to what activities the funding was reallocated: n/a	
REPLICABILITY AND SUSTAINABILITY	
Associated technical assistance/training provided	In addition to awareness workshops, several training workshops were organized during the project period to train technicians on alternate technology. In 2015, HFC-32 and HC-290 were not yet commercially available in Cambodia's domestic market. MOE worked closely with technical experts, service agencies and implementing agencies on identification of feasible options for adoption. Also, in the meantime, MOE continued organizing awareness activities and capacity building for technicians for new technologies.
Associated policies or regulatory measures planned/promulgated, if any	Ban of imports of HCFCs-based equipment from 2020.
Number of additional end-users that followed the same approach as a result of the project	No specific study done. The replacement incentive programme is still ongoing.
Comments on the reasons for success of failure of the project and recommendations: Project ongoing.	

PROJECT DESCRIPTION	
Country	Croatia
Stage of the HPMP	Stage I
Implementing agency	UNIDO
Project title	HCFC Phase-out Management Plan
Subsector/application	Retrofit/replacement of HCFC-22 chillers/industrial/commercial refrigeration installations
Alternative technology	Retrofit to HFCs, replacement to natural alternatives
Number of beneficiaries planned	At least three (3) sites retrofitted to the use of alternative refrigerants with zero ODP; At least seven (7) sites converted to the use of refrigerants with low GWP, like CO ₂ , ammonia or hydrocarbons.
HCFC-22 to be phased out (mt)	0.89
Funds approved (US \$)	360,000
Co-funding commitment (US \$)	About US\$ 690,000
Planned date of completion	Completed December 2015
Description: This component shall be used as a promotion of low GWP alternatives and new technologies. In this case, it is of particular interest to support some demonstration retrofit projects of non-HFC, low-GWP technologies, such as hydrocarbon (R290, R1270), carbon dioxide (R744) and ammonia (R717) with applications in supermarket refrigeration, chiller installations and heat pump systems. In the Republic of Croatia there are a number of water chillers that contain and consume high quantities of HCFC-22 refrigerant. Insufficient funding for maintenance and service activities is the major cause of their poor condition. In order to decrease the HCFC-22 consumption and at the same time to increase energy efficiency and lower the GWP impact of existing systems, it is recommended to replace the largest, state-owned HCFC-22 systems, e.g. public hospitals, ministerial premises, etc. in the Republic of Croatia.	
ACHIEVEMENTS AND IMPACT	
Number of beneficiaries assisted	32
HCFC-22 phased out (mt)	2,224 (installed capacity)
Co-funding provided (US \$)	Approximately US\$ 870,000
Actual date of completion	December 2015
Main results obtained and any other environmental/economic impact achieved: 22 retrofits to HFCs – (1,502 kg) 7 conversions to propane and 3 conversions to ammonia (722 kg) Annual saving of 4,472,110 kg CO ₂ eq	
Reasons for delay. If the project was discontinued, please explain the reasons and indicate to what activities the funding was reallocated: Not applicable	
REPLICABILITY AND SUSTAINABILITY	
Associated technical assistance/training provided	Not as part of the incentive programme, but as separate HPMP component.
Associated policies or regulatory measures planned/promulgated, if any	Adoption of EU regulations
Number of additional end-users that followed the same approach as a result of the project	All HCFC-users, since after entry to the EU, Croatia had to comply with EU regulations.
Comments on the reasons for success of failure of the project and recommendations: The project was successful due to the legal obligations of phasing-out HCFCs ahead of the original schedule and the significantly increased HCFC prices, as well the availability of the environmental fund to support retrofits and conversions.	

PROJECT DESCRIPTION	
Country	Cuba
Stage of the HPMP	HPMP (2011-2020)
Implementing agency	UNDP
Project title	HCFC phase-out management plan Stage 1
Subsector/application	RAC/ Commercial /Commercial refrigeration
Alternative technology	Non established.
Number of beneficiaries planned	500
HCFC-22 to be phased out (mt)	2.85 mt (for all activities in the refrigeration sector).
Funds approved (US \$)	350,000
Co-funding commitment (US \$)	
Planned date of completion	On-going (December 2020)
Description: The project aimed to provide technical assistance and co-financing to a determined number of commercial refrigeration users to convert and update their HCFC-based refrigeration system to ODS-free technologies. Conversion is structured in different levels, from replacing the condensing units, the compressors and controls to changing the refrigerant and oils. The type of equipment converted is commercial refrigeration units, medium size, located in stores (such as cold rooms); The converted equipment used HCFC-22 as refrigerant, with high leakage rate and high energy consumption. These two problems were solved with the conversion to R-404A. When the NOU designed this activity within the HPMP, it analyzed different alternatives for the selection of the refrigerant, at the end R-404A was selected due to availability, cost, and technical knowledge; other alternatives were either more expensive, with higher GWP or not available in the country.	
ACHIEVEMENTS AND IMPACT	
Number of beneficiaries assisted	715
HCFC-22 phased out (mt)	Not available.
Co-funding provided (US \$)	Not available.
Actual date of completion	On going (December 2020).
Main results obtained and any other environmental/economic impact achieved: The project supported the introduction of an ODS-free technology in 715 RAC systems while helping to improve the energy efficiency, to reduce the refrigerant leaks and to improve the reliability of the RAC systems. All these effects translate in savings for the owner of the equipment and increased “on-time” of the equipment which translated in fewer lost of goods. Also, OTOZ promoted among RAC technicians criteria for evaluating the RAC systems to determine if conversion was a cost-effective option.	
Reasons for delay. If the project was discontinued, please explain the reasons and indicate to what activities the funding was reallocated: There were not delays in the implementation of the project. Other alternatives with lower GWP were not available in the country or were not cost-effective, this lack of alternatives could be considered a constrain for the implementation of the project.	
REPLICABILITY AND SUSTAINABILITY	
Associated technical assistance/training provided	Workshops, awareness actions, information sharing and sensitization on alternatives technologies for the supermarket sector, mainly transcritical CO2.
Associated policies or regulatory measures planned/promulgated, if any	N/A.
Number of additional end-users that followed the same approach as a result of the project	N/A
Comments on the reasons for success or failure of the project and recommendations: Considering that the Kigali Amendment was approved and that the country is in process of its ratification, OTOZ is analyzing possible alternatives with lower GWP to replace the introduction of R-404A. Finding a suitable alternative will be key for the continuation of the project. Nevertheless, the technical assistance given and the criteria thought to the RAC technicians are key elements to support the replicability and sustainability of the conversion to ODS-free technologies. The improvements in the performance of the equipment and the generated operational savings are used to promote the conversion to new refrigerants.	

PROJECT DESCRIPTION	
Country	Fiji
Stage of the HPMP	HPMP I
Implementing agency	UNDP
Project title	HCFC Phase out Management Plan Stage I
Subsector/application	Residential AC and large RAC (including fishery)
Alternative technology	Non ODS Low GWP alternates
Number of beneficiaries planned	33
HCFC-22 to be phased out (mt)	120 kg
Funds approved (US \$)	US\$ 48,500 (including incentive and awareness/capacity building workshops)
Co-funding commitment (US \$)	Up to 25% incentive would be provided for replacement incentive programme Up to 25% as co-funding
Planned date of completion	December 2020
Description: The activities in the HPMP were designed to address three strategic elements crucial to the successful phase-out of HCFCs in the country, namely: reducing the dependence on HCFCs and HCFC-based equipment through limiting supply, promoting HCFC-free-based alternatives to HCFC-based equipment and reducing demand for HCFCs in existing equipment. End-user incentive programme is one of the important part of HPMP I which supports promoting HCFC Free alternatives to reduce demand of HCFCs. The purpose is to demonstrate and share experience on replacing R-22 in RAC sector with zero-ODP and low-GWP alternatives, with the provision of incentive (up to 25% of the cost). The activity also includes awareness workshops for stakeholders, technical workshops for capacity building of technicians in addition to implementation of replacement programme.	
ACHIEVEMENTS AND IMPACT	
Number of beneficiaries assisted	Ongoing
HCFC-22 phased out (mt)	-
Co-funding provided (US \$)	-
Actual date of completion	NA
Main results obtained and any other environmental/economic impact achieved: Several consultation meetings on replacement options and incentive schemes with the residential air-conditioning and fishing vessel sectors were organized. A scheme for implementing end-user incentive programme for residential ACs was designed. Meetings were held with relevant stakeholders. It is noted that R32 is introduced in the market and this end user incentive programme will support penetration of this low-GWP alternative.	
Reasons for delay. The incentive programme is delayed mainly for the fishery sector, most vessels are second hand and already reached age of 25-35 years. Due to this, there are frequent issues of leakage and maintenance. Till now, there is no suitable viable alternative that can be applicable to the aged vessels (matching factors of investment required, payback period, and A1 alternatives with acceptable lower GWP than current HCFCs). A study is being done by the government to assess the situation, since fishery sector is critical in growing economy of Fiji, it is very important for department of Environment to work out a solution for this sector. The awareness is already there in the sector about HCFC phase out. NOU along with UNDP is working to find out various options. The residential AC incentive programme will be implemented soon.	
REPLICABILITY AND SUSTAINABILITY	
Associated technical assistance/training provided	Several training programme for technicians were conducted on alternate technology including HC, R32 and R290 to assist the industry in transiting to non-ODS and low GWP refrigerant.
Associated policies or regulatory measures planned/promulgated, if any	Fiji currently regulates the ODS through Act 1998 and the ODS Regulations 2010 which regulates the use of ODS and Equipment charged with ODS
Number of additional end-users that followed the same approach as a result of the project	n/a.
Comments on the reasons for success of failure of the project and recommendations: Overall, though replacement programme is still ongoing, the awareness and technical assistance activities allowed to spread awareness about alternatives and also gave exposure to main stakeholders to understand options and its pros and cons. The important lesson is that alternatives for the domestic RAC sector exists and can become viable at the country, however for fishery sector, more efforts will be required, due to the unavailability of a suitable alternate A1 refrigerant (uncertainty of performance of alternate refrigerant, safety, costs etc.). Second hand old vessels of Fiji are most vulnerable to the HPMP activities. Meetings were organized with the fisheries sector stakeholders to assess the need and way forward for implementing replacement programme in Fiji. The meeting also initiated a technical working group / stakeholder working group which will focus on replacement programme related issues to find ways to move forward.	

PROJECT DESCRIPTION																			
Country	Ghana																		
Stage of the HPMP	Stage I																		
Implementing agency	UNDP																		
Project title	END-USER INCENTIVE PROGRAMME (EUIP)																		
Subsector/application	COMMERCIAL REFRIGERATION SERVICING (Cold Stores)																		
Alternative technology	RETROFITTING/CONVERSION FROM HCFC-22 TO A NON-ODS (in first 4 cases, R407C was selected as transitional refrigerant).																		
Number of beneficiaries planned	Ca. 13 to 15 beneficiaries in total expected at HPMP approval, but only four of them have been covered by the project as of today.																		
HCFC-22 to be phased out (mt)	1.246																		
Funds approved (US \$)	38,000 USD have been provided to the 4 first companies.																		
Co-funding commitment (US \$)	160,296 USD from the four companies that have completed the project.																		
Planned date of completion	June 2020																		
<p>Description: These were facilities that were running on R22 until the HPMP assisted the beneficiaries to retrofit their facilities to run on (HFC) R-407C. In addition to the refrigeration systems, the retrofits included improvements of the existing electrical installations for maximum safety and efficiency. Safety precautions including personal protective clothing and storage techniques, such as First-in-First-Out (FIFO) & Last-In First-Out (LIFO) were also provided.</p> <p>The modality for the incentive was based on the initial HCFC-22 refrigerant charged into the system, inspection of facilities and vetting and approval of application by the National Committee on ODSs (NACODS). Advertisements were made in the print and electronic media for the general public to buy into the programme. Beneficiary companies were required to sign contracts with Ghana EPA and provide bank guarantees of financial solvency and operational sustainability. Payments were made in two installments. First 60% installment was paid upon signing of contract and 40% after the completion with a verification report among others.</p>																			
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">COMPANY</th> <th style="text-align: right;">PROJECT FUND (USD)</th> <th style="text-align: right;">CO-FINANCED (USD)</th> </tr> </thead> <tbody> <tr> <td>Home Support Cold Store</td> <td style="text-align: right;">8,000</td> <td style="text-align: right;">30,823.23</td> </tr> <tr> <td>BroadWater Co. Ltd</td> <td style="text-align: right;">11,000</td> <td style="text-align: right;">39,139.30</td> </tr> <tr> <td>Charlie Boy Ent.</td> <td style="text-align: right;">11,000</td> <td style="text-align: right;">51,709.22</td> </tr> <tr> <td>Bajejo</td> <td style="text-align: right;">8,000</td> <td style="text-align: right;">38,624.18</td> </tr> <tr> <td>TOTAL</td> <td style="text-align: right;">38,000</td> <td style="text-align: right;">160,295.93</td> </tr> </tbody> </table>		COMPANY	PROJECT FUND (USD)	CO-FINANCED (USD)	Home Support Cold Store	8,000	30,823.23	BroadWater Co. Ltd	11,000	39,139.30	Charlie Boy Ent.	11,000	51,709.22	Bajejo	8,000	38,624.18	TOTAL	38,000	160,295.93
COMPANY	PROJECT FUND (USD)	CO-FINANCED (USD)																	
Home Support Cold Store	8,000	30,823.23																	
BroadWater Co. Ltd	11,000	39,139.30																	
Charlie Boy Ent.	11,000	51,709.22																	
Bajejo	8,000	38,624.18																	
TOTAL	38,000	160,295.93																	
ACHIEVEMENTS AND IMPACT																			
Number of beneficiaries assisted	Four (initial group)																		
HCFC-22 phased out (mt)	0.46																		
Co-funding provided (US \$)	160,296																		
Actual date of completion	20 th Sep. 2017 (Completion by initial group of 4 beneficiaries)																		
<p>Main results obtained and any other environmental/economic impact achieved:</p> <p>The retrofitted facilities are currently running on R-407C which has zero ODP and better energy efficiency (with a GWP of 1774). The retrofits were performed using safety and technical guidance to ensure safe and efficient operations of the facilities and have been well accepted by the beneficiaries. This HFC blend is being used as transitional refrigerant pending final replacement with zero- or low-GWP refrigerant. It also provides better cold storage temperatures thus providing better quality frozen foods in the cold rooms. The operatives have been trained in the code of good refrigeration practices and have acquired better maintenance culture. Unwanted emissions and leakages of the refrigerant have been prevented leading to refrigerant savings and mitigation of adverse environmental impact on the ozone layer and climate.</p>																			
<p>Reasons for delay. If the project was discontinued, please explain the reasons and indicate to what activities the funding was reallocated:</p> <p>The initial four beneficiaries completed retrofitting their facilities in 2017. However, due to the decision against the use of high-GWP HFCs as alternatives to HCFC-22 the implementation of the programme for the next group of nine companies was suspended. With resources currently available from the EUIP programme it is intended to take some initiatives imminently to address the issues of low-GWP technologies and their market availability in order to restart the programme. This is intended to be achieved through cooperation and assistance of the IAs (UNDP and Italy) and external institutions, such as the Centro Studi Galileo of Italy (which has expressed interest) in organizing relevant seminar/workshop for stakeholders and technical fact-finding visits by a selected national refrigeration expert to facilities and suppliers abroad to facilitate quicker transition to appropriate alternatives.</p>																			
REPLICABILITY AND SUSTAINABILITY																			
Associated technical assistance/training provided	The technicians manning the facilities were retrained on routine and running maintenance of the facilities based on good refrigeration servicing practices. It is expected that the trained technicians, especially workshop foremen will in turn train other operatives on the job. The NOU keeps monitoring the facilities. Additionally,																		

PROJECT DESCRIPTION	
Country	Ghana
	the three Ghanaian special refrigeration training centres established with MLF support are made accessible to practicing technicians for regular refresher training.
Associated policies or regulatory measures planned/promulgated, if any	The underpinning strategy of the Ghana HPMP is transition from ODS-based refrigerants to alternative natural refrigerants to the extent possible and low-GWP refrigerants as they become available and economically viable for end-users. Policies and regulatory measures taken as part of the implementation of the HPMP have driven the widespread use of R-600a as alternative to CFC-12 and HFC-134a in the domestic refrigeration sector, while R-290-based air conditioners and R-290 as alternative refrigerant for HCFC-22 are gaining market acceptability. The Ghana EPA intends to organize focused workshops to address the issues of low-GWP alternatives for the RAC servicing sector in general and in the commercial refrigeration sub-sector in particular in line with ExCom Decision 84/48 (b) and (c).
Number of additional end-users that followed the same approach as a result of the project	Given the appropriate conditions of availability of alternative technology the remaining identified nine companies could follow the same approach as result of the success story from the first four beneficiaries. However, unless the alternatives proposed are ozone- and climate-friendly, the funding from the Multilateral Fund would not be provided.
<p>Comments on the reasons for success of failure of the project and recommendations:</p> <p>The Ghana EPA advocacy was well received by the beneficiaries which provided leverage for companies to contribute on average a co-financing of 4 to 1 to the MLF funding. The tangible operational and economic advantages derived from the project generated interest among other stakeholders to participate in the programme.</p> <p>UNDP and Italy are supporting Ghana to explore the opportunity for the low-GWP alternatives. Please note that due to the potentially higher costs, the beneficiaries might be limited.</p> <p>For LVC Article 5 countries, the low consumption volumes of refrigerants usually militate against early market penetration of more environmentally acceptable refrigerants on markets available elsewhere; this is due to high costs. In order to facilitate the market uptake of the low-GWP alternative, LVCs need more funding from the MLF to provide the incentives. Current budget may be insufficient to carry out the incentive programme using the alternatives such as CO₂, Ammonia, R290, HFOs.</p>	

PROJECT DESCRIPTION	
Country	Madagascar
Stage of the HPMP	Stage I
Implementing agency	UNEP/UNIDO
Project title	- Project title: HCFC phase-out management plan - Activity title: Replacement scheme aiming to facilitate the replacement of HCFC-based air-conditioners to low-GWP alternative
Subsector/application	- Project subsector/application: servicing sector - Activity subsector/application: replacement of 38 HCFC-22-based air-conditioners (12,000 BTU cooling capacity) by R-290-based air-conditioners (18,000 BTU cooling capacity)
Alternative technology	Natural refrigerant (propane, R-290)
Number of beneficiaries planned	6 Facilities
HCFC-22 to be phased out (mt)	0.154 (ODS 2.8)
Funds approved (US \$)	USD 120,000 (incl. training, purchase and distribution of equipment for installation and maintenance of the R-290-based air-conditioners)
Co-funding commitment (US \$)	The beneficiaries will have to provide inland transportation for the equipment and install the R-290-based air-conditioners.
Planned date of completion	May 2020
Description: Facilities were identified to benefit from the financial incentive scheme aiming to facilitate the replacement of HCFC-based air-conditioners with low-GWP alternatives. The beneficiaries will have to provide inland transportation for the equipment and install them. UNIDO will provide technical support during the installation process. A supplier in a position to deliver the required air-conditioners was identified and commercial contract was established. The procurement process is ongoing and is expected to be completed during the course of 2019. The planned payment of incentives to commercial facilities to convert refrigeration systems from HCFC-22 to low-GWP alternatives was replaced by a replacement scheme expanded to more buildings due to inadequate funding for the refrigeration conversion after closer survey of proposed beneficiaries.	
ACHIEVEMENTS AND IMPACT	
Number of beneficiaries assisted	Project is ongoing
HCFC-22 phased out (mt)	Project is ongoing
Co-funding provided (US \$)	Project is ongoing
Actual date of completion	Project is ongoing
Main results obtained and any other environmental/economic impact achieved: Project is ongoing	
Reasons for delay. If the project was discontinued, please explain the reasons and indicate to what activities the funding was reallocated: Project is ongoing	
REPLICABILITY AND SUSTAINABILITY	
Associated technical assistance/training provided	Project is ongoing
Associated policies or regulatory measures planned/promulgated, if any	N/A
Number of additional end-users that followed the same approach as a result of the project	Project is ongoing
Comments on the reasons for success of failure of the project and recommendations: Project is ongoing	

PROJECT DESCRIPTION	
Country	Malaysia
Stage of the HPMP	HPMP I
Implementing agency	UNDP
Project title	Pilot retrofitting/replacement programme for end-users
Subsector/application	Residential and commercial RAC sector
Alternative technology	Zero ODP Low GWP alternates
Number of beneficiaries planned	Two large users in the air-conditioning and two large users in the refrigeration sector
HCFC-22 to be phased out (mt)	Not established
Funds approved (US \$)	US\$ 98,000 (including awareness and technical assistance)
Co-funding commitment (US \$)	1:1 ratio
Planned date of completion	Dec 2017
Description: Pilot retrofitting/replacement programme for end-users was aimed to replace HCFC-based equipment in the domestic and commercial RAC sector to demonstrate, build confidence in other end-users, precipitate early replacement in other end-users, and reduce HCFC demand for servicing equipment at end-users.	
ACHIEVEMENTS AND IMPACT	
Number of beneficiaries assisted	82 domestic air conditioning and one commercial refrigeration
HCFC-22 phased out (mt)	203 kg
Co-funding provided (US \$)	US\$ 110,000 by beneficiary
Actual date of completion	April 2017
Main results obtained and any other environmental/economic impact achieved: As approved for third tranche request (75 th ExCom): (1) it was decided that rather than promoting retrofit, country would replace around 100 small-size HCFC-22-based air-conditioning units for HFC-32-based units (retrofit that time to low-GWP efficient retrofit technologies were not recommended). (2) Reallocation of the fund balance leading to US \$162,952 for supporting pilot incentive programme for replacement of HCFC-22 equipment with alternatives to industrial and commercial refrigeration (e.g., ammonia-based systems and CO ₂ -based systems). Pilot retrofitting/replacement programme for end-users was one of the activities under HPMP I. Replacement project at Jaya Grocer with CO ₂ was completed in April 2016 with support from Panasonic, Japan. Replacement project of HCFC-22 air conditioners with HFC-32 air conditioners was completed in July 2016 at two demonstration sites (University Kuala Lumpur - 16 units; Environmental Institute of Malaysia - 66 units). Both the replacement programme were well received by the stakeholders. It allowed the market transformation for residential air conditioning with the field demonstration of safety and efficiency of the units deployed.	
Reasons for delay. If the project was discontinued, please explain the reasons and indicate to what activities the funding was reallocated: The commercial refrigeration replacement project was delayed by 3-4 months due to difficulty in identifying technology providers in Malaysia and the beneficiary willing to provide co-funding required. Several meetings were organized by NOU with supplier and beneficiary and finally the management of Jaya Grocer agreed to co-fund the replacement of old R-22 system.	
REPLICABILITY AND SUSTAINABILITY	
Associated technical assistance/training provided	Throughout the project period, many awareness programme for users/technician were carried out to create awareness/capacity building for alternate technology.
Associated policies or regulatory measures planned/promulgated, if any	A ban on the establishment and expansion of new HCFC-based manufacturing capacities as of 1 January 2013 was issued. Malaysia will also issue ban on the import of RAC equipment operated with HCFCs and on the manufacturing and new installation of RAC equipment operating with HCFCs by 1 Jan 2020.
Number of additional end-users that followed the same approach as a result of the project	No dedicated monitoring funds were allocated further than collect the project immediate results.
Comments on the reasons for success of failure of the project and recommendations: The activities related to replacement programme under the HPMP were implemented successfully with active support, participation and cooperation of the NOU and critical stakeholders. The collaboration between NOU, Supplier, beneficiaries and UNDP helped effective implementation. The awareness and technical training also has a big role to play for any such replacement programme.	

PROJECT DESCRIPTION	
Country	Maldives
Stage of the HPMP	HPMP (2011-2020)
Implementing agency	UNDP (co-op IA)
Project title	HCFC phase-out management plan
Subsector/application	RAC domestic air-conditioning and Fisheries
Alternative technology	R-32 for domestic air-conditioners and R-438A for large commercial and industrial refrigeration end-users
Number of beneficiaries planned	750 residential units 15 commercials units
HCFC-22 to be phased out (mt)	1,650 Kgs residential (includes maintenance) 300 Kgs. Commercial (includes maintenance)
Funds approved (US \$)	US\$ 220,000 (includes TA for workshops, experts and documentation)
Co-funding commitment (US \$)	In large systems, US\$ 70,443 and In small appliances, it is being 35% was funded from project and 65% was co-financed by the beneficiaries (final figures at the completions of the project)
Planned date of completion	November 2020
Description: The objective of the replacement incentive programme was to support and promote zero ODP and low GWP appliances. 765 units of appliances were planned: 750 appliances in domestic refrigeration and air conditioning and 15 in large commercial and industrial refrigeration sector.	
ACHIEVEMENTS AND IMPACT	
Number of beneficiaries assisted	Four end-users supported: 15 units of commercial RAC system. One end-user supported: 135 units of air-conditioners
HCFC-22 phased out (mt)	1,497 Kgs in total: 297 Kgs. from air conditioners and 1,200 Kgs. from commercial retrofitting
Co-funding provided (US \$)	Co-financing for the R 438A conversion by beneficiaries – 70,422.80 USD Co-financing for the R-32 conversion by beneficiary – 299,000 USD (on-going)
Actual date of completion	The project is on-going
Main results obtained and any other environmental/economic impact achieved:	
<p>This activity was carried out through organizing four consultative workshops with government and private partners. The activity was divided into two groups: (a) large commercial and industrial refrigeration end-users (inc. Fisheries Sector); and (b) Domestic air-conditioning:</p> <ul style="list-style-type: none"> In fisheries sector, total 1,200 kgs of R-22 was eliminated by four beneficiaries, where 15 large units were replaced (project's target accomplished). In domestic air-conditioning, a series of workshops were held from 2014-2017 to aware the beneficiaries and on alternative technologies, but penetration of low-GWP units were still very incipient and no further replacement action could take place. In 2017, a technology roadshow was organized to promote R-32, R-290, Ammonia and CO2 alternatives. It was noticed during technology road show that the price of R-410A units offered by importers was lower than R-32 and R-290 based air-conditioners, but with additional benefits of having similar COPs but easier handling (no flammable, wide range of parts for maintenance), which constituted another barrier. The tourism sector (resorts) showed interest in engage into a large programme, however because of the competitive scenario for HFC-32, the project could not go on with these stakeholders. In this regard, after thorough market analysis, the Ministry (MIFCO) took the lead on the incentive programme and replaced approximately 135 air-conditioners of different capacity with R-32 to "open the market" for the technology and holding the higher cost opportunity for the transition. Current, almost same quantity of ACs are being procured under the replacement incentive scheme. MIFCO is keen on deliver further support especially for the fisheries sector (critical for Maldives), where another six vessels are interested in retrofit/replacement, however only viable alternative would be R-448A, which currently is not incentivized as per discussions held at MLF level for the Demonstration Project. 	
Reasons for delay. If the project was discontinued, please explain the reasons and indicate to what activities the funding was reallocated:	
<p>The project was delayed due to non-availability of best alternatives in the Asian market. The alternate came into the market was R-438A, which was used by the beneficiaries, however MLF conveyed that the usage of R438A should not be encouraged due to high GWP.</p>	
REPLICABILITY AND SUSTAINABILITY	
Associated technical assistance/training provided	All the technicians of the companies involved were given training. In the case of fishery vessels, specific trainings were provided. Some of the areas covered during the trainings include;

PROJECT DESCRIPTION	
Country	Maldives
	<ul style="list-style-type: none"> - Good practices in retrofitting - Fundamental of refrigeration and air-conditioning - Alternatives to R 22 - Good servicing practices in handling flammable refrigerants
Associated policies or regulatory measures planned/promulgated, if any	<p>HCFC import/export controls imposed as per the new Ozone Layer Protection Act, 2015, and the Government of Maldives has introduced tax incentives for HCFC alternatives and disincentives for HCFCs through its Import and Export Act.</p> <p>For ammonia, the import tax reduced from 10% to 5% to provide incentive for adoption of low GWP alternatives. For HCFCs and blends, the import tax was increased from 10% to 100%.</p>
Number of additional end-users that followed the same approach as a result of the project	Horizon Fisheries, a private fisheries complex has converted all their equipment to non-HCFCs with their own funding after the retrofit programme. The company has reduced from 2,202 kg of HCFCs.
<p>Comments on the reasons for success of failure of the project and recommendations:</p> <ul style="list-style-type: none"> • Fishery sector is critical in terms of technology selection. Social and environmental factors must be balanced when deciding the technology change (in many cases, it is not feasible to push the change of the vessel for a new one that is fully adapted for toxic/flammable alternatives due to extreme higher costs when issues related to return rate, profitable, investment capacity of the owner are not feasible). In this regard, the lifetime of current vessels must be considered and some flexibility in the technology change should be allowed to assure compliance with the HCFCs phase-out schedule. • Market penetration of low-GWP alternatives is critical! Ample time should be given in search of and for test run of new refrigerants. Countries that are “technology takers” suffer the double as the low GWP alternatives will take much longer to be available at competitive costs. Training is also critical to assure that proper installation and maintenance is given. Aftermarket parts are also critical to assure sustainability. • In all workshops and consultations, the message given by stakeholders is that “All the end users should be comfortable with the new refrigerant” 	

PROJECT DESCRIPTION	
Country	Nepal
Stage of the HPMP	HPMP Stage I (2012-2020)
Implementing agency	UNDP (co-op. IA)
Project title	HCFC phase-out management plan
Subsector/application	RAC/ domestic air-conditioning / commercial/industrial refrigeration and air-conditioning
Alternative technology	R-32 (No ODP, GWP-675) and/or low GWP
Number of beneficiaries planned	18 beneficiaries planned. (15 domestic air-conditioning, and 3 for large commercial/ industrial refrigeration)
HCFC-22 to be phased out (mt)	153 Kgs planned. (including charge amount and servicing sector needs)
Funds approved (US \$)	US\$ 36,000
Co-funding commitment (US \$)	35% funded from project; 65% was co-financed by the beneficiaries
Planned date of completion	December 2020.
Description: The objective of the replacement incentive programme is to support and promote zero ODP and low GWP appliances in domestic refrigeration and air conditioning and in commercial sector.	
ACHIEVEMENTS AND IMPACT	
Number of beneficiaries assisted	24 (as of 31 July 2019)
HCFC-22 phased out (mt)	75 Kgs.
Co-funding provided (US \$)	USD 111,607
Actual date of completion	On-going
Main results obtained and any other environmental/economic impact achieved: Three meetings with government stakeholders and two workshops with multi-stakeholders were organized to promote this activity. A public call notice was published twice in newspaper to seek for interested end-users. The government could get very low response from the public calls and it was believe that due to public's lack of interest for (i) relative higher cost of alternative equipment and; (ii) need to go over screening and legal process to engage into programme. The government obtained support from equipment distributors, this was critical to establish a route to channel the incentives and facilitate access of end-user, since the customer can access the distributor of his/her trust to obtain technical and commercial support on the replacement. The distributor is responsible to complete all legal and bureaucratic steps on behalf of the end-user, the application is submitted to the Government whom will (or not) approve the incentive to be release. The NOU staff will verify the documents and approve the funds. This approach has worked very successful. Up to now, 34 installations were completed. On the monitoring side, the NOU undertake verification of installations based on sampling approach, also interacting with the end-user to assess the implementation performance of the project, and so far, no issues were raised by the end-users.	
Reasons for delay. If the project was discontinued, please explain the reasons and indicate to what activities the funding was reallocated: The project has faced some initial delays due to a confluence of issues: change of the National Ozone Officer and Assistant, the earthquake that hit Nepal requesting change of priorities from GOV and private sector and the lack of R-32 based units in the market at competitive costs with other high-GWP alternatives. Initial issues were resolved and since 2018 project is in full implementation, has already surpassed initial target, it is considered that there is a high demand of end-users seeking for support.	
REPLICABILITY AND SUSTAINABILITY	
Associated technical assistance/training provided	stakeholders workshop looked to sensitize target audience on the benefits of the alternate technologies. The distributors were training and are replicating energy savings approach to increase impact. Lower emissions, and no ODP features are also being informed.
Associated policies or regulatory measures planned/promulgated, if any	Yes, the government put a ban on new air-conditioners with HCFC-22.
Number of additional end-users that followed the same approach as a result of the project	Not available
Comments on the reasons for success or failure of the project and recommendations: Despite the challenges faced in the beginning, the project has gained its momentum is demonstrating to be successful. Project is still ongoing.	

PROJECT DESCRIPTION	
Country	Sri Lanka
Stage of the HPMP	Stage I
Implementing agency	UNDP
Project title	HCFC Phase-out Management Plan
Subsector/application	Air-conditioners (Domestic air-conditioning up to 2 TR capacity)
Alternative technology	R-32 or other low GWP technology
Number of beneficiaries planned	204 (domestic and commercial)
HCFC-22 to be phased out (mt)	520 kg (including charge amount and servicing sector needs)
Funds approved (US \$)	60,866 (requested funds were US\$137,000; however, the approval was of US\$ 60,866) It includes replacement and TA activities.
Co-funding commitment (US \$)	Incentive payment depend on the cooling capacity was paid to end user and balance cost of the Air Conditioner was borne by the end user. Approximately 15-25% from the project and 75-85% by the beneficiary.
Planned date of completion	December 2020
Description: Objective of this project was to encourage purchasing of new technology domestic Air Conditioners working on zero ODP, Low GWP refrigerant such as R 32 or R 290. It was related to new purchase and majority as replacement of old ACs worked on R-22. Modality of incentive paid for a unit of AC was as follows: 9,000 Btu/h – US\$ 120; 12,000 Btu/h -US\$ 150, 18,000 Btu/h – US\$ 200, 24,000 Btu/h – US\$ 250	
ACHIEVEMENTS AND IMPACT	
Number of beneficiaries assisted	199 (as of 31 July 2019)
HCFC-22 phased out (mt)	520 Kg of HCFC-22 eliminated
Co-funding provided (US \$)	166,410
Actual date of completion	Project ongoing.
Main results obtained and any other environmental/economic impact achieved: The project has not yet been completed. Preliminary results are showing that the Sri Lankan Government is being able to promote R-32 as a suitable replacement for installations that current work or aim to on R-22. A strong awareness programme was put in place so general public could be aware of low GWP alternative technologies available in the country. Based on the incentives, customers have opted for R-32 ACs upon AC replacement actions. At present, leading importers are fully aware of existence and technical features of R-32 ACs up to 5 RT, as well as have access to main global suppliers.	
Reasons for delay. If the project was discontinued, please explain the reasons and indicate to what activities the funding was reallocated: NA	
REPLICABILITY AND SUSTAINABILITY	
Associated technical assistance/training provided	NOU provided training on handling of flammable refrigerant to RAC technicians under the Good Practices of Refrigeration Training Programme. Database of Technicians are being prepared to enhance of training on priority basis.
Associated policies or regulatory measures planned/promulgated, if any	Recommended to include a clause to the Government Procurement Guidelines to prioritize purchase of equipment with low GWP alternatives for acquisition of new and replacement of existing equipment. Low-GWP technologies considerations were incorporated with Green Building Guidelines, and higher grading/standard allows allocation of 2 extra marks for buildings that use 0 ODP, Low GWP AC systems
Number of additional end-users that followed the same approach as a result of the project	No external monitoring is at place, however, per interviews collected from importers, it is perceived that customers are open for new technologies (R 32, R 290), being that the argument over energy efficiency is remarkably positive. NOU is continuing follow up the market trends.
Comments on the reasons for success of failure of the project and recommendations: At the beginning of the project, there were no importer of R-32 ACs. Cost of early shipments of R-32 ACs were higher compare to R-410A ACs, and even incentive proposed was not enough to compensate the price difference. However, with the increase of number of importers who imported R-32 ACs the scenario has changed, but still it took several years from the approval of the Stage I to bring AC price competitive nowadays, being that gross of replacements occurred between 2018 and 2019. Propaganda against R-32 as mild flammable refrigerant was a barrier for market penetration, and is still a great barrier for introduction of R-290a units (allied to lack of suppliers willing to export these A3 units). However, the project was critical to support the market penetration of the R-32 technology. Incentive payment was the “game changer” for the beneficiaries and helped to bridge the gap of the difference of cost of new technology equipment. The Government consider that would be highly recommended to continue similar incentives under the HPMP stage II to minimize the burden when acquiring new alternative technologies. Monitoring funding (for both EE gains and replicability results) should also be allocated.	

PROJECT DESCRIPTION	
Country	Togo
Stage of the HPMP	Stage I
Implementing agency	UNEP/UNIDO
Project title	- Project title: HCFC phase-out management plan - Activity title: Replacement scheme aiming to facilitate the replacement of HCFC-based air-conditioners to low-GWP alternative
Subsector/application	- Project subsector/application: servicing sector - Activity subsector/application: replacement of 70 HCFC-22-based air-conditioners (12,000 BTU and 18,000 BTU cooling capacity) by R-290-based air-conditioners (18,000 BTU cooling capacity)
Alternative technology	Natural refrigerant (propane, R-290)
Number of beneficiaries planned	3 facilities
HCFC-22 to be phased out (mt)	0.2145 (ODS 3.9)
Funds approved (US \$)	USD 90,000
Co-funding commitment (US \$)	The beneficiaries will have to provide inland transportation for the equipment and install the R-290-based air-conditioners.
Planned date of completion	December 2021
Description:	
<p>Facilities were identified to benefit from the financial incentive scheme aiming to facilitate the replacement of HCFC-based air-conditioners with low-GWP alternatives. The beneficiaries will have to provide inland transportation for the equipment and install them. UNIDO will provide technical support during the installation process. A supplier in a position to deliver the required air-conditioners was identified and commercial contract was established. The procurement process is ongoing and is expected to be completed during the course of 2019.</p> <p>The planned payment of incentives to commercial facilities to convert refrigeration systems from HCFC-22 to low-GWP alternatives was replaced by a replacement scheme expanded to more buildings due to inadequate funding for the refrigeration conversion after closer survey of proposed beneficiaries.</p>	
ACHIEVEMENTS AND IMPACT	
Number of beneficiaries assisted	Project is ongoing
HCFC-22 phased out (mt)	Project is ongoing
Co-funding provided (US \$)	N/A
Actual date of completion	Project is ongoing
Main results obtained and any other environmental/economic impact achieved: Project is ongoing	
Reasons for delay. If the project was discontinued, please explain the reasons and indicate to what activities the funding was reallocated: Project is ongoing	
REPLICABILITY AND SUSTAINABILITY	
Associated technical assistance/training provided	Project is ongoing
Associated policies or regulatory measures planned/promulgated, if any	Development of guidelines, taking into account international experience, for installation and servicing of R-290-based equipment- still ongoing.
Number of additional end-users that followed the same approach as a result of the project	Project is ongoing
Comments on the reasons for success of failure of the project and recommendations: Project is ongoing	

Group II Projects to demonstrate alternative technologies

PROJECT DESCRIPTION	
Country	Chile
Stage of the HPMP	HPMP (2011-2025)
Implementing agency	UNDP
Project title	HCFC phase-out management plan Stage 1
Subsector/application	RAC/ Commercial /Supermarkets
Alternative technology	Non established.
Number of beneficiaries planned	5
HCFC-22 to be phased out (mt)	2.15 mt
Funds approved (US \$)	485,863
Co-funding commitment (US \$)	
Planned date of completion	Completed (December 2018)
Description: The project aimed to provide technical assistance and co-financing to a determined number of supermarkets (including large, medium and small examples) in the selection of the most viable technology, the project design, the installation and servicing. The converted installations would become demonstrative cases to be documented and disseminated in the sector. The demonstrative conversions would help understand the in-situ complexities and barriers of adopting these technologies in order to help remove them to encourage others to replicate.	
ACHIEVEMENTS AND IMPACT	
Number of beneficiaries assisted	2 (3 facilities)
HCFC-22 phased out (mt)	Aprox. 3.30 mt
Co-funding provided (US \$)	USD 482,790 (from CCAC). Beneficiary companies invested more than USD\$ 1 million for the construction of the RAC system for each supermarket.
Actual date of completion	July 2018
Main results obtained and any other environmental/economic impact achieved: Transcritical CO ₂ technology was introduced into the country, becoming the default technology in new supermarkets for two (2) of the major supermarket chains in the country. Transcritical CO ₂ installations were between 15% and 40% more energy-efficient than comparable installation with HCFC-22 and R-507.	
Reasons for delay. If the project was discontinued, please explain the reasons and indicate to what activities the funding was reallocated: The project was delayed as supermarkets did not have experience on the management of the new technology, companies were afraid of be the first to try the technology. Also, it was difficult to match the project's schedule with the supermarket's business plan schedule. Another issue that caused delays in the implementation of the project was the difficulties to design an evaluation method that ensure a fair assessment between different approaches.	
REPLICABILITY AND SUSTAINABILITY	
Associated technical assistance/training provided	Workshops, awareness actions, information sharing and sensitization on alternatives technologies for the supermarket sector, mainly transcritical CO ₂ .
Associated policies or regulatory measures planned/promulgated, if any	N/A.
Number of additional end-users that followed the same approach as a result of the project	After the project was completed, 6 additional stores using transcritical CO ₂ as refrigerant were built.
Comments on the reasons for success or failure of the project and recommendations: The project was successfully implemented, although with some delays, with an approach that covered the technical and financial aspects for the introduction of a new technology. First, the project rose the awareness on the technologies available for phase out the use of HCFC in the supermarket sector, then trained the technical decision-makers of the beneficiary companies on the technology and reduced the risk associated with the adoption of the new technology when covered part of the incremental costs for the adoption of the new technology. Another reason for the success of the project was that the company selected for the design and installation of the new systems had ample experiences in the selected technology in other regions and that the company was closely supported by its technological suppliers. Transcritical CO ₂ - based systems installed in Chile are more energy-efficient than comparable HCFC-22 of HFC-based systems, which helped to the technical teams at the supermarket chains to take the decision to select transcritical CO ₂ as the default technology for new installations.	

PROJECT DESCRIPTION	
Country	Ecuador
Stage of the HPMP	HCFC phase-out management plan (stage I, third tranche)
Implementing agency	UNIDO
Project title	Demonstration Project of R-290 (propane) as an alternative refrigerant in a cold store used for flower storage.
Subsector/application	Cold store used for flower storage to 1°C (±2°C) whose cooling system has six evaporator blocks, which are fed by two externally located condensing unit, with a capacity of 160,000 BTU / hr approximately.
Alternative technology	As part of a demonstration project, it is proposed to convert the refrigeration systems that provide the flow coldstore with cooling to R-290.
Number of beneficiaries planned	For demonstration one beneficiary is selected. The same beneficiary can replicate the results in at least 10 cold rooms used for flower storage or store perishable goods in similar conditions.
HCFC-22 to be phased-out (mt)	0,03 Ton
Funds approved (US \$)	As component of HPMP, no specific funds for the project
Co-funding commitment (US \$)	In-kind and approximately 10,000 USD
Planned date of completion	No completion specified. It is planned for November 2019.
Description:	
<p>On behalf of the Government of Ecuador, UNIDO as the designated implementing agency has submitted as component of the HPMP the demonstration project of R-290 as an alternative refrigerant in a cold store used for flower storage.</p> <p>The project objectives are:</p> <ul style="list-style-type: none"> - to demonstrate the safe use of R-290 as a low-GWP refrigerant in a cold store used for flower storage; - validate the requirements for the operation of cold rooms with R-290 refrigerant; - demonstrate the safe handling and proper risk management for the introduction of flammable refrigerants in the conservation of perishable products, to encourage possible adoption in similar applications. 	
ACHIEVEMENTS AND IMPACT	
Number of beneficiaries assisted	Hilsea Company
HCFC-22 phased out (mt)	Installed capacity 0,03 service ca. 0.01 mt per year
Co-funding provided (US \$)	Not specified
Actual date of completion	Ongoing
Main results obtained and any other environmental/economic impact achieved:	
<ul style="list-style-type: none"> - Successful implementation of this project would be an advance in technology and would enable the introduction of a low-GWP alternative to a sector that otherwise can migrate to HFC-404A or HFC-507A. - Application of methods to risk assessment and eliminate sources of ignition in refrigeration systems with flammable refrigerants. - Technical training and qualification of the personnel responsible for providing the refrigeration maintenance and installation with HC as refrigerant. - This project will generate inputs for updating/formulating the regulations and standards for flammable refrigerants that Ecuador intends to adopt during the implementation of the HPMP Stage II. - Dissemination workshops are planned at the end of the project, focused on end users related to this sector or with similar cooling needs. - Application of methodology based on social, economic and environmental life cycle analysis to determine the best replacement option for refrigeration technologies that deplete the ozone layer and cause global warming. 	
Reasons for delay. If the project was discontinued, please explain the reasons and indicate to what activities the funding was reallocated: N/A	
REPLICABILITY AND SUSTAINABILITY	
Associated technical assistance/training provided	<p>A workshop will be carried out to provide support for the beneficiary company and the company responsible for the installation of the HC refrigeration equipment. The training included both theory and practice workshops with an international expert that focused on the safe handling of R-290 refrigerant during the installation and maintenance services of refrigeration systems. The main topics presented were:</p> <ul style="list-style-type: none"> - HCFC -22 system charged with R-290; - Risk assessment and eliminate sources of ignition in refrigeration systems with flammable refrigerants; - Modifications to electrical components and enclosures/panels; - Methods of leak detection system.

PROJECT DESCRIPTION	
Country	Ecuador
Associated policies or regulatory measures planned/promulgated, if any	As component of the HPMP, the Government of Ecuador is promoting the use of hydrocarbon. For the training activities, the demonstration and use of hydrocarbon as alternative is compulsory. Furthermore, Stage II of Ecuador's HPMP and Kigali Amendment include activities for development and establishment of regulations and standards for flammable refrigerants that will allow the safe handling in the use and servicing of HC in refrigeration equipment. The project's outputs will be taken as input for the regulations or standards that will be formulated.
Number of additional end-users that followed the same approach as a result of the project	The flower export association has provided support on this project and the results will be disseminated through them. It is expected that other producers will also follow the approach. In addition, the information generated on the use and measures to ensure the safe handling of HC in refrigeration systems would be made available, which could benefit other projects in the region.
Comments on the reasons for success of failure of the project and recommendations: The project is being implemented with local service and engineering companies and training is provided to the service companies. All the components and equipment has been purchased through local suppliers. It is possible to replicate results like this.	

PROJECT DESCRIPTION	
Country	Georgia
Stage of the HPMP	I
Implementing agency	UNDP
Project title	Demonstration projects to use natural refrigerants
Subsector/application	Servicing
Alternative technology	CO2 as a target for demonstration
Number of beneficiaries planned	1
HCFC-22 to be phased out (mt)	TBD – after a market search for potential partners is completed
Funds approved (US \$)	91,300
Co-funding commitment (US \$)	TBD – after a market search for potential partners is completed
Planned date of completion	December 2020
Description: HPMP-I had long planned for demonstration of a new technology running on CO2 or ammonia with procurement of a complete package for smaller scale application depending on market prices.	
ACHIEVEMENTS AND IMPACT	
Number of beneficiaries assisted	0
HCFC-22 phased out (mt)	TBD – after a market search for potential partners is completed
Co-funding provided (US \$)	TBD – after a market search for potential partners is completed
Actual date of completion	TBD – planned December 2020
Main results obtained and any other environmental/economic impact achieved: Georgia has not started any implementation except identification of potential project sites since the funding in the previous tranche was not enough to have a type of demonstration they wanted to have. Currently the data collection process is ongoing which will help see which type of demos could be financed by the project, and on what conditions (like co-finance, type of technology).	
Reasons for delay. If the project was discontinued, please explain the reasons and indicate to what activities the funding was reallocated: N/A. NOU-Georgia planned to combine remaining funds from Tranche 2 and new funding from Tranche 3 to attempt to capitalize on this opportunity and make the project more successful due to generally high prices of new technologies related to CO2 or ammonia as compared to HFC systems available on the market.	
REPLICABILITY AND SUSTAINABILITY	
Associated technical assistance/training provided	Training will be provided by supplier of equipment, if the demonstration project is successful.
Associated policies or regulatory measures planned/promulgated, if any	To be reported later
Number of additional end-users that followed the same approach as a result of the project	Only one project could be possible with available funding. Replication results will mostly depend on capital and operating costs related to the new equipment.
Comments on the reasons for success of failure of the project and recommendations: To be reported later in 2020.	

PROJECT DESCRIPTION	
Country	Grenada
Stage of the HPMP	Stage I
Implementing agency	UNEP
Project title	Demonstration project for the replacement of existing HCFC-based equipment
Subsector/application	Split AC systems
Alternative technology	Hydrocarbons
Number of beneficiaries planned	Not specified
HCFC-22 to be phased out (mt)	Not specified
Funds approved (US \$)	9,000
Co-funding commitment (US \$)	No additional funding was provided
Planned date of completion	December 2020
Description: A small-scale demonstration project for the replacement of existing HCFC-based equipment was approved at ExCom-77, as part of UNIDO's component of Grenada's HPMP Stage I.	
ACHIEVEMENTS AND IMPACT	
Number of beneficiaries assisted	2 AC units replaced at a community college

PROJECT DESCRIPTION	
Country	Grenada
HCFC-22 phased out (mt)	Not available
Co-funding provided (US \$)	No co-funding provided
Actual date of completion	December 2018
<p>Main results obtained and any other environmental/economic impact achieved: The National Ozone Unit (NOU) in the Energy Division of the Ministry of Infrastructure Development, Public Utilities, Energy, Transport & Implementation, in conjunction with the United Nations Industrial Development Organisation (UNIDO) procured two (2) split AC units using natural refrigerants, R-290 (Propane), that were installed in selected buildings to monitor and compare their performance and energy efficiency.</p> <p>The electrical consumption data of the AC units were collected using an efergy e2 classic energy monitor. The consumption was logged on an hourly basis in kilowatt hours (KWh). From this data other parameters such as energy cost and carbon emissions can be calculated. The electricity consumption of the AC units was logged for a minimum of one month (excluding weekends and holidays). Electricity consumption comparisons were made between the units that were previously installed (R-410A) and the replacement R-290 units.</p> <p>In one case, the previously installed 18,000 BTU (5.2KW) split AC unit using R-410A was replaced with the R-290 unit. The exercise showed that the R-290 unit performed approximately 30.03% more energy efficient than the previously installed unit, which resulted in savings in running costs and reduction in GHG emissions.</p>	
<p>Reasons for delay. If the project was discontinued, please explain the reasons and indicate to what activities the funding was reallocated:</p>	
REPLICABILITY AND SUSTAINABILITY	
Associated technical assistance/training provided	<p>Over 60% RAC technicians in Grenada have received some level of training in hydrocarbon refrigerant technology. This training is geared for RAC technicians with at least three years' experience in the field. The focus of the training is on the safe handling of flammable refrigerants. Day one of the training covers the theoretical aspects and day two is used for practical sessions. Some of the major topics covered in the training included:</p> <ul style="list-style-type: none"> • Properties of hydrocarbons • Risk assessment • Legislation, policy and standards • Fire and electrical safety • Charge limitation and room size calculations • Personal protective equipment and specialize tools and equipment required for installation and servicing • Leak detection • Installation, servicing and maintenance practices • Brazing and pipe connections
Associated policies or regulatory measures planned/promulgated, if any	<p>Through a series of consultations and workshops, with the last one being a National Refrigerant Symposium for stakeholders in the RAC industry in Grenada (organized on June 28th, 2019 in observance of the World Refrigeration Day), the NOU Grenada managed to raise awareness of stakeholders' on the importance of the natural refrigerants. Among the stakeholders present at the symposium were: RAC equipment and refrigerant importers, procurement officers, government officials, RAC technicians, the Grenada Bureau of Standards, academia and training institutions and end users.</p> <p>Until recently hydrocarbon-based AC systems were not available in Grenada. At the symposium, participants were informed that there are two Grenadian based companies that have Hydrocarbon (R290) mini-split AC units commercially available and that there are three companies already supplying the hydrocarbon refrigerants. An announcement was made on the testing of R-32 equipment by another company and to make them commercially available on the local market by the third quarter of 2019. A rebate of XCD 100.00 will be offered for every ton of cooling capacity of R-22 and R-410A replaced with the new R-32 equipment. The representative from the Grenada Bureau of Standards also informed of the two new standards that were established for the RAC sector and gave an insight on others that are currently being developed.</p>

PROJECT DESCRIPTION	
Country	Grenada
Number of additional end-users that followed the same approach as a result of the project	Not available at this time.
<p>Comments on the reasons for success of failure of the project and recommendations: This study was carried out using business-as-usual (BAU) scenarios therefore the information presented is specific to the environment where units were installed and monitored. Therefore, individual results and efficiencies may vary at other locations.</p> <p>R-290 split ACs are a sustainable option for Grenada with their ozone and climate friendly refrigerant properties. In addition, they show tremendous potential for energy and cost savings when compared to the previously installed units using fluorinated hydrocarbons.</p>	

PROJECT DESCRIPTION	
Country	Iran (Islamic Republic of)
Stage of the HPMP	I
Implementing agency	Germany
Project title	Financial incentives for technology demonstration
Subsector/application	Refrigeration sector – Introducing Sealed system to beneficiaries, replace the flare connection to brazed one and introduce the brazed component to the market and technicians for using leak tight system, Do demonstration on 3 supermarket systems and hold workshop to promote this technology
Alternative technology	Introduce sealed system for R290
Number of beneficiaries planned	2
HCFC-22 to be phased out (mt)	111 mt (6,1 ODP Tons)
Funds approved (US \$)	415,000 USD
Co-funding commitment (US \$)	-
Planned date of completion	31.12.2015
Description: Nowadays more and more brands are entering the chain supermarket market but during the time when the project took place Refah and Shahrvand were the biggest supermarket chains in Iran (Islamic Republic of). Around 150 branches of Refah and 50 branches of Shahrvand exist. As a consequence of this (market) situation it was decided to start the demonstration project with them and introduce the sealed system as the fundamental point for promoting R290 and HC systems in general. Brazed components were introduced to the market. In cooperation with local technicians and under supervision of an international technical advisor 3 systems were converted to leak tight systems and at the end a workshop was hold for all technicians of these two supermarkets in order to present this new technology and demonstration project itself to them. The technical handbook “Guidelines for Leakage Reduction and HCFC Emission Reduction in Supermarket Refrigeration Systems” was developed, translated to Farsi, printed and distributed to the beneficiaries.	
ACHIEVEMENTS AND IMPACT	
Number of beneficiaries assisted	2 beneficiaries (Refah and Shahrvand) but in total 3 supermarket systems have been converted (2 of Refah and 1 for Shahrvand).
HCFC-22 phased out (mt)	111 mt (6,1 ODP Tons)
Co-funding provided (US \$)	-
Actual date of completion	2014
Main results obtained and any other environmental/economic impact achieved: Introducing leak tight system to the beneficiaries in order to decrease the release of R22 into the atmosphere and also practice with brazed joint and components as the fundamental aspects in using R290 systems.	
Reasons for delay. If the project was discontinued, please explain the reasons and indicate to what activities the funding was reallocated:	
REPLICABILITY AND SUSTAINABILITY	
Associated technical assistance/training provided	Two days workshop was hold for all technicians of these two supermarket and the new technology and demonstration project introduce to them. The technical handbook “Guidelines for Leakage Reduction and HCFC Emission Reduction in Supermarket Refrigeration Systems” was developed, translated to Farsi, printed and distributed to the beneficiaries.
Associated policies or regulatory measures planned/promulgated, if any	Banned on import of RAC equipment that consist of R22
Number of additional end-users that followed the same approach as a result of the project	Nowadays more and more brands are entering the chain supermarket market but during the time when the project took place Refah and Shahrvand were the biggest supermarket chains in Iran (Islamic Republic of). Around 150 branches for Refah and 50 branches for Shahrvand exist.
Comments on the reasons for success of failure of the project and recommendations: Availability of the brazed equipment on market was a challenge and is crucial so that the technicians are able to use this equipment.	

PROJECT DESCRIPTION	
Country	Mauritius
Stage of the HPMP	HCFC Complete phase out
Implementing agency	GIZ
Project title	HCFC Phase-out Management Plan
Subsector/application	AC
Alternative technology	R-290
Number of beneficiaries planned	Still planned
HCFC-22 to be phased out (mt)	(as per the approved proposal)
Funds approved (US \$)	250,000
Co-funding commitment (US \$)	(funds committed by beneficiaries, government or other sources, including the level and source of the fund)
Planned date of completion	(as per the approved proposal) 2030
<p>Description: (description of the main objective of the project, whether it is related to conversions, replacements of systems or any other assistance to the end-user; and the modality of the incentive, i.e., what is paid by the Fund and what is paid by the beneficiary)</p> <p>The HPMP for Mauritius was approved already at the 63rd Excom. The project had originally wanted to implement an end user incentive scheme for converting HCFC equipment to low GWP technology but following the Decision 72/17, this activity was revised in the 3rd tranche submission in 2017. Currently the plan is to use these funds to fund the supermarket conversion as well as support the creation of a supply chain for R290 ACs through an incentive scheme. The project implementation is still being planned as the NOU is in consultations with the various stakeholders on it.</p>	
ACHIEVEMENTS AND IMPACT	
Number of beneficiaries assisted	still ongoing
HCFC-22 phased out (mt)	(annual amount of HCFC-22 used to serve the converted/replaced systems)
Co-funding provided (US \$)	(indicate the value and the source of the co-funding)
Actual date of completion	(if completed)
<p>Main results obtained and any other environmental/economic impact achieved: (description of the main results achieved by the implementation of the project against the original plan; if none, explanation of the reasons)</p> <p>NA</p>	
<p>Reasons for delay. If the project was discontinued, please explain the reasons and indicate to what activities the funding was reallocated: NA</p>	
REPLICABILITY AND SUSTAINABILITY-	
Associated technical assistance/training provided	Under the HPMP all efforts are already ongoing to ensure that the trainers and technicians are trained in both CO2 for the supermarkets and HC for ACs
Associated policies or regulatory measures planned/promulgated, if any	Mauritius is committed to achieve early phase out of HCFC while discouraging use of high GWP refrigerants and therefore CO2 is clearly the option that is best suitable for the supermarket sector.
Number of additional end-users that followed the same approach as a result of the project	
<p>Comments on the reasons for success of failure of the project and recommendations: (lessons learned on the parameters that should be in place for the project to be successful and any other lesson learned that could be applicable to future similar projects) Ongoing.</p>	

PROJECT DESCRIPTION	
Country	Mauritius
Stage of the HPMP	HCFC Complete phase out
Implementing agency	GIZ
Project title	HCFC Phase -out Management Plan
Subsector/application	Demonstration project - Supermarket
Alternative technology	CO ₂
Number of beneficiaries planned	1
HCFC-22 to be phased out (mt)	(as per the approved proposal)
Funds approved (US \$)	200,000
Co-funding commitment (US \$)	(funds committed by beneficiaries, government or other sources, including the level and source of the fund)
Planned date of completion	(as per the approved proposal) 2028
Description:	
<p>The HPMP for Mauritius was approved already at the 63rd ExCom. The project had originally wanted to do a demo for a working supermarket. However, at the time of implementation the NOU through discussions with the supermarkets reached a conclusion that there was a general know-how deficient on CO₂ technologies. So instead, a demonstration unit for CO₂ use in the supermarket sector was designed specifically for the UDM (the local university). 2 trainings systems have been provided one working solely on CO₂, another a cascade system using Ammonia and CO₂. This has been done for training purposes for students and working technicians. There is ongoing consultations with supermarket owners to determine if a local supermarket can be converted to use CO₂.</p>	
ACHIEVEMENTS AND IMPACT	
Number of beneficiaries assisted	still ongoing
HCFC-22 phased out (mt)	(annual amount of HCFC-22 used to serve the converted/replaced systems)
Co-funding provided (US \$)	(indicate the value and the source of the co-funding)
Actual date of completion	(if completed)
Main results obtained and any other environmental/economic impact achieved: (description of the main results achieved by the implementation of the project against the original plan; if none, explanation of the reasons)	
<p>Mauritius has become one of the few countries in the world that has a state of the art CO₂ system at a local training institute. This unit has allowed graduating technicians to gain hands-on training on how to work with CO₂. This we believe will help the local supermarket sector move towards this technology which is now globally becoming the Business as Usual technology option for this sector.</p>	
Reasons for delay. If the project was discontinued, please explain the reasons and indicate to what activities the funding was reallocated:	
NA	
REPLICABILITY AND SUSTAINABILITY	
Associated technical assistance/training provided	Training was provided during the time of commissioning of the system to the trainers at UDM and other local institutions as well as to industry technicians interested in working with CO ₂ . This has also become part of the regular RAC courses conducted at the UDM.
Associated policies or regulatory measures planned/promulgated, if any	Mauritius is committed to achieve early phase out of HCFC while discouraging use of high GWP refrigerants and therefore CO ₂ is clearly the option that is best suitable for the supermarket sector.
Number of additional end-users that followed the same approach as a result of the project	This is ongoing and before the end of the HPMP it is hoped that supermarkets will be adopting this technology. NOU has been in consultations with the supermarkets on this.
Comments on the reasons for success of failure of the project and recommendations: (lessons learned on the parameters that should be in place for the project to be successful and any other lesson learned that could be applicable to future similar projects)	
Ongoing.	

PROJECT DESCRIPTION	
Country	Saint Vincent and the Grenadines
Stage of the HPMP	Stage 1
Implementing agency	UNEP/UNIDO
Project title	Demonstration project for retrofitting to HC refrigerants
Subsector/application	Commercial AC
Alternative technology	Hydrocarbon refrigerant
Number of beneficiaries planned	2
HCFC-22 to be phased out (mt)	Not specified
Funds approved (US \$)	US \$ 99,800
Co-funding commitment (US \$)	No co-funding was provided
Planned date of completion	December 2026
Description: Demonstration project for retrofitting to HC refrigerants in a government and a private building, and provision of conversion kits, was approved for Saint Vincent and the Grenadines, as part of UNEP component of their HPMP. The aim of the pilot project was to provide a physical demonstration for what could be achieved, in terms of energy savings, through retrofitting to low-GWP refrigerants. With the expected positive results from the demonstration, the equipment owners and other stakeholders would recognize the advantages and benefits of retrofitting and reduce the use of HCFCs.	
ACHIEVEMENTS AND IMPACT	
Number of beneficiaries assisted	Two – a clinic and the National Archives
HCFC-22 phased out (mt)	Not available
Co-funding provided (US \$)	No co-funding was provided
Actual date of completion	Ongoing project
Main results obtained and any other environmental/economic impact achieved: The NOU, in cooperation with UNEP, has selected two buildings to be included in the pilot program. One is a clinic where most of the AC units are not working and in dire need. The other is the National Archives that also houses the Government’s servers. The technology of choice is HC based AC units, following intense training of RAC certified technicians. So far, preliminary needs assessment was done, and the equipment was purchased. Training and retaining was done as recently as July 2019. The installations are expected to commence soon.	
Reasons for delay. If the project was discontinued, please explain the reasons and indicate to what activities the funding was reallocated: N/A	
REPLICABILITY AND SUSTAINABILITY	
Associated technical assistance/training provided	So far, 104 technicians successfully completed their training in “Good Refrigeration Practices, Recovery, Recycling and Retrofitting of HCFCs, Alternative Technology and Natural Refrigerant with Particular Emphasis on HC Technology, with 16 specially trained under the retrofitting exercise” Description of the specific subjects of the training provided to support the project and the coverage in terms of technicians/end-users trained is as follows: Ozone layer depletion and the Montreal protocol; Refrigerant Issue; Introduction to Hydrocarbon; Refrigerant Safety; Guidelines for working with HCs; practical applications of refrigerants; Component service procedure; Conducting Conversions; Installation and servicing procedure; Case studies using Hydrocarbon for conversion; Practical work
Associated policies or regulatory measures planned/promulgated, if any	Not applicable at this point, the project is still ongoing.
Number of additional end-users that followed the same approach as a result of the project	Not applicable at this point, the project is still ongoing.
Comments on the reasons for success of failure of the project and recommendations: Project is ongoing.	

PROJECT DESCRIPTION	
Country	Venezuela (Bolivarian Republic of)
Stage of the HPMP	Stage II, Manufacturing Sector
Implementing agency	UNIDO
Project title	Phase out HCFC in the manufacturing sector
Subsector/application	Service sector. Chiller used in hospital
Alternative technology	R-290 Cold water chiller
Number of beneficiaries planned	N/A
HCFC-22 to be phased out (mt)	0.005 mt
Funds approved (US \$)	Integrated in HPMP
Co-funding commitment (US \$)	In kind
Planned date of completion	Planned for end 2019
<p>Description: The project aims to introduce non-ODS low GWP alternatives to the manufacturing sector in the country. The selected alternative for the project was R-290 locally bottled which is widely available, fulfils the standards, reduces energy consumption and is a reliable technology.</p> <p>The objective of the conversion was to phase out of 5 (five) kilos of HCFC-R22 and ca. 3 (three) kilos consumed for service per year. The HCFC-22 based unit was dismantled and replaced with a R-290 unit with equivalent capacity (5 TR – 60000 Btu) compact air conditioning.</p>	
ACHIEVEMENTS AND IMPACT	
Number of beneficiaries assisted	One beneficiary, a second one has been selected.
HCFC-22 phased out (mt)	0.005 mt and ca. 0.003 mt used for service per year
Co-funding provided (US \$)	N/A
Actual date of completion	November 2018
<p>Main results obtained and any other environmental/economic impact achieved:</p> <p>The objectives of the project were achieved. The R-290 based unit is installed and working with energy consumption reduction of ca. 20% compared to the previous unit. The old HCFC-R22 was dismantled and destroyed, average refrigerant service consumption was more than 50% of total in the unit.</p> <p>The new unit, designed and assembled locally by national companies and experts, was installed by a local refrigeration service company. The project was promoted and presented to other producers through the refrigeration chamber in the country.</p> <p>The possibility of using A3 classified refrigerants, safely and without altering the performance of the equipment was demonstrated. The results will contribute to promoting the use of substances and technologies with low-GWP in unusual applications.</p>	
<p>Reasons for delay. If the project was discontinued, please explain the reasons and indicate to what activities the funding was reallocated: N/A</p>	
REPLICABILITY AND SUSTAINABILITY	
Associated technical assistance/training provided	The project, in addition to the replacement of the equipment, included training in refrigeration good practices for the personnel in charge of servicing the system. It was a good opportunity to train other service providers and technicians in safely handling of low GWP alternatives and promotion of R-290 as alternative.
Associated policies or regulatory measures planned/promulgated, if any	The National Ozone Unit has a plan to promote HC as refrigerant under the HPMP activities. The training in service and promotion of hydrocarbon is priority in the country.
Number of additional end-users that followed the same approach as a result of the project	It is expected to have a second conversion and promote the results through the refrigeration chamber. Other end users which may be interested will receive support from the project.
<p>Comments on the reasons for success of failure of the project and recommendations:</p> <p>Training of personnel related to system maintenance is very important to ensure the proper functioning of the system. Periodic monitoring will allow the early detection of equipment malfunctions, avoiding damages.</p> <p>The strengthening of human resources and technology will allow replicating this experience in a simple and fast way.</p>	

Group III: Leakage reduction programmes at end-users

PROJECT DESCRIPTION	
Country	Brazil
Stage of the HPMP	Stage 1
Implementing agency	Germany
Project title	HCFC-22 Better Containment Demonstration Projects in Brazilian Supermarkets
Subsector/application	Commercial Refrigeration / Compound Systems in Supermarkets
Alternative technology	Introduction of sealed system design and best maintenance practices for HCFC-22 containment
Number of beneficiaries planned	5
HCFC-22 to be phased out (mt)	909 (reduction target for the whole servicing sector to be achieved by training and capacity building activities, technical assistance and outreach campaigns)
Funds approved (US \$)	860.736,00
Co-funding commitment (US \$)	-
Planned date of completion	31.12.2015
Description: The project focuses on improved containment practices for existing HCFC systems by demonstrating how to improve system tightness by replacing old inefficient parts and using better seals, valves, pipe connections etc. The case studies differ from one another in terms of refrigerant charge, type of system and critical components. This practice, which leads to energy savings and lower demand for HCFCs is efficient, innovative and costs are comparatively low, enhancing the replication of the methodology by other supermarkets. Costs for equipment and tools, engineering and training were covered by the Fund. The selected partner supermarkets paid for technicians' service, consumables and servicing tools.	
ACHIEVEMENTS AND IMPACT	
Number of beneficiaries assisted	3
HCFC-22 phased out (mt)	0,774 mt
Co-funding provided (US \$)	-
Actual date of completion	to be completed until 31.12.2019
Main results obtained and any other environmental/economic impact achieved:	
Summary of the main findings from the first two interventions:	
- Annual leakage rate before the project:	
<ul style="list-style-type: none"> • Supermarket 1: 62% of the system charge size (no leak alarms were reported since the intervention in 04/2018): The containment of 118 kg of HCFC-22 corresponds to a reduction of direct emissions of 213.580 kg of CO₂ equivalent. • Supermarket 2: 130% of the system charge size (no leak alarms were reported since the intervention in 09/2018): The containment of 156 kg of HCFC-22 corresponds to a reduction of direct emissions of 282.360 kg of CO₂ equivalent. 	
- Improvements in system performance, e.g. superheat reduction, reduction of discharge temperature to recommended values; reduction of condensation temperature; increase of evaporation temperature and thus increasing the performance of the system.	
- Average COP increase:	
<ul style="list-style-type: none"> • Supermarket 1: Average COP increase of 13% was achieved in the case of the plus cooling system and 4% in the case of the minus cooling system. • Supermarket 2: Average COP increase of 7,4% was achieved in the case of the plus cooling system. 	
- Increase in energy efficiency and therefore the reduction of energy consumption contributes to the reduction of indirect emissions as well.	
- Improvement of HCFC-22 containment practices adopted by the maintenance team of the supermarkets was clearly noted.	
Reasons for delay. If the project was discontinued, please explain the reasons and indicate to what activities the funding was reallocated:	
The technical condition of the supermarket systems was more critical than expected and interventions in order to correct the identified problems were much more complex. Some examples:	
<ul style="list-style-type: none"> - Refrigerant leakages are the focus of the project. Annual refrigerant consumptions of the selected supermarket RAC systems were up to 200% of the initial refrigerant charge. Most of the selected systems comprise of hundreds of mechanical circuit components connections and provide constant sources of refrigerant leakage. Wrong dimensioning, selection and installation practices of refrigerant circuit components lead to abrupt losses of high amounts of refrigerants. Executed insulation of circuit tubing and components (filter elements, suction header, liquid accumulators, etc.) is generally inadequate and lead to corrosion. In many cases pressure vessels are undersized in terms of the maximum allowable working pressure PS (for HCFC-22 refrigerant), safety valves are not dimensioned as required. Operating conditions of primary controllers are not balanced. Most compound plant systems do not operate energy efficient and minimum storage temperatures for frozen and chilled goods are not maintained. Strategic structure for scheduled and preventive maintenance is generally not integrated. 	

PROJECT DESCRIPTION	
Country	Brazil
	<ul style="list-style-type: none"> - Therefore, larger investments for equipment and for national and international technical consultancy were required even though it was not initially expected. - In addition, there had been delays in the delivery of purchased equipment and components, which had required special attention from the project team. In the meantime, changes to the original layout of the refrigeration system also occurred, which required a reassessment of the project as well as additional technical site visits and data collection. - Two supermarkets announced, close to the beginning of the implementation of the intervention plan, that they would like to decline from the project due to changing of corporate governance strategy, which intends to change the whole refrigeration system within the next two years to an indirect/direct CO₂/ R134-a subcritical cascade system. One supermarket could immediately be replaced by another with the same technical needs and the already purchased equipment could be used as intended. - In order to identify a suitable replacement for the second store, additional technical visits were made. However, given that all equipment purchased was designed and specified in accordance with the originally selected store and its refrigeration system, the project could not be implemented without additional investments in the vast majority of stores. Negotiations with some suitable supermarkets were not successful. - In order to make the best possible use of the equipment and materials, which were already purchased for the implementation of the last demonstration project, vocational training institutions were identified, among the ones that are already partners in the implementation of the HPMP best practice training program to receive the equipment as donation. The functional and sustainable use of the equipment was ensured through a careful selection process, which considers qualification criteria, such as: sustainability, proposed design and work plan, regional importance, synergies with activities already underway within the HPMP. - As HPMP Stage 2 has given priority to HCFC-22 containment in the AC sector, some of the partner schools are not offering training courses in the commercial refrigeration. Therefore, the donation of the equipment will improve the technical infrastructure for demonstration of sealed system design for commercial refrigeration. Besides that, it will increase the capacity of the training institutions for commercial refrigeration in the framework of the HPMP.
REPLICABILITY AND SUSTAINABILITY	
Associated technical assistance/training provided	Training of supermarket technical staff in best practices in commercial refrigeration, additional 4.800 refrigeration technicians trained in best practices (e.g. sealed system design, leak detection, brazing, recovery and recycling, data recording, planned preventive maintenance)
Associated policies or regulatory measures planned/promulgated, if any	The intention of the project was not to regulate the sector but to demonstrate best practices.
Number of additional end-users that followed the same approach as a result of the project	The project demonstrates to the supermarket sector in Brazil the possible best practices to improve the operation of their refrigeration systems with HCFC-22 or HFCs (e.g. 404A) with economic and environmental gains. The results are being widely disseminated and with the cooperation of the Brazilian Supermarket Association – Abras a great number of end -users will get to know the demonstrated methodology. Besides that, the refrigeration technicians involved in the implementation of the intervention plans also work for other supermarket chains and since they were enthusiastic with the results obtained for the supermarket they intend to apply the methodology to others supermarket chains with high leakage rates in the refrigeration system.
Comments on the reasons for success or failure of the project and recommendations:	
Lessons learnt are described below:	
<ul style="list-style-type: none"> - Components and equipment for the implementation of the intervention plans in the framework of better HCFC containment demonstration projects such as the fixed leak detection and monitoring system are not always available in the national market. Selecting alternative components and contacting potential national suppliers was harder than expected. Moreover, finding suppliers interested in participating in tenders and offering supplies in accordance with the project's technical specifications and requirements has proven to be a difficult task. The tender had to be published several times and the contract for the supply of all items listed in the tender notice took almost one year to be completed. In addition, most of the contracted suppliers had not been able to meet the agreed delivery schedules. - It took more than three years since the first visit to the selected supermarkets and the real start of the implementation due to the delay in the equipment procurement and the delivery. Therefore, several changes had occurred in the management structure and technical team of the supermarkets which led to the withdrawal of two initially selected supermarkets. 	