



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

Distr.
GENERALE

UNEP/OzL.Pro/ExCom/63/31
3 mars 2011

FRANÇAIS
ORIGINAL : ANGLAIS

COMITE EXECUTIF
DU FONDS MULTILATERAL AUX FINS
D'APPLICATION DU PROTOCOLE DE MONTREAL
Soixante-troisième réunion
Montréal, 4 – 8 avril 2011

PROPOSITION DE PROJET : GHANA

Le présent document comporte les observations et les recommandations du Secrétariat du Fonds sur la proposition de projet suivante :

Destruction

- Projet pilote de démonstration sur la gestion et la disposition des SAO résiduaire PNUD

FICHE D'EVALUATION DU PROJET – PROJET NON PLURIANNUEL

GHANA

TITRE DU PROJET

AGENCE D'EXECUTION

Projet pilote de démonstration sur la gestion et la disposition des SAO résiduares	PNUD
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ORGANISME NATIONAL DE COORDINATION : GHANA - EPA

DERNIERES DONNEES DE CONSOMMATION DE SAO SIGNALÉES POUR LE PROJET

A : DONNEES VISEES A L'ARTICLE 7 (TONNES PAO, 2009)

Annexe I, CFC	3,4		

B : DONNEES SECTORIELLES DU PROGRAMME DE PAYS (TONNES PAO, 2009)

SAO	Sous-secteur/quantité	Sous-secteur/quantité	Total
CFC			3,4

AFFECTATIONS AU TITRE DE L'ANNEE EN COURS	Financement total (\$ US)	Elimination totale (tonnes PAO)
	281 000	8,8

TITRE DU PROJET

CONSOMMATION DE SAO DE L'ENTREPRISE	s.o.
SAO A ELIMINER	s.o.
SAO A INTRODUIRE	s.o.
PROJET FAISANT PARTIE DU PLAN D'ACTIVITES ACTUEL	Oui
SECTEUR	SAO résiduares
SOUS-SECTEUR	Secteur de l'entretien en réfrigération

RETOMBEES DU PROJET	8,8 tonnes métriques de CFC-12
DUREE DU PROJET	36 mois
PARTICIPATION LOCALE	100 %
COMPOSANTE D'EXPORTATION	

MONTANT DEMANDE AU FONDS MULTILATERAL	\$ US	198 000
COUTS D'APPUI DE L'AGENCE D'EXECUTION (9 %)	\$ US	17 820
COUT TOTAL DU PROJET POUR LE FONDS MULTILATERAL	\$ US	215 820
RAPPORT COUT-EFFICACITE	\$ US/kg	22,5 SAO (métrique)
JALONS DE SURVEILLANCE DU PROJET		Inclus

RECOMMANDATION DU SECRETARIAT :	Pour examen individuel
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PROJET DESCRIPTION

Introduction

1. Au nom du gouvernement de la République du Ghana (« le Ghana »), le PNUD a initialement présenté à la 62^e réunion une proposition pour un projet pilote de démonstration portant sur la gestion et la disposition des substances appauvrissant la couche d’ozone (SAO), au montant de 377 677 \$ US. Lors des discussions, le Comité exécutif a décidé notamment de reporter à la 63^e réunion du Comité exécutif l’examen de ce projet pilote de démonstration présenté par le PNUD, en raison des problèmes liés à l’entretien des installations de disposition proposées et de l’absence d’un modèle de gestion détaillé afin d’assurer le soutien du projet après sa phase pilote (décision 62/28).

2. Au nom du gouvernement du Ghana, le PNUD a présenté à nouveau pour examen à la 63^e réunion la proposition révisée pour un projet pilote de démonstration sur la gestion et la disposition des SAO résiduelles au Ghana, pour un montant de 219 776 \$ US. Ce projet est présenté en accord avec la décision 58/19 et portera sur la disposition de 8,8 tm de SAO résiduelles au pays. Le gouvernement du Ghana demande que ce projet soit approuvé à la 63^e réunion.

3. A sa 57^e réunion, le Comité exécutif a fourni des fonds au PNUD pour préparer un projet pilote de démonstration sur les SAO pour le Ghana. A cette réunion, la décision prise visait à évaluer des projets pilotes de disposition des SAO qui seraient en accord avec la décision XX/7 de la Vingtième réunion des Parties, qui stipulait que les projets pilotes pourraient porter sur la collecte, le transport, l’entreposage et la disposition des SAO, en mettant l’accent sur des stocks regroupés ayant un potentiel élevé de réchauffement de la planète (PRG), et fourniraient un échantillon représentatif de diverses régions de pays visés à l’article 5. Les membres ont aussi souligné que les projets de démonstration sur la disposition des SAO devraient être réalisables et qu’ils devraient comprendre des possibilités de leviers financiers. Le Ghana a été l’un des pays sélectionnés en fonction de ces critères.

Données générales

4. A sa 58^e réunion, le Comité exécutif a discuté des critères et des lignes directrices à appliquer à la sélection de projets de disposition des SAO, ce qui a mené à la décision 58/19. Cette décision a jeté les bases pour l’examen et l’approbation de projets de démonstration sur la disposition des SAO. L’examen effectué par le Secrétariat reposait sur les principes établis par cette décision, ainsi que sur la décision 62/28. Le Secrétariat a appliqué le sous-paragraphe a) ii) de la décision, qui précise qu’aucun financement ne sera disponible pour la collecte des SAO lors de cet examen. La définition de la collecte de SAO faisait partie d’une annexe au rapport de la 58^e réunion, intitulée « Définition des activités figurant dans les lignes directrices intérimaires sur le financement des projets de démonstration sur la destruction des SAO ». Ce projet pilote pour le Ghana couvrira les SAO déjà récupérées, ainsi que les quantités supplémentaires à récupérer dans le cadre du projet de promotion des réfrigérateurs éconergétiques par le truchement du volet « Transformation du marché » à être financé par le Fonds pour l’environnement mondial (FEM).

5. Ce projet pilote vise à développer un cadre logistique efficient et économique pour le transport, l’entreposage et la destruction des SAO au Ghana. Comme on l’a indiqué ci-dessus, ce projet pilote est étroitement intégré au Projet sur l’efficacité énergétique (EE) financé par le Fonds pour l’environnement mondial (FEM), dans lequel les réfrigérateurs en fin de vie utile (EOL) et très peu efficaces sur le plan énergétique seront retirés tôt du circuit, récupérés et démantelés dans des dépôts régionaux pour la récupération des SAO. Des incitatifs (remises, crédits pour retour, et crédits carbone) sont mis en valeur dans le cadre du projet sur l’efficacité énergétique (EE) du FEM, afin d’inciter les consommateurs à acheter des réfrigérateurs et des congélateurs éconergétiques. Le plan de gestion de l’élimination finale

(PGEF) existant et les opérations de récupération connexes du plan de gestion de l'élimination des HCFC (PGEH) pour l'entretien des équipements de réfrigération actuels viendraient apporter un complément à ces activités, ce qui accroîtrait aussi les quantités de SAO résiduares qui ne pourraient plus être réutilisées. Une proposition de projet détaillée est jointe à l'annexe I du présent document.

Description du projet

6. Ce projet pilote portera tout d'abord sur la destruction des 1,8 tonne of CFC-12 qui ont déjà été récupérées et qui sont prêtes à être détruites. En même temps, il offrira des mesures permettant de rendre le projet durable et analysera les SAO résiduares disponibles qui seront récupérées grâce à un programme national de collecte mis en place dans le cadre du programme d'efficacité énergétique en cours d'approbation par le Fonds pour l'environnement mondial. Le gouvernement national a aussi fourni un soutien stratégique au programme en adoptant des règlements nationaux qui dissuaderont l'exportation des SAO résiduares et favoriseront l'importation de SAO résiduares des pays limitrophes de la Communauté économique des Etats de l'Afrique de l'Ouest (CDEAO) en tant que modèle régional d'importation. Le projet de démonstration de la destruction des SAO devrait être mis en oeuvre durant une période de trois ans.

7. Le projet propose d'exporter les SAO résiduares vers des installations de disposition accréditées dans un pays visé à l'article 2.

Estimation des SAO à détruire

8. Les SAO destinées à la destruction proviennent des stocks existants, du programme de récupération des frigorigènes, et des importations des pays de la Communauté économique des Etats de l'Afrique de l'Ouest (CDEAO). Actuellement, le Ghana a déjà en entreposage 1,8 tonne métrique (tm) de CFC-12 destinées à être détruites. La quantité de frigorigène à récupérer dans le cadre du programme EE du FEM, toujours en cours d'approbation, est évaluée à 5,8 tm supplémentaires de CFC-12 des réfrigérateurs éliminés, sur la base de 72 500 unités devant être récupérées durant une période de 3 ans à un taux de récupération de 80 pour cent (Tableau 1).

Tableau 1 : Quantités estimatives de SAO résiduares à utiliser dans le projet

	Quantité	Tonnes
En entrepôt (déjà récupérées)		1,8
Programme EE du FEM	72 500	5,8
Programmes de récupération et de recyclage actuels et futurs	10 345	1,2
Importations de SAO résiduares de la CDEAO		A déterminer
		8,8

Gestion financière du projet

9. La proposition prévoit que le financement reçu du Fonds multilatéral couvrira les coûts de la mise en oeuvre et du fonctionnement du projet pilote durant 3 ans. Elle prévoit aussi que des crédits carbone pourraient être utilisés pour mettre le projet à l'échelle, en fonction des résultats de l'activité pilote. Au moins 30 000 unités devraient être retournées chaque année du programme sur l'efficacité énergétique du FEM et permettre de récupérer 2,4 tonnes of CFC-12, afin d'obtenir une réduction vérifiée des émissions de 22 500 t équivalent-CO₂ et d'aller chercher une réduction vérifiée des émissions d'au moins

3 \$ US/t équivalent-CO₂. On peut donc présumer que le projet du FEM sera entièrement opérationnel au moment où le financement du Fonds multilatéral sera rendu disponible.

10. A la fin des trois années d'aide du Fonds multilatéral et du FEM et selon ce qui a été indiqué ci-dessus, le projet convertira d'autres quantités de SAO récupérées en crédits carbone, ce qui rendrait les installations durables. Le Ghana entend rappeler 1 million de vieux réfrigérateurs en 10 ans, soit quelque 100 000 réfrigérateurs par année. Toutefois, une estimation plus prudente de 30 000 réfrigérateurs par année signifierait 2,4 tonnes ou plus de CFC-12 par année, ce qui pourrait représenter dans le meilleur des cas la quantité potentielle pouvant être détruite plus tard.

Sélection de la technologie de disposition

11. Les options possibles de disposition des SAO sont les suivantes : i) disposition dans un four à ciment; ii) installation d'un centre local de disposition; et iii) exportation vers des installations de disposition accréditées dans un pays visé à l'article 2. La disposition dans un four à ciment n'était pas possible au Ghana, parce que des spécialistes ont confirmé qu'il n'en existe aucun au pays (tout le ciment est produit par broyage de mâchefer importé).

12. La deuxième option était la méthode proposée à la 62^e réunion du Comité exécutif, selon laquelle le projet était articulé autour d'une petite machine à arc au plasma développée au Japon. Toutefois, le rapport coût-efficacité d'une telle méthode était marginal, et l'on s'est interrogé en ce qui a trait à la gestion des installations et à leur durabilité.

13. La troisième option envisagée et finalement adoptée est basée sur l'exportation des SAO résiduaire pour disposition dans des installations d'incinération de matières dangereuses et de niveau potentiellement commercial dans des pays non visés à l'article 5. Les coûts de disposition selon cette méthode pourraient être réduits. Dans ce cas, le centre de disposition situé à Port Tema recevrait de petites bouteilles de SAO résiduaire des divers centres de traitement et de démantèlement au pays, identifiées selon le type de SAO et expédiées dans de plus grands conteneurs (selon le type de SAO) vers des installations de disposition précises à l'étranger. Le transbordement de Port Tema au site de disposition sera géré par l'entreprise contractante pour la disposition des SAO. L'exploitation d'un centre de disposition sera accordée en sous-traitance à un distributeur de frigorigènes ou à un importateur existant selon un processus d'attribution axé sur le rendement. Le centre devrait viser à encourager le transport vers ses installations de petites quantités de SAO qui y seront regroupées dans des conteneurs plus grands, et à maintenir une base de données détaillée des quantités de frigorigènes reçues et exportées. Cette base de données serait essentielle à toute demande future visant à obtenir des crédits carbone qui permettraient de continuer à l'exploiter de manière durable après la fin du projet de démonstration.

14. La proposition indique aussi que, en ce qui a trait à la conformité à la Convention de Bâle (sur le contrôle des mouvements transfrontières de déchets dangereux et de leur élimination), la Convention n'empêcherait pas le transfert de SAO entre des pays qui en sont Parties. Pour l'expédition de SAO résiduaire, la documentation normale de la Convention de Bâle, y compris le consentement préalable et la formation appropriée du personnel, serait requise. La formation du personnel du centre de démantèlement en ce qui a trait à ces exigences ferait partie des tâches assignées aux consultants pour le projet.

Surveillance et vérification de la destruction

15. Afin de s'assurer que les SAO soient vérifiées et comptabilisées de manière appropriée, le processus sera étroitement surveillé et les données seront consignées aux centres de démantèlement et de destruction. Un plan strict de surveillance et de vérification sera mis en place afin d'éviter le double

compte et d'autres erreurs. Un programme de traçabilité et de chaîne de possession sera élaboré afin de s'assurer d'une surveillance transparente et responsable. Par exemple, les données récupérées dans les centres de démantèlement pourraient comprendre un registre séquentiel des équipements rejetés ainsi que des indications sur les quantités récupérées de chaque pièce d'équipement, afin de déterminer le nombre de bouteilles à utiliser. Au centre de destruction, des renseignements servant à identifier les bouteilles seront consignés, afin qu'ils correspondent aux renseignements au moment de la collecte. Une procédure de surveillance transparente aidera à la vérification externe indépendante des SAO détruites, afin d'obtenir un certificat pour les crédits carbone.

Coût du projet

16. Le coût total du projet initialement présenté a été évalué à 219 776 \$ US (Tableau 2).

Table 2 : Coût du projet proposé

Budget	Unité	\$ US
A. Coût en capital		
Trousse d'identification, bouteilles, divers, etc.		20 000
Ordinateur et logiciel de surveillance des données		2 000
Total partiel		22 000
B. Frais de transport		
Transport des centres de démantèlement et d'entretien à Port Tema	1,00 \$ US/kg	
Transport à l'étranger	8,08 \$ US/kg	
Redevance de déversement pour la disposition	4,19 \$ US/kg	
Total partiel	13,27 \$ US/ kg pour 8 800 kg	116 776
C. Coûts de la sous-traitance pour l'exploitation des installations		
1 technicien (durant 3 ans)		21 000
Location d'espace, sécurité, électricité, eau, AC dans des installations existantes (durant 3 ans)		6 000
Personne à temps partiel pour la surveillance et l'établissement de la base de données sur les SAO résiduaire (durant 3 ans)		6 000
Total partiel		33 000
D. Soutien technique et supervision		
Consultant national à temps partiel		24 000
Consultant international à temps partiel (incluant 2 visites au Ghana)		24 000
Total partiel		48 000
Total global		219 776

OBSERVATIONS ET RECOMMANDATION DU SECRETARIAT

OBSERVATIONS

17. Le Secrétariat a fourni au PNUD des commentaires et des observations sur la proposition après l'examen en fonction des critères indiqués dans la décision 58/19. Il a aussi souligné que le projet sur l'efficacité énergétique du FEM qui contient les dispositions relatives à la structure du système de collecte fondamental pour d'autres SAO résiduaire à récupérer n'a pas encore été approuvé par le FEM, bien qu'il en soit à la dernière étape avant son approbation.

18. On s'est dit préoccupé quant à la disponibilité d'une quantité de SAO résiduares suffisante pour assurer la réussite et la durabilité du programme. Des 8,8 tm visées pour destruction par le projet pilote, seulement 1,8 tm sont actuellement disponibles et récupérées au pays. Le Secrétariat a indiqué que, bien que l'approbation de la préparation du projet soit basée sur les 1,8 tm de SAO résiduares déjà récupérées, un système doit être en place et permettre un approvisionnement assez constant en résidus pour que le programme soit rentable. Le PNUD a répondu que, avec la mise en œuvre complète du projet sur l'efficacité énergétique du FEM et le nombre visé de réfrigérateurs à remplacer, on peut affirmer avec certitude que des circuits de déchets supplémentaires seront disponibles régulièrement. En outre, le programme n'a pas non plus tenu compte des SAO résiduares en provenance d'autres pays qui les récupéreront et les stockeront pour exportation par les installations de disposition proposées. Le PNUD a aussi mentionné qu'au moins durant les six premiers mois, les activités viseront d'abord à mettre les installations en place. Il présume donc qu'à compter de la deuxième année, davantage de SAO résiduares seront disponibles en plus des 1,8 tm.

19. Le Secrétariat a demandé au PNUD de définir « installations de disposition », et d'indiquer si elles étaient des installations de stockage centrales axées sur le stockage et la gestion des SAO résiduares. Le PNUD a confirmé que, bien que les installations de disposition agiront comme lieu de stockage temporaire, elles détermineront aussi quelles SAO pourront être recyclées et réutilisées et lesquelles pourront être exportées pour disposition. Ces installations comprendront aussi une base de données sur ces substances, et on indiquera quel terme conviendrait le mieux pour décrire ce type d'installations. On a donc établi clairement que les installations de disposition, tel qu'on l'a mentionné, ne comprennent pas la disposition sur place.

20. Le Secrétariat a aussi demandé d'autres explications sur le fonctionnement prévu du centre de disposition envisagé dans la proposition. Le PNUD a indiqué que le centre comprendra des installations de disposition conçues et gérées au niveau national et qui seront utilisées comme des installations centralisées près du port où les SAO résiduares provenant des centres d'entretien et de démantèlement du pays seraient stockées. Ce centre servira de lieu de dépôt central pour les quantités de SAO résiduares qui seront récupérées, et il sera responsable de l'identification des SAO résiduares reçues et de leur pureté. Il recyclera les frigorigènes le cas échéant, et prendra des mesures pour exporter les SAO résiduares pour disposition vers un pays non visé par l'article 5.

21. Le Secrétariat a aussi demandé au PNUD de clarifier la valeur de base de la rémunération fondée sur le rendement du centre dans le cadre d'un sous-contrat et comment il en est arrivé au chiffre de 3 \$US le kilogramme de SAO comme coût du traitement des SAO au centre. Le PNUD a expliqué que cette valeur était basée entre autres sur une estimation du coût réel d'installation d'un centre et de la rémunération des membres du personnel, qui a alors été divisée par la quantité de SAO résiduares dont le centre doit détruire, afin d'en arriver à environ 3 \$ US/kg. Le PNUD a indiqué que cette rémunération incitera le sous-traitant à devenir un partenaire à part entière qui permettra de réaliser les objectifs (montants à disposition).

22. En outre, conformément à la décision 62/28, le Secrétariat a demandé au PNUD de clarifier la question du manque de modèle de gestion détaillé afin d'assurer le soutien du projet après la phase pilote, parce qu'il a observé que ce dernier n'était pas clairement défini dans la proposition. Le PNUD a répondu que la rentabilité et la durabilité du projet dépendront du succès de cette phase initiale. Le PNUD a procédé à une analyse de sensibilité afin de comparer les réfrigérateurs (20 000 à 90 000 à 80 grammes/unité), le volume annuel de CFC-12 comme SAO (1,6 t à 7,2 t), et les réductions vérifiées (2 \$ US à 5 \$ US par réduction vérifiée). Si l'on combine le nombre ciblé de réfrigérateurs qui seraient récupérés dans le cadre du programme EE du FEM, leur disposition par le truchement de l'exportation serait profitable en termes de réductions vérifiées et elle pourrait par la suite être utilisée pour le soutien du projet. Le PNUD a aussi mentionné que l'expérience du Ghana quant aux avantages économiques,

sociaux et environnementaux de l'élimination des ampoules incandescentes très peu efficaces sur le plan énergétique rend plus fort l'engagement du gouvernement à éliminer les appareils ménagers très peu efficaces sur le plan énergétique. Selon le PNUD, cet engagement national sera l'élément moteur de ce projet.

23. Le Secrétariat et le PNUD ont attiré l'attention sur le coût total du projet et le coût correspondant par kilogramme de SAO détruit, et souligné que, bien que l'investissement initial de la proposition actuelle ait été considérablement réduit en raison du changement de méthode, le coût par kilogramme (25,0 \$ US/kg) était plus élevé que dans la proposition initiale présentée à la 62^e réunion. Le PNUD a indiqué que cela était attribuable à la plus petite quantité de SAO qui serait éliminée dans le cadre de la proposition actuelle. Le Secrétariat a demandé au PNUD de revoir les coûts afin de déterminer s'il est possible d'y apporter des rajustements, en particulier les coûts des consultants, et peut-être aussi les frais de transport. Ce rajustement a mené à un coût de 22,4 \$ US/kg de SAO détruits. Ce coût est plus élevé que le coût maximal admissible de 13,2 \$US/kg (décision 58/19), mais puisque le Ghana est un pays à faible volume de consommation (PFV), il n'est pas couvert par cet élément particulier de la décision.

24. Le coût final du projet a été convenu à 198 000 \$ US plus des coûts d'appui (Tableau 3).

Table 3 : Coûts convenus du projet

Budget	Nombre d'unités	\$ US
A. Coût en capital		
Trousse d'identification, bouteilles, divers, etc.		20 000
Ordinateur et logiciel de surveillance des données		1 560
Total partiel		21 560
B. Frais de transport		
Transport des centres de démantèlement et d'entretien à Port	0,6 \$ US/kg	
Transport à l'étranger	6,6 \$ US/kg	
Redevance de déversement pour la disposition	4,1 \$ US/kg	
Total partiel	11,3 \$ US/ kg for 8 800 kg	99 440
C. Coûts de la sous-traitance pour l'exploitation des installations		
Un technicien (durant 3 ans)		21 000
Location d'espace, sécurité, électricité, eau, AC dans des installations		6 000
Personne à temps partiel pour la surveillance et l'établissement de la		6 000
Total partiel		33 000
D. Soutien technique et supervision		
Consultant national à temps partiel		22 000
Consultant international à temps partiel (incluant 2 visites au Ghana)		22 000
Total partiel		44 000
Total global		198 000

RECOMMANDATION

25. Le Comité exécutif peut souhaiter envisager :

- a) Prendre note avec satisfaction de la présentation par le gouvernement du Ghana d'un projet pilote visant la gestion et la destruction des SAO résiduares afin de détruire globalement 8,8 tonnes métriques de SAO résiduares;

- b) Approuver en principe la mise en oeuvre d'un projet pilote pour la gestion et la destruction des SAO résiduelles au Ghana, au montant de 198 000 \$ US plus des coûts d'appui de 17 820 \$ US pour le PNUD, en étant entendu qu'aucun financement ne sera décaissé au pays sans l'obtention de l'approbation du projet d'efficacité énergétique du FEM; et
- c) Approuver le montant de 198 000 \$ US à cette réunion, et prendre note qu'avec cette approbation, il est entendu qu'aucun autre financement ne sera disponible pour le Ghana pour tout projet futur de destruction des SAO.



Project Document

Government of Ghana

United Nations Development Programme

Funded by the Multilateral Fund (MLF) for the Implementation of the Montreal Protocol

Pilot Demonstration Project on ODS-Waste Management and Disposal

18 Feb 2011

COUNTRY: Ghana **IMPLEMENTING AGENCY:** UNDP
PROJECT TITLE: Pilot Demonstration Project on ODS-Waste Management and Disposal

PROJECT IN CURRENT BUSINESS PLAN: Yes
SECTOR: ODS-Waste
Sub-Sector: Refrigeration Servicing Sector

PROJECT IMPACT: 8.8 Metric Tons of CFC-12
PROJECT DURATION: 36 months

LOCAL OWNERSHIP: 100 %
EXPORT COMPONENT: 0 %

REQUESTED MLF GRANT: US\$ 198,000
IMPLEMENTING AGENCY SUPPORT COST: US\$ 17,820 (9%)
TOTAL COST OF PROJECT TO MLF: US\$ 215,820

COST-EFFECTIVENESS: US\$ 22.5/kg ODS (metric)
PROJECT MONITORING MILESTONES: Included
NATIONAL COORDINATING AGENCY: Ghana-EPA

Brief Description.

UNDP Ghana in collaboration with the Environment Protection Agency (EPA), Energy Commission of Ghana and the Center for Rural and Industrial Research (CRIR) has developed an overarching strategy to provide climate and ozone benefits through the Integrated Plan for Energy Efficiency, Climate Mitigation and ODS Reductions for the Refrigeration Sector as shown in Figure 1. This integrated plan brings about the convergence of 3 synergistic interventions to combine and sequence financing for: (i) the phasing out of HCFC based appliances (MLF); (ii) the promotion of energy efficient refrigerators through Market Transformation (GEF) and (iii) the complimentary pilot project for the recovery and disposal of ODS (MLF). The ultimate objective of this plan is to bring economic, social and environmental benefits to the people in Ghana through the scaling up of energy efficient appliances with low global warming potential (GWP) and zero ozone depleting potential (ODP) for the mainstreaming of ozone and climate benefits into the national development plan.

This ‘learning by doing’ pilot seeks to demonstrate how the technical, financial, regulatory and institutional barriers and risks could be overcome to set up an ODS management-disposal facility. The project will demonstrate the management and disposal* of ODS refrigerants recovered from old stocks (1.8 t) and subsequent early retired or end of life (EOL) refrigerators/freezers, air-conditioners as well as from the servicing sectors. Waste-ODS would be transported from the refrigerator dismantling centers to be set up with the assistance of the GEF-project (for end-of-life equipment) as well as from the Recovery Centers to be set up through the MLF-funded HPMP (for functioning equipment being serviced). The ODS thus collected will be transported and destroyed overseas. Opportunities to monetize the ODS destroyed as carbon credit for the voluntary market will be explored so that alternative sources of funds may be tapped into once this MLF-funded demonstration project will be completed. In addition to the carbon market, other financial modalities will also be explored: bilateral grants and auction from the European Union Allowance (EUA). This should ensure sustainability of the operation beyond the duration of this demonstration.

*: Throughout the document, the word “dispose” is used to mean “to get rid of”. Indeed, after a previous submission found that local destruction of the waste in Ghana would not be feasible, the country has agreed to utilize the export-option to get rid of the waste. As such, the words “destroy” and “destruction” were replaced by “dispose” and “disposal” throughout this project document.

1. INTRODUCTION AND BACKGROUND.

The Government of Ghana is requesting funding for the starting up of a pilot project to evaluate and demonstrate on the safe disposal of ODS. The project complies with the criteria established by Decision 58/19 and it will focus on specific aspects not previously addressed by this type of pilot projects. This 'learning by doing' project will be the first of its kind in the West African region, and will demonstrate how the technical, financial, regulatory and institutional barriers can be overcome for the mainstreaming of ODS management and disposal project. This project will generate valuable information about possible models to establish a long term self-sustaining system to collect ODS from the banks and dispose of them. Furthermore, this information could also be helpful to other ECOWAS countries interested to undertake similar approaches to manage their ODS banks. As there is no ODS destruction technologies or equipment in West Africa, there is great potential to collect, recover and dispose of ODS in banks and in old inventory stocks, which justifies the investment.

The case of Ghana has the following unique features:

- This project seeks to demonstrate the viability or otherwise of a national management and ODS disposal facility, noting that this is part of a larger strategic approach by UNDP to demonstrate a range of options in the projects it is currently assembling for a range of country specific situations.
- Ghana is a developing country with no ODS destruction facilities in place. This is the situation of many countries in the region, which makes this pilot attractive as the information generated and lessons learnt could be shared with other countries with comparable characteristics. The destruction of CFC-11 contained in foam will not form part of this pilot-project, unless a solution can be found to handle its disposal within the existing budget.
- ODS waste from Ghana will be exported. If found feasible, ODS waste from the neighbouring ECOWAS countries will be contemplated as well. The risks and barriers (economic, legal, Basel and Rotterdam conventions stipulations, etc.) for such interventions will be identified and means for mitigation will be formulated.
- This pilot project seeks to develop an efficient and cost effective logistic framework for the transport, storage and shipment of ODS in Ghana. As such, this pilot project is closely integrated with the GEF funded Energy Efficiency (EE) project where End-of-Life (EOL) and early retired energy inefficient refrigerators will be collected and dismantled in regional depots for ODS recovery. Incentives schemes (rebate, turn in and carbon credits) are developed under the GEF EE project to incentivize consumers to purchase EE refrigerators/freezers. These efforts would be complemented by existing TPMP and HPMP related recovery operations for the servicing of existing refrigeration equipment, which also will generate volume of ODS waste that can no longer be re-utilized.

- The disposal center* will be operated by a sub-contractor through a performance based bidding process. The sub-contractor will be guided by a comprehensive operation and a stringent monitoring plan to be supervised by a national consultant.
- The opportunity to leverage market based finance mechanisms and other innovative modalities (bilateral grants and EUA auctions) will be explored for the monetization of environmental services of avoided ODS emissions into carbon assets. Means for mitigating the technical, regulatory and financial risks will be discussed.

*** Note: Throughout the document, the term "disposal center" is used to mean a centralized facility near the port where the ODS-waste would be temporarily stored, coming from the various dismantling and servicing centers throughout the country. It would have the function of encouraging the transport of small quantities of ODS-waste to its location. It would also identify the ODS-waste received and its purity, recycle refrigerants when possible, and arrange for its export if non-recyclable. The amounts disposed by the center would correspond to the sum of ODS-waste recycled plus ODS-waste exported.**

2. OVER-ARCHING STRATEGY AND PROJECT OBJECTIVES

The Multilateral Fund (MLF) has for over fifteen years supported ODS phase out projects. By and large this support has been focusing on the so-called Annex-A substances from which CFCs constitute the main group. A Terminal Phase out Management Plan (TPMP) is nearing completion in Ghana which addresses the CFC phase-out. As a follow-up, an HCFC Phaseout Management Plan (HPMP) which tackles the control and phase out of HCFCs, has recently been approved in July 2010.

UNDP in collaboration with EPA, Energy Commission and the Center for Rural Industrial Research (CRIR) has developed an overarching strategy to provide climate and ozone benefits through the Integrated Plan for Energy Efficiency, Climate Mitigation and ODS Reductions for the Refrigeration Sector as shown in Figure 1. This integrated plan brings about the convergence of 3 synergistic interventions: (i) the phasing out of HCFC based appliances (MLF); (ii) the promotion of energy efficient refrigerators through Market Transformation (GEF) and (iii) the complimentary pilot project for the recovery and disposal of ODS (MLF). Opportunities to convert the environmental services into carbon credits and assets offered by these programs will be explored. The ultimate objective of this plan is to bring economic, social and environmental benefits to the people in Ghana through the scaling up of energy efficient appliances with low global warming potential.

The TPMP and HPMP phase out project only target the servicing sector where functioning refrigerators are being repaired. Whilst the TPMP and HPMP programs are targeted at the accelerated phase out of ODS in the servicing sector, the ODS disposal project seeks to reduce potential ODS and carbon emissions from the ODS bank. This proposed ODS disposal pilot project with MLF funding seeks to address both the early refrigerator retirement program through rebate and turn in as well as the End-of-Life program when old refrigerator reach the end

of their life and are beyond repair. It is evident that some of the actions undertaken would address the objectives of both the Montreal Protocol and the Kyoto Protocol.

The proposed Integrated Plan would address all subsectors (residential, commercial, industrial refrigeration, air-conditioner [AC], mobile air-conditioner [MAC], chillers) and all types of refrigerants (CFCs, HCFCs and HFCs) as shown in the following diagram.

Figure 1: Integrated Plan for Energy Efficiency, Climate Mitigation and ODS Disposal Management

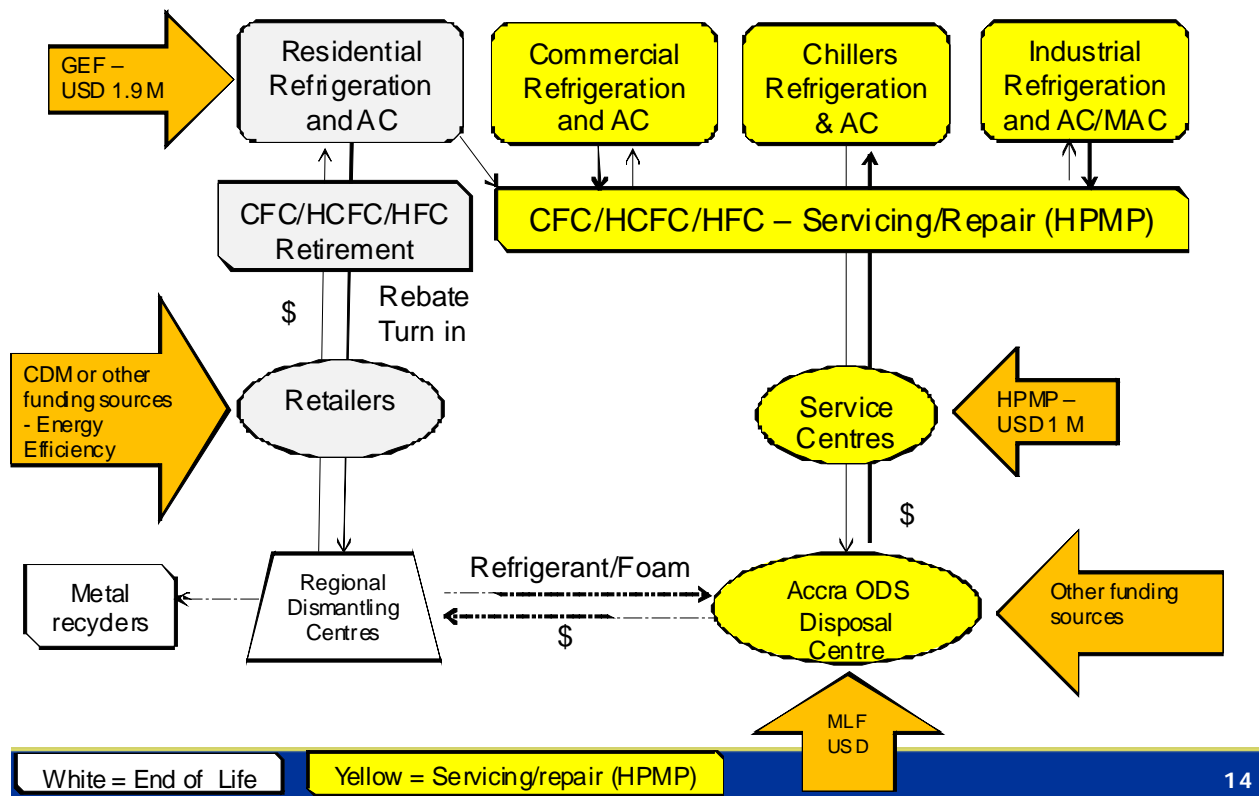


Figure 1 provides an overview of how the proposed Integrated Plan would work. Boxes in white represent the GEF-funded End-of-Life “Market Transformation for Energy Efficiency” programme, while the yellow boxes represent ODS management projects for the servicing sector financed by the MLF. Through the End-of-Life Scheme, equipment would be collected by trained retailers or NARWAO workshops owners scattered across Ghana.

The refrigerators would be stockpiled and then transported to Regional Dismantling and Recovery Centres. The recovered refrigerants would be stored safely in refillable cylinders and the foam packaged as bale would be sent to a central ODS Disposal Centre to be located in Port Tema. As proposed in this project, all the unusable ODS refrigerants would be exported for final

disposal. The opportunity for initial ODS recycling or reuse will be explored. TPMP and HPMP activities would involve servicing operations on existing equipment, which would be supported by the MLF.

The brown arrows relate to the expected influx of funding from the GEF/MLF and other potential sources. Downward arrows in the diagram represent the process by which refrigeration equipment/refrigerant is delivered to the Regional Dismantling and Recovery Centre. Upward arrows represent resources required to make the programmes operational and MLF and GEF funding (or funding from other grants) is needed to help developing countries and enterprises (especially Small-Medium Sized Enterprises) cover the necessary upfront investments. Without these funds they would not be able to cover these costs. As such GEF and MLF funding would play a critical role in kick-starting the above-mentioned scheme in Ghana during the first couple of years.

GEF funds would initiate the Early Retirement as well as End-of-Life scheme for the domestic refrigeration sector. The MLF's previous TPMP efforts and upcoming HPMP funds would help establish a refrigerant recovery scheme and collection centre, while the MLF's ODS waste pilot project would help fund ODS disposal operations, or the transshipment of ODS waste for destruction abroad. The legislative framework required to help sustain the operations will be established.

Once the model has been tested and proven, it is anticipated that other sources of finance, including carbon finance, would generate the necessary funding that would allow the cycle to continue and to become self-sustainable. The ODS Disposal Centre would contribute to the provision of reliable information regarding the reclaimed/disposed ODS amounts, which in turn would facilitate obtaining approval for these alternative funding sources.

The objective of this MLF-funded demonstration project will be to demonstrate the viability of an efficient and cost effective framework/infrastructure for the transport to the central facility, storage of recovered/aggregated ODS and an approach to transport these ODS for destruction abroad.

3. JUSTIFICATION FOR THE ODS-DISPOSAL PILOT PROJECT

The Executive Committee, at its 58th Meeting, has approved a set of interim guidelines for the funding of demonstration projects for the disposal of ODS in accordance with paragraph 2 of decision XX/7 of the Meeting of the Parties. The followings described in detail how the project complies with the Decision 58/19:

3.1. Updated and more detailed information for all issues required to obtain project preparation funding.

i. An indication of the category or categories of activities for the disposal of ODS (collection, transport, storage, destruction), which will be included in the project proposal.

The collection of refrigeration equipment will be carried out under the GEF funded Energy Efficiency project (Figure 1) where a grant of USD 1.72 million will be used to establish Regional Dismantling Centres for the recovery of CFC-12 and HCFC-22 refrigerants from early retired or End-of-Life (EOL) domestic refrigerators/freezers. The GEF EE project is in an advance stage of responding to comments received from GEF CEO and has been resubmitted in February 2011 for final CEO-endorsement.

Other ODS streams will be coming from the commercial sector covered under the MLF-funded TPMP and HPMP programs for the phase out of CFCs and HCFCs. Hence, this pilot project would thus not deal with the collection/dismantling of refrigeration equipment, but solely with the transport, storage and disposal of the unusable ODS that would be resulting from the GEF, TPMP and HPMP programmes.

ii. An indication whether disposal programmes for chemicals related to other multilateral environmental agreements are presently ongoing in the country or planned for the near future, and whether synergies would be possible.

National Programme on Energy Efficiency:

A GEF-funded Full-Size Project on energy-efficiency in Ghana to be implemented by UNDP would allow Ghana to introduce minimum energy performance standards (MEPS) for refrigerators in addition to air-conditioners and compact fluorescent lamps which already have MEPS approved in 2005. The banning of used and second hand refrigerators will prevent the importation of obsolete and energy guzzling appliances which place a heavy burden on the already strained national power supply. Much as the Government of Ghana has approved energy labels for air conditioners with a minimum of EER 2.8 for single star air conditioners two years ago, the Parliament of Ghana has in October 2009, approved an act effective within six months, establishing energy Standards and Labels (S&L) for all new refrigerators and freezers imports into the country. This ODS-Waste pilot project will complement the effort to be undertaken by GEF EE project for the scaling up of energy efficiency appliances via market based mechanism to incentivize behavior change.

To reduce energy demand, ozone depletion, and global climate impacts, it is critical that the older and inefficient refrigerators are permanently removed from homes, offices and other locations and properly disposed of so that environmentally-harmful refrigerants and foam blowing agents are captured and recycled or destroyed. Given the large number of refrigerated appliances expected to be taken out of service under the market transformation, the environmental impacts of removing and properly disposing of old appliances can be significant

The GEF project would set up regional equipment-collection and dismantling centers. The MLF-current pilot project on ODS-waste would tie into this effort by assuring transportation of the refillable cylinders to a centralized ODS-waste centre in Port Tema that would focus on the final disposal of these ODS.

Ghana - Capacity Building for PCB Elimination: Polychlorinated Biphenyls (PCBs) are not regulated in Ghana. PCBs have been found in significant quantities in equipment in the electrical power network in Ghana. Approximately 2 % of the transformer population is filled with pure PCB oils and some 12% are contaminated with PCBs due to maintenance practices. In addition 147 capacitors (7.5 tons) of PCB containing capacitors have been inventoried. The GEF-funded project implemented by UNDP-UNITAR is aimed at strengthening the capacities and capabilities of government officials and stakeholders outside of government to address PCB identification, manage existing sources of PCBs as well as their elimination. The project develops and describes a strategy, and the required steps, from the current unsustainable management of PCB-containing equipment to sound management and disposal practices. This GEF project will focus on capacity building and PCB destruction in addressing not only Ghana's PCB-related obligations under the Convention, but also related to wider chemicals management issues. The economic and legal feasibility to combine the export of ODS-waste with PCB for destruction overseas will be explored in this MLF-funded pilot proposal. In this regard, it can be anticipated that Ghana will propose a PCB stockpile elimination project for GEF funding and likewise is a participant in the multi-agency Africa Obsolete Pesticide Stockpile project, both of which could offer synergies for the destruction of ODS along with other chlorinated EOL chemicals.

Hazardous Wastes: In response to the global mandate for the environmentally sound management of hazardous, solid, radioactive and electronic waste (e-waste), Ghana has among other things, embarked on a life cycle approach to address chemicals and other hazardous wastes management in an integrated manner. This involves a broad range stakeholder institutions and organizations including non-governmental organizations. In 1997, a comprehensive National Chemicals Management Profile was prepared by the EPA with the assistance of United National Institute of Training and Research (UNITAR) and the Inter-organization Programme for Sound Management of Chemicals (IOMC). Other programmes, which are being undertaken, include the framework for Integrated Coastal Zone Management.

The issue of waste management has become a subject for research in many stakeholder institutions. The management of plastic waste is receiving attention. Some technologies have been developed to assist in the recycling of waste. A number of small-scale plastic waste recycling plants have been set up in the Greater Accra Region. There are plans to set up similar ones in other metropolitan, municipal and urban areas of the country. The management of other solid and hazardous waste is also being researched at the Ghana Atomic Energy Commission and the Council for Scientific and Industrial Research (CSIR). Exogenous technologies are also being studied for their appropriate adoption and transfer for local use. This proposal will develop sound management and infrastructure for the safe disposal of metals and scraps from the de-manufacturing processes of retired refrigerators.

iii. An estimate of the amount of each ODS that is meant to be handled within the project.

Information included in following paragraph.

iv. The basis for the estimate of the amount of ODS; this estimate should be based on known existing stocks already collected, or collection efforts already at a very advanced and well-documented stage of being set up.

The project will start by disposing the 1.8 t of CFC-12 that NOU has collected in store. But given that there is only 1.8 t of CFC-12 stock in Ghana (Table 2), one of the risks identified in this project is the sustainable supply of enough ODS for disposal. In order to overcome these uncertainties, steps are being taken to ensure the sustainable supply of ODS for disposal, including: i) ensuring strong political will and buy-in to support the program to replace energy inefficient refrigerators (through a GEF funded EE programme); ii) discouragement for the export of ODS except through the dedicated disposal center and iii) encouragement for importation of ODS-waste from neighboring ECOWAS countries. The Minister of Environment of Ghana has issued a letter of transmittal to support this approach (see Appendix 1). The Basel Convention would not prevent the movement of ODS between countries in the region that have ratified the Basel Convention. For shipment of ODS-waste to Ghana, the normal Basel documentation including prior consent and proper training of the staff would be required.

The amounts that will be available for disposal described below:

Table 1: Estimated quantities of ODS-waste that will be used in the project:

	Units	Tons
In storage already		1.8
From GEF EE Programme	72,500	5.8
From ongoing and future R&R schemes	10,345	1.2
From ECOWAS imports of ODS-Waste		Tbd
		8.8

It is important to understand the urgency of the Ghanaian government to execute this ODS disposal project to complement the GEF EE and HPMP project. The government of Ghana has experienced the economic, social and environmental benefits of legislating pragmatic and sound energy demand side management policy (Minimum Energy Performance Standard) for the promotion of energy efficient appliances as a mean to curb national energy demand. The distribution of six million free Compact Fluorescent Lamps (CFL) in exchange for incandescent lamps in 2007 resulted in a saving of 124 MW of power by the end of the first quarter of 2008 and energy cost savings in excess of US\$33 million per annum.

Having seen and tested such life saving benefits and success, the Ghanaian government is keen once again to introduce 72,500 ‘Star rated’ energy efficient refrigerators (average savings from 600 to 950 kWh/year per unit) over a period of three years to further reduce national energy demand under the GEF EE project.

Hence there is already in place a strong political will, financial incentives and institutional support to replace 1 million old and energy guzzling refrigerators to provide further savings in power as a follow up to the GEF EE project. Indeed, the daily opportunity cost is too high for

any delay in the replacement of the 1 million energy inefficient refrigerators which is draining both personal and national incomes. To expedite this urgency, a Public Notice was advertised in August 2010 in the national daily newspaper (Appendix 2) by Ghana's Energy Commission on 'Energy Efficiency Standards for Refrigerating Appliances and the Prohibition of the Manufacturing, Importation and Sale of Used Refrigerators and Freezers'. This is enacted under the legislation approved in Nov 2009 (Energy Efficiency Standards and Labeling (Refrigerator, Refrigerator-Freezer and Freezer - Regulations, LI 1958). Incentives will be provided as turn in rebate coupons from GEF funding as detailed in Appendix 3. Financial modalities to sustain the project beyond the pilot phase will be explored (e.g. market based carbon credits from CDM on energy gain and ODS destruction credits, bilateral grant and EUA auctions).

Table 2 shows the phased approach in the GEF-funded rebate programme. A conservative volume of 5.8 t of CFC-12 ODS could be collected from the 72,500 refrigerators to be turned in under the GEF EE project over the first three years. In addition to this, however, there will be the amounts of ODS-waste collected from the servicing centers established during the TPMP and those that will be created by the soon-to-be established HPMP. Furthermore, ODS in cylinders from neighboring countries may also be imported to Ghana for disposal.

Table 2: Action plan for the GEF/Govt refrigerator turn-in program in Ghana					
Year	2011	2012	2013	2014	2015
Program	GEF EE to turn in 72,500 refrigerators over three years with rebate incentive scheme (Manufacturing, importation and sale of used refrigerators/freezers are banned in May 2010)			Ghana National Turn In Program to replace 1 million refrigerators over 10 years (@ 100,000 units/yr)	
Funding sources	Combine and sequence GEF fund for ODS collection and MLF fund for ODS disposal			Ghana government and voluntary carbon finance	
Refrigerators turned in per year	7,500	25,000	40,000	72,500	60,000
CFC-12 recovered (t)*	0.6	2.0	3.2	4.0	4.8
Old CFC-12 Stock (total 1.8 t)	1	0.8	0	0	0
Other ODS sources	TPMP and HPMP programs (1.2 t) and possible import from ECOWAS region.				
Total ODS to be disposed of	1.6	2.8	3.2	4.0	4.8
* 80% recovery of 100 g/unit = 80 g/unit					

v. For collection activities, information regarding existing or near-future, credible collection efforts and programmes that are at an advanced stage of being set up and to which activities under this project would relate.

Relatively large amounts of refrigerants (CFCs, HCFCs, HFCs and HCs) and potentially in the future will be collected from various ongoing GEF EE and CFC/HCFC phase out and future programmes. There is a substantial bank of HCFC mixtures (HCFC-22/142b and HCFC-406a) in HCFC based equipment that would not be directly recyclable but warrant disposal. The ODS waste stream will come from the following sources:

- The proposed GEF-funded FSP related to the proposed end-of-life programme in the domestic refrigeration sector;
- Any future expansion to other sectors of this end-of-life programme;
- Continuation of previous Recovery/Recycling schemes (mostly based on CFCs) in refrigeration and MAC and possible cylinders of un-usable refrigerants that resulted from such past programmes;
- Previous recovery-schemes created during the RMP and TPMP efforts;
- New Refrigerant Recovery schemes that will form part of the upcoming HPMP funded by the MLF; and
- HCFC-related efforts which may indirectly result from the above-mentioned Recovery/Recycling programme

It might also be necessary to elaborate on the commercial relationship between the regional centers, the servicing sector generally and the central disposal facility that is also at least theoretically acting as a central clearing house for the return of recycled material to the market place.

In view that the success of this ODS pilot is dependent upon the successful collection and recovery of ODS from the GEF EE project and the servicing sector, it is crucial that full commercial relationships, synergies, and coordination are forged with the GEF EE and HPMP project coordinator to overcome the following challenges in:

- (a) **Locating and securing old refrigeration appliances and equipment** – the procedures for the GEF EE turn in program for the collection and recovery of ODS is described in detail in Appendix 3. To ensure better coordination for the collection, recovery and disposal of ODS, the operation of the ODS disposal center will be sub-contracted out to the existing importer or distributor with suitable recovery facility as elaborated in more detail in Section 3.2 (iv).
- (b) **Enforcement Considerations:** reducing the technical, financial and regulatory risks for the enforcement of ODS collection, recovery and disposal with strong buy in from all stakeholders.
- (c) **Coordination of project implementation schedules** – the implementation of the demonstration disposal project substantially depends on the generation of EOL ODS from the GEF project and the HPMP so the development of the physical disposal capability has to match this. Likewise, the provision of arrangements for transportation and storage as part of this project needs to be in place as EOL ODS is generated.

The setup of an ODS-waste disposal centre now as opposed to a delay of one or two years would have the following strategic advantages:

- The concerted impact of starting all three converging projects around the same time (GEF EE and MLF's HPMP and ODS) will help to demonstrate the synergistic value of combining and sequencing MEA funding in bringing ozone and climate benefits to the people of Ghana and around the wider ECOWAS region;
- The start of this ODS disposal project now to complement the GEF EE and HPMP will send a strong signal to the industrial sector that the ODS-waste collection and recovery means "serious business". Without this clear signal, the risk is high that ODS-waste collection will never get started and ODS leakage may remain high;
- The development of the ODS disposal facility in Port Tema in step with the GEF project now will help to strengthen the institutional and infrastructure capability for the collection and recovery of ODS;
- The ODS disposal facility could be used as a training center to train technicians locally on the economic, social and environmental benefits of maximizing ODS recovery and to minimize leakage for demonstrating best practices; and
- The Ghana project provides one of four current projects being undertaken by UNDP for submission at ExCom 61 and ExCom 62. The others (Brazil, Cuba, Columbia) will demonstrate other options tailored to specific country needs and will provide a useful menu of options for replication purposes.

vi. For activities that focus at least partially on CTC or halon, an explanation of how this project might have an important demonstration value;

This project will focus exclusively on the disposal of contaminated CFCs and HCFCs and no CTCs or halons will be involved in this pilot project.

3.2. Detailed description of the foreseen management and financial set-up.

Currently abandoned domestic refrigerators/freezers are dismantled by individuals in unregulated scrapyards where the used refrigerant is vented, foam is either burned openly or thrown in the river and Korle Lagoon and recycled metals sold to scrap dealers. This project will help to reduce health hazards and address the safety issue of the current practices whilst creating employment in the district areas. This section includes details such as the total cost of the disposal activity.

i. Collection Centers. Early retired or End-of-Life (EOL) refrigerators will be collected by trained retailers or NARWOA workshop owners in exchange for rebate coupons as an incentive for consumers to replace their old refrigerators for new energy efficient refrigerators (5 star) which has low GWP and zero ODS to be co-funded by the GEF EE project. The turn in program is described in Appendix 3 and the GEF EE PIF and the price of the rebate coupon is yet to be determined (possibly in the range of USD 30 to 50 per unit against a price of USD 130 for new refrigerators). Upon collection, these refrigerators will be transported to the regional dismantling and recovery centres. This decentralized system has the advantage of avoiding the transportation of the old refrigerators with dead weight over a long distance to a central area in Port Tema.

ii. Dismantling and Recovery Centers.

A senior highly trained technician will be hired to manage each center to be supported with two shredders or packers. 72,500 units of refrigerators will be collected and dismantled over the first three years. In addition, 4,000 commercial and domestic air conditioners will also be dismantled. Upon receipt, data for each appliance will be recorded, verified and entered into the computer (Figure 3). The ODS from each refrigerator will be recovered by the technician using special equipment according to best practices, labeled and stored in H4499 refillable cylinders (max ODS weight – 10 kg). Each refrigerator will be dismantled taking out the compressor and stripping out the door and wall.

The foam insulation will be segregated from the metal door and wall. Metal, plastic and wires will be sorted and sold to scrap metal dealers. Given the low volume of foam that is available in Ghana, it may not be viable for an expensive vacuum system to be deployed in order to avoid CFC-11 emissions during the dismantling process. The insulation foam will be stockpiled safely for transport and future exports/destruction.

The dismantling and recovery activities will help to create some local employment.

iii. Transport from Regional Collection-Centers to ODS Disposal Centre in Port Tema.

Once ODS cylinders have been stockpiled, these will be transported to the Disposal centre in Port Tema and this cost will be covered under the proposed MLF budget. The technician will record and verify all the data. A budget for transport is foreseen in this project (see budget section below). The monitoring and tracking procedures are explained in Section 3.4.

iv. ODS Disposal Centre

The potential options for ODS disposal were identified as i) cement kiln destruction; ii) developing a local destruction facility and iii) export to a qualified destruction facility in an Article 2 country.

With regards to the first option, consultation with local experts in late-December 2010 has confirmed that there is no cement kiln in Ghana (all cement production is based on grinding of imported clinker) and it is not cost effective to modify the only one cement kiln in neighboring Togo for the destruction of ODS waste from Ghana.

The second option was the one preferred by the Government and a proposal was submitted to this effect to the 62nd meeting of the Executive Committee in early December 2010. The project was designed around a small-scale Plasma-Arc machine developed in Japan. However the cost effectiveness of such a unit was found to be border-line. Risks were found to be high that the operation would not function in a sustainable manner, even if used it on a 2 eight-hour shift basis to make it more cost-effective. The Committee requested UNDP to propose a different approach (as elaborated below) and further to a visit to Ghana in late-December, this message was conveyed to the Government, which agreed to try the third option.

It should be noted that the Basel Convention would not prevent the movement of ODS between countries that have ratified the Basel Convention. For shipment of ODS-waste, the normal Basel documentation including prior consent and proper training of the staff would be required. Training to the staff of the dismantling center on these requirements would form a part of the tasks of the consultants.

The third option is based on the export of the ODS-waste for destruction at hazardous waste incineration and potentially commercially scaled facilities in non-article-5 countries abroad. Lower destruction costs can be achieved by this method. In this case, the disposal centre in Port Tema would just receive the small safe cylinders of ODS-waste from the various dismantling and servicing centers throughout the country, identify the ODS and ship it (by ODS) abroad in larger containers. The transshipment from Port Tema to the destruction facilities abroad will be managed by the contracted ODS destruction company.

To reduce the overhead cost and for efficient coordination, the operation of the disposal center will be sub-contracted out to an existing importer or distributor of refrigerant through a performance based bidding process (see TOR in Appendix 4). One of the tasks of the centre would be an active campaign to encourage the transport of the small quantities of ODS to its location and maintain a detailed database of amounts of refrigerants received and amounts exported. This database would be essential to facilitate any future application to obtain carbon credits which should enable the operation to continue in a sustainable manner once the MLF-demonstration project is over.

The subcontracted sum will be paid under the MLF ODS pilot project (Table 4). Where possible, the HCFC-22 (and also CFCs) from the commercial and domestic air-conditioners will be recycled for re-use. Heavily contaminated ODS however will be exported. To allow for this, refrigerant-identifying equipment, a recycling unit and a set of storage cylinders will be purchased and their budget is shown below in Table 4.

Figure 1 above (see overarching strategy), clearly shows the place of the disposal center within the overall strategy-framework in Ghana. The dismantling and servicing centers will be scattered throughout the country and will not be able to substitute the task that is expected from the centralized dismantling centre.

A performance-based subcontract arrangement will be utilized to kick start the project at the location of an existing refrigerant distributor or similar facility (private or public). While an initial payment will be made upfront to allow the start-up of the centre, further bi-yearly payments would be based on the amounts of ODS-waste that can be recycled or exported. For more information, see appendix 4 for the detailed TOR for the subcontract with the disposal center and its mandate.

(v) Efforts beyond the demonstration-phase of the project.

The MLF funding will cover the implementation and operation of the pilot project for 3 years. Thereafter carbon credit could be used to scale up the project. The impact of ODS volume recovered from different refrigerator units recycled and potential Voluntary Emission Reductions (VER) carbon prices on project profitability is shown in Figure 3. To breakeven, at least 30,000 units would need to be turned in annually for the recovery of 2.4 t of CFC-12 to give a VER of 22,500 tCO₂e and to fetch at least USD 3/tCO₂e (VER).

At the end of the three years of GEF and MLF funding, it is hoped that whatever ODS that can be recovered from the continuation of the Ghana project will be converted into carbon credits. Ghana intends to turn in 1 million old refrigerators over 10 years. This would translate into 100,000 refrigerators per year, but to take a more conservative estimate of 30,000 refrigerators per annum = 2.4 t or more CFC-12 per year, which would be as a follow up to the GEF project. It should also be noted that the CFCs would gradually be complemented with HCFCs and HFCs, all of which would be eligible under either the Kyoto Mechanism or Voluntary Market mechanisms.

USG Umweltservice GmbH has recently submitted a methodology (Greenhouse Gas Emission Reductions by Recovering and Destroying Ozone Depleting Substances (ODS) from Products) for the destruction of ODS (CFC-12 refrigerant and CFC-11 blowing agent in insulation foam) for approval by VCS. This methodology has been opened for public comment from 5 May 2010 till 3 June 2010 (http://www.v-c-s.org/methodology_ggerrdods.html). Once approved, the Ghana project could use this methodology for claiming carbon credits. Due to monitoring and verification issues, the Climate Action Reserve (CAR) at present would only accept a project where the ODS are destroyed in the USA under a stringent monitoring protocol.

Eligibility for accessing these carbon funds would only start after the MLF-demonstration would be completed (due to the “additionality” issue), and this, further to the fact that the sustainability of the operation will have been demonstrated thanks to this demonstration project, which includes a robust and reliable ODS monitoring system (needed when trying to access carbon funds).

In addition to the carbon market, other financial modalities will also be explored: bilateral grants and auction from the European Union Allowance (EUA). This should ensure sustainability of the operation beyond the duration of this demonstration.

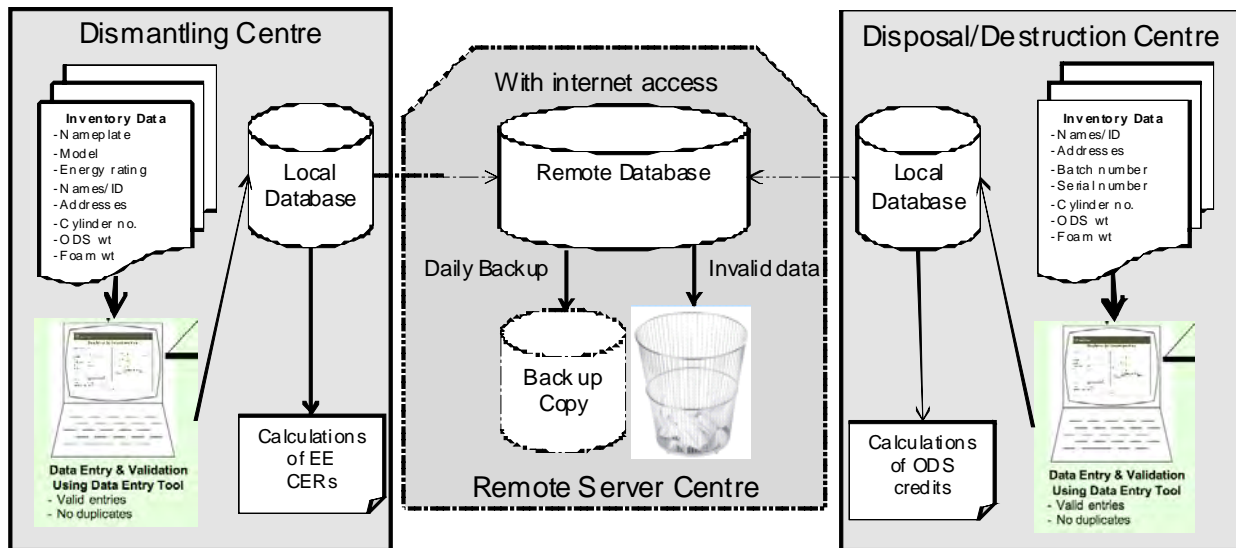
3.3. Concept for monitoring the origin of recovered ODS

The objective of this monitoring is to discourage perverse incentive in the declaration of virgin ODS as used ODS for disposal. The transparent monitoring procedures will allow for external verification of the amounts disposed of, and the costs for its operation should be covered sustainably.

With the intention that the ODS recovered and disposed of could be monetized as carbon credits, a stringent detail monitoring and verification plan for both dismantling and disposal centres will be developed according to approved carbon protocol (e.g. CAR or VCS) so that all the baseline and project data and information captured and recorded can be validated and verified by independent third parties. A transparent and robust tracking system will be developed to cover the following facets: record on collection, transportation, storage at the 6 regional dismantling centres will be kept by the GEF EE project coordinator. Being the first of its kind of technology in Ghana, the national consultant and technicians will work in close collaboration with the international consultant and the technology provider to ensure that the monitoring and servicing plan and data collection are executed with high accuracy and in close supervision.

The technicians will record the volume of refrigerator, metal, foam and ODS recovered from the dismantling process. To ensure high Quality Assurance/Quality Control for carbon projects, technicians will be trained to record the number of ODS provisions to ensure that data acquisition and transcription are carried out consistently and with precision. Excellent chain of custody data will be developed to avoid the perverse incentive of virgin ODS being disposed and to avoid double-counting of ODS destruction credits. For ODS to be exported: relevant data will be captured for verification purposes, the full chain of custody from departure from origin country through to final disposal will be documented, and the methodology for analysing the composition of the ODS will be developed.

Figure 4: Monitoring and verification plan



Attempts to provide these valid assurances and verification as transparent Certificates of Destruction are covered in Item (iv) above and in Figure 4 to ensure traceability, integrity and transparency. The computer data source with a good backup system will allow third party validation and verification deemed essential for developing high quality carbon projects. Such

high integrity and transparent tracking system will allow all stakeholders to put good governance and accountability into practice.

3.4. Exploration of other disposal options for the used ODS.

Relatively large amounts of refrigerants (CFCs, HCFCs, HFCs and HCs) will be collected from various ongoing GEF EE refrigerator replacements and TPMP/HPMP servicing centers. Where possible, ODS will be recycled for reuse to reduce the need for import. In the transition to a full disposal scheme, the opportunity to recycle and reuse the ODS as an initial alternative to disposal according to international best practices will be considered by taking into account the following considerations.

- Market opportunities for recycled ODS
- Minimum quality standards required for recycling or reuse
- Selling price. Factors that will favour decisions for re-use or recycling:
 - Purity of available substance;
 - Equipment age and condition;
 - Existing equipment relying on specific substance without low cost retrofit;
 - Lack of immediate replacement technologies;
 - Likely future demand for the substance
 - Social/Economic impact of refrigerant shortage
- Factors that will favour decisions for ODS destruction:
 - Mixture of ODS or significantly contaminated substance;
 - Desire to accelerate technology transition;
 - Linkage with wider waste programme at product/equipment level;

The technical and economic feasibility to establish a reclaim center will be assessed. Through the distillation of mixes of refrigerants, the reclaim centre would be able to separate out various refrigerants and make them available in a quasi-virgin state. The amounts would therefore be used to avoid imports of equivalent amounts of refrigerants. There may, however, still be certain quantities of refrigerants that cannot be processed and these will be disposed of.

4. PROJECT COSTS

Table-4: Project Budget

	Unit	Tons
ODS stock in storage (with Ghana-EPA)		1.8
ODS from the GEF EE Programme	72,500 refrigerators	5.8
From ongoing and future R&R schemes	10,345 refrigerators	1.2
From ECOWAS imports of ODS-Waste	(see remark 1)	tbd
Total ODS		8.8

Budget	Remark	US\$
A. Capital cost		
Identifier, Cylinders, Miscellaneous, etc		20,000
Computer and Database Monitoring Software		1,560
Subtotal		21,560
B. Transport cost		
Transportation from Dismantling and Servicing Centres to Disposal Centre in Port Tema	0.6 US\$/kg (see remark 2)	
Transport abroad	6.6 US\$/kg (see remark 3)	
Gate fee for destruction	4.1 US\$/kg (see remark 3)	
Subtotal	11.3 US\$/ kg for 8,800 kg	99,440
C. Sub-contract cost to operate the facility		
One technician over 3 years	(see remark 4)	21,000
Space, security, electricity, water, AC in an existing facility over 3 years	(see remark 4)	6,000
Part-time person for database on ODS-waste / Monitoring over 3 years	(see remark 4)	6,000
Subtotal		33,000
D. Technical Support and Supervision		
Part-time National Consultant		22,000
Part-Time International Consultant (incl 2 visits to Ghana)	(see remark 5)	22,000
Subtotal		44,000
Grand Total		198,000
Project Cost Effectiveness (USD/kg)		22.5

Remark 1: There is a possibility that some neighboring countries (especially landlocked countries to the north) would export their ODS-waste through the Disposal Centre in Ghana, but as this cannot be confirmed today, so no tonnage is being accounted for this at this time.

Remark 2: In December 2010, an estimate was made based on the cost to transport cylinders of LPG from Port Tema to various cities. As the number of dismantling and servicing centres are large and spread around the country (distances ranging from 50km to over 600 km from Port Tema), it was found difficult to come up with a comparable cost for what the local transportation of 8.8 tonnes of ODS-waste might cost, especially as the quantities involved are contained in small cylinders. Including handling, it was estimated that the average cost would come to around US\$ 1/kg. **However it is thought that costs can be reduced to US\$ 0.6/kg.**

Remark 3: Several quotes were requested to export the ODS-waste to Europe, USA, South Africa. Only two quotes were received of which Tredi (France) would come to the cheapest solution. Its quote is summarized as appendix 5. As can be seen, the per kg cost is estimated at US\$ 12.27 /kg. **UNDP however believes that it would be possible to reduce this cost to US\$ 10.7 US\$/kg.** It should be noted that an official bidding exercise will be conducted by UNDP during the implementation of the project.

Remark 4: These three budget-lines are indicative and given for estimation-purposes only, as they will be part of a performance-based subcontract (see draft TOR in appendix 4).

Remark 5: The consultants will devote part of their time to assist Ghana to find funding that would be needed beyond the 3-years duration of this project, as described elsewhere in this document.

The requested grant for this project amounting to: **US\$ 198,000 (excludes 9% support costs).**

5. IMPLEMENTATION/MONITORING

Table-5: Implementation Schedule

TASKS	2011				2012				2013			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Phase I - Project Start-up												
MF Project Approval	X	X										
Receipt of Funds	X	X										
Grant Signature		X	X									
Procurement arrangement		X	X									
Performance based Subcontract		X	X									
Recruitment Consultants		X	X									
Phase II – Operation & Completion												
Operation for 30 months				X	X	X	X	X	X	X	X	X
Monitoring by local consultant				X		X		X		X		X
Identification of alternative funding mechanisms to ensure continuation beyond pilot-stage									X	X	X	X
Final report												X

Table-6: MILESTONES FOR PROJECT MONITORING

TASK	MONTH*
(a) Project document submitted to beneficiaries	1
(b) Project document signatures	2
(c) Procurement, Subcontracting, Recruitment	2,3
(d) Phase II - starts operation	6
(e) Phase II project closure – final reporting	24-36

* As measured from project approval

6. ANNEXES

Appendix 1: Letter of Transmittal by the Minister of Environment

Appendix 2: Public Notice by the Energy Commission on Energy Efficiency Standards and the Prohibition of the Manufacturing, Importation and Sale of Used Refrigerators in Ghana

Appendix 3: GEF EE Turn In Program to collect old refrigerators for ODS recovery


Appendix 4: Terms of Reference for a Sub-contractor to operate and dispose of ODS wastes in Ghana

Appendix 5: Quotation from Tredi (France) for export – destruction of ODS waste.

Appendix 6: Ghana ODS Destruction Pilot Annex- Legal Framework

Appendix 1: Letter of transmittal by the Minister of Environment

Appendix 2: Public Notice by Energy Commission on the Energy Efficiency Standards and Prohibitions (as advertised in national newspaper in August 2010)

	ENERGY COMMISSION	NO. EC_EE-01-10-001	PUBLIC NOTICE
ENERGY EFFICIENCY STANDARDS FOR REFRIGERATING APPLIANCES AND PROHIBITION OF MANUFACTURE, IMPORTATION AND SALE OF INCANDESCENT FILAMENT LAMPS, USED AIR CONDITIONERS, REFRIGERATORS AND FREEZERS.			
<p>1. Parliament has passed into law, the Energy Efficiency - Standards and Labelling (Household Refrigerating Appliances) Regulations, 2009 (LI 1958) which has set energy efficiency standards for domestic refrigerators, freezers refrigerator freezers and chillers. All refrigerating appliances imported or manufactured for sale in the country must meet the minimum energy efficiency requirement set out in the regulations. Besides meeting the energy efficiency requirements, the law requires that the appliance must be properly labelled as prescribed in the regulations with the following information provided;</p> <ul style="list-style-type: none">a. Energy efficiency star rating (one star to five star);b. Manufacturer;c. Fresh and frozen food volumes, in litres;d. Annual electricity consumption in kWh;e. Model number;f. Refrigerant type;g. Climate class (Sub-tropical or tropical)	<p>2. Parliament has also passed into law the Energy Efficiency (Prohibition of manufacture, Sale or Importation of incandescent Filament Lamp, Used Refrigerator, Used Refrigerator-Freezer, Used Freezer and Used Air-conditioner) Regulations, LI 1932 which prohibits:</p> <ul style="list-style-type: none">(a) Manufacture, sale or importation of incandescent filament lamps;(b) Importation and sale of used air-conditioners; and(c) Importation and sale of used refrigerator, refrigerator-freezer and freezer.	<p>4. Importers of the following which are exempted in the LI 1932 should obtain permit from the Energy Commission;</p> <ul style="list-style-type: none">i. motor vehicle lights;ii. flood lights;iii. holoenlights;iv. spotlights or searchlightsv. airport runway lightsvi. street lights; andvii. special purpose lights including theatre or stage lights.	<p>5. In view of the above, all importers of air-conditioners, compact fluorescent lamps and refrigerating appliances should register with the Energy Commission not later than 30th September, 2010.</p>
<p>Importers and the general public are advised that the provisions in these regulations took effect from 11th November 2009.</p>	<p>The provisions in this regulations relating to (a) and (b) entered into force on 23rd October 2008 while provisions related to (c) took effect from 8th May 2010.</p>	<p>Importers who fail to comply with this notice will have their goods detained until the Ghana Standards Board has performed tests and has certified them as complying with the Ghana Standards before the goods would be released.</p>	
		<p>Issued under the Authority of the Energy Commission</p>	

Appendix 3: Turn In Program of the GEF EE project for the collection and storage of ODS

Registration of importers

The process starts with registration of importers refrigeration appliances by the Energy Commission. All importers and future manufacturers of refrigeration appliances will have to comply with the minimum energy efficiency requirements; this is mandatory. However, compliance with higher energy efficiency standards is voluntary.

For the purposes of clarification, an importer is the person or company that imports the appliances. The dealer is the retailer. It is worthy of note that in Ghana, most importers have retailer outlets as well. The importers will be needed to submit test reports to assure the Commission that the appliances meet the required minimum standards. It is the importer who the Commission will deal with in the release of coupons.

Certification and labeling regime

With the introduction of labeling and certification regime, all imported refrigerators that are properly labeled and accompanied by certificates will be immediately released by the Ghana Standards Board. Appliances without labels will be detained until the technical details have been provided and the efficiency level determined. A printing firm will be pre-qualified to print labels to be affixed on the appliances that meet the minimum requirements. Those that do not meet the requirements will have to be re-exported.

Participation in the rebate scheme

Participation in the refrigerator rebate scheme is voluntary. Importers that opt to deal in higher efficiency appliances will register with the Commission and they will be given certificates and special stickers to be displayed in front of their shops. The importers of higher efficiency appliances will submit test reports from accredited test laboratories to the Energy Commission who will in conjunction with Ghana Standards Board, determine the efficiency level. Coupons will then be issued corresponding to determined efficiency levels with predetermined rebate values to the importer.

The Table below gives an estimated average annual consumption and saving for each star rating.

Star Rating	Annual Energy Consumption of Refrigerator, kWh	Annual Energy Savings of Refrigerator, kWh
5 star	250	950
4 star	350	850
3 star	400	800
2 star	500	700
1 star	600	600

Administration of the Rebate

The Energy Commission will appoint a participating bank where the rebate funds will be lodged. Security-enhanced coupons will be issued in quadruplicate by the Energy Commission and entered into a data base; one copy each of the coupon will be put on the records of the Commission and that of the participating bank. The remaining two copies of the coupon will be issued to the participating importer, and they will be completed at the time of purchase by the buyer, and then signed and stamped by the dealer. The dealer will retain one of the coupons whilst the buyer will keep the other coupon and use its value as part payment for the refrigeration appliance by submitting it to the participating bank for redemption. The bank will honour the coupon after having satisfied itself of the authenticity of the coupon (i.e. serial number, security features etc).

Checks against fraud

In order to ensure the scheme against fraud, the participating bank will redeem coupons from only registered importers after it is satisfied that the serial numbers are correct and that there is an Energy Commission stamp duly affixed. Buyers may be visited at random to certify that the refrigeration appliances are indeed at the buyer's premises.

Appendix 4: TERMS OF REFERENCE FOR A SUBCONTRACTOR TO DISPOSE OF ODS WASTE IN GHANA

The services of a subcontractor are being sought under the framework of the ODS-Waste Disposal Programme for Ghana, to be funded by the Multilateral Fund for the Implementation of the Montreal Protocol and implemented by the United Nations Development Programme (UNDP) in collaboration with Ghana-EPA. The National Ozone Unit at Ghana-EPA and UNDP wishes to retain the services of company XXXX represented by Mr. YYYY, with the following address and email-contact:

*ZZZZZZZZZZZZZZZZZZZZ, Ltd
ZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZ Street
ZZZZZZZZZZZZZZZZZZZZ, Ghana
YYY.YYYY@ZZZZ.COM*

Definitions:

The term “disposal center” is used to mean a centralized facility near the port where the ODS-waste would be temporarily stored, coming from the various dismantling and servicing centers throughout the country. It would have the function of encouraging the transport of small quantities of ODS-waste to its location. It would also identify the ODS-waste received and its purity, it would recycle refrigerant when possible, and arrange for its export if non-recyclable. The “amounts disposed of” by the center would correspond to the sum of ODS-waste recycled plus ODS-waste exported.

The specific objectives of this subcontract are as follows:

1) The subcontractor will provide space, electricity, water and human resources to operate the ODS-waste Disposal facility that will form part of this project. Peripheral equipment that would be purchased by UNDP separately (not part of this contract) would include the following:

Recycling Unit (or Reclaim)
ODS Identifier
Cylinders, Miscellaneous equipment to handle various refrigerants
Computer, database software for monitoring of ODS-waste received and disposed of

2) The subcontractor in close collaboration with the national and international consultants will commit to provide high quality and professional services for

- Contacting the refrigerator dismantling and servicing centers throughout the country to ensure that the cylinders of ODS-waste are being sent to them for disposal. Undertake any other awareness related activities to stimulate the receipt of ODS-waste. The budget for transportation of the cylinders would not form part of this subcontract.
- Accept additional ODS-waste from neighboring Ecowas countries if found feasible.

- Receiving of ODS-waste contained in small cylinders coming from all parts of the country (refrigerator dismantling and servicing centers).
- To identify the contents of the cylinders, and when found that the ODS may be re-used, recycle and store for selling on the market. Most of the contents is however expected to be un-usable, and would be stored by refrigerant in larger cylinders, ready for export abroad.
- Ensure administrative steps to arrange for export of un-usable ODS. Transport cost to a facility abroad will be covered by the project but will not form part of this subcontract.
- Maintain a database recording all amounts of ODS received at the facility (on a monthly basis), all amounts that was recycled, and all amounts that were sent for destruction abroad. This information will be kept by refrigerant (CFC-12, HCFC-22, HFC-134a, other).

3) The subcontractor will prepare 6-monthly reports about the daily activities that were performed at the disposal centre, including information about the quantities of each ODS consignment that were received, recycled and disposed of during the period concerned, Six-monthly payments will be based on these reports as elaborated upon below.

Monitoring

The National and International Consultants of the project (outside the scope of this subcontract) will have the task to verify that the quantities claimed to be received, recycled and disposed of are truthful. Special action will be taken to avoid any risk of the perverse incentive whereby virgin refrigerant would be soiled and sent to the disposal centre as ODS-waste. This monitoring will also be conducted by the consultants.

Duration of the subcontract

This subcontract will last until the target amount of ODS-waste stipulated below has been disposed of (recycled or exported). It is anticipated that this may take up to 2 to 3 years.

Remuneration

a) The subcontract is performance-based, which means that the subcontractor will get an initial 6-month advance of US\$ 6,000 upon signature of the contract to allow for the start of the operations, but that further 6-monthly payments would be based on the quantities of ODS-waste disposed of during the preceding 6 months, which would be calculated as US\$ 3 per kilogram of ODS-waste recycled or disposed of.

b) The 6-monthly payments would continue till the maximum ceiling of US\$ 33,000 (including the initial payment) is reached. As such, the amount of ODS-waste that would have been recycled or disposed of at the end of the subcontract arrangement would amount to $(US\$ 33,000 - US\$ 6000) / 3 US\$/kg = 9$ metric tons which more or less corresponds to the overall objective of the demonstration-project.

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c) As mentioned above, and except for the initial payment, further payments would be based on 6-monthly reports by the subcontractor which will be verified by the independent National Consultant, and further endorsed by the NOU and UNDP-Accra.

Signed by NOU

Signed by UNDP-Accra

Signed by the Subcontractor

Date :

Date :

Date :

Appendix 5: Quote from Tredi for the export and destruction of ODS-Waste

Quotes for the import of CFC-12 by Tredi from Port Tema in Ghana for destruction in France				
Description	Conditions	Tariff (Euro)	USD	USD/kg
1 x 20 footer - Gross weight =	11,500 kg	Exchange rate	1.37	
Net CFC-12 weight	6,020 kg			
1 x 20 footer = 602 x M4499 cylinders				
A. Cost from Port Tema to Tredi				
1. Administrative cost for Basel Convention compliance	Permit will last one year	4,500	6,165	1.02
2. Sea freight – 1 x 20’ from Port Tema to Marseille	1 x 20’	13,500	18,495	3.07
3. Handling and packaging material with field tools	Gross weight 11,500 kg	5,000	6,850	1.14
4. Field crew – Supervisor	Gross weight 11,500 kg	6,000	8,220	1.37
5. Supervisor Travel expenses	Gross weight 11,500 kg	6,500	8,905	1.48
6. Gate fee for the Destruction of CFC-11 and CFC-12 cylinders	Gross weight 11,500 kg	18,400	25,208	4.19
Sub-Total (Port Tema to Tredi)	6,020	53,900	73,843	12.27

Appendix 6: LEGAL FRAMEWORK

Ghana is a signatory to the Montreal Protocol on Substances that Deplete the Ozone Layer. The status of the ratification of this protocol and its Amendments is as follows:

Multilateral Environmental Agreement	Date of Ratification	Date of Entry into Force for Ghana
Ozone-related		
Vienna Convention on the Protection of the Ozone Layer	24 July 1989	22 October 1989
Montreal Protocol on Substances that Deplete the Ozone Layer	24 July 1989	22 October 1989
Montreal Amendment	24 July 1992	22 October 1992
Copenhagen Amendment	9 April 2001	8 July 2001
Montreal Amendment	8 August 2005	6 November 2005
Beijing Amendment	8 August 2005	6 November 2001
Climate-related		
United Nations Framework Convention on Climate Change (UNFCCC)	6 September 1995	5 December 1995
Kyoto Protocol	30 May 2003	16 February 2005