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COMITÉ EJECUTIVO DEL FONDO MULTILATERAL
PARA LA APLICACIÓN DEL
PROTOCOLO DE MONTREAL
Cuadragésima Primera Reunión
Montreal, 17 al 19 de diciembre de 2003

PROPUESTA DE PROYECTO: ECUADOR

Este documento contiene los comentarios y las recomendaciones de la Secretaría del Fondo sobre la propuesta del siguiente proyecto:

Eliminación

- Plan nacional de eliminación de CFC (primera parte) — Banco Mundial

HOJA DE EVALUACIÓN DE PROYECTO
ECUADOR

SECTORES: múltiples Uso de SAO en el sector (2002): 229,6 toneladas PAO

Umbrales de relación de costo a eficacia del subsector:	
Espuma de revestimiento integral	$EUA16,86/kg
Espuma poliestireno/polietileno	$EUA8,22/kg
Espuma rígida	$EUA7,83/kg
Refrigeración comercial	$EUA15,21/kg

Título del proyecto :

a) Plan nacional de eliminación de CFC (primera parte)

Datos del proyecto	**Múltiples**
	Plan de eliminación de CFC
Consumo de la empresa (toneladas PAO)	246,40
Impacto del proyecto (toneladas PAO)	242,95 *
Duración del proyecto (meses)	84 *
Monto inicial solicitado ($EUA)	779 329
Costo final del proyecto ($EUA):	
Costo adicional de capital (a)	616 712
Costo de imprevistos (b)	
Costo adicional de explotación (c)	1 413 843
Costo total del proyecto (a+b+c)	2 030 555
Propiedad local (%)	100
Componente de exportación (%)	0
Monto solicitado ($EUA)	779 329
Relación de costo a eficacia ($EUA /kg.)	9,01
¿Financiación de contraparte confirmada ?	
Organismo nacional de coordinación	Dependencia de Gestión Ambiental del MICIP
Organismo de ejecución	Banco Mundial

Recomendaciones de la Secretaría	
Monto recomendado ($EUA)	
Impacto del proyecto (toneladas PAO)	
Relación de costo a eficacia ($EUA /kg)	
Costo de apoyo del organismo de ejecución ($EUA)	
Costo total al Fondo Multilateral ($EUA)	

* Impacto total del plan nacional de eliminación: el impacto de la primera parte es 164 toneladas PAO.
** Duración del plan: la duración de la primera parte (programa anual) es 12 meses.

DESCRIPCIÓN DEL PROYECTO

Antecedentes del sector

Perfil de consumo y eliminación de CFC (Anexo A, Grupo I)

Según la Decisión 35/57, Ecuador seleccionó la Opción 1 como punto de partida, lo que asciende a:	225,3 ton. PAO
- Consumo remanente de CFC admisible para el financiamiento a la 41a. Reunión (en virtud de la Decisión 35/57, condición B)	225,3 ton. PAO
- Impacto de todos los proyectos de CFC presentados a la 41a. Reunión para financiamiento	225,3 ton. PAO
- Consumo de CFC remanente a partir del consumo de punto de partida después de la aprobación de los proyectos presentados a la 41a. Reunión	0 ton. PAO

Plan nacional ecuatoriano de eliminación de CFC

Introducción

1. En nombre del gobierno de Ecuador, el Banco Mundial presentó a la 41a. Reunión un plan nacional de eliminación de CFC para eliminar un total de 245,92 toneladas PAO, incluyendo 16,87 toneladas PAO en polioles premezclados. El objetivo del plan es eliminar 55,43 toneladas PAO y 3,72 toneladas PAO de CFC en el sector de espumas y el subsector de fabricación de equipos comerciales de refrigeración, respectivamente, y eliminar el consumo remanente de CFC con actividades sin inversión. No se piden fondos para la eliminación de SAO en usos con solventes, pues no se identificaron las empresas admisibles para el financiamiento. Sin embargo, durante la ejecución del plan se proporcionará asistencia técnica sobre la selección de solventes alternativos.

2. En 2002, el gobierno del Ecuador informó un consumo total de 273,4 toneladas PAO de sustancias controladas del Anexo A, Anexo B y Anexo E, distribuidas de la manera siguiente:

Sustancia	Consumo de 2002 (toneladas PAO)	Consumo básico (toneladas PAO)
CFC	229,6	301,4
CTC	0,2	0,5
Metilcloroformo	2,8	2,0
Metilbromuro	40,8	66,2
Total	273,4	370,1

3. De acuerdo con la Decisión 35/57, el gobierno de Ecuador eligió la Opción 1 (225,3 toneladas PAO) como el punto de partida para determinar el consumo restante de CFC, admisible para financiamiento. No se ha aprobado ningún proyecto para eliminar CFC en ese país, desde que adoptó el consumo de punto de partida. Por lo tanto, el consumo máximo para Ecuador, admisible para financiamiento, sigue siendo 225,3 toneladas PAO.

4. El consumo de SAO que abarca el plan se distribuye por sector y subsector de la manera siguiente:

	CFC-11	**CFC-12**	**CFC-113**	**CFC-115**	**Total CFC**	**TCA**	**CTC**	**Total**
Espumas	9,76	30,00			39,76			39,76
Fabricación de equipos de refrigeración		6,00			6,00			6,00
Servicio y mantenimiento de equipos de refrigeración	2,22	178,30		2,74	183,26			183,26
Solventes			0,51		0,51	1,00	0,22	1,73
Agentes de proceso						1,38		1,38
Total	**11,98**	**214,30**	**0,51**	**2,74**	**229,53**	**2,38**	**0,22**	**232,13**

Criterios y regulaciones existentes

5. El gobierno de Ecuador adoptó los criterios y regulaciones siguientes para cumplir con sus obligaciones en virtud del Protocolo de Montreal.

- Designación por Decreto Presidential del Ministerio de Comercio Exterior, Industrialización, Pesquerías y Competitividad (MICIP) como organismo director para la aplicación del Protocolo de Montreal en el país.
- Prohibición de la importación de equipos de refrigeración que contienen CFC.
- Vigente desde 1996, todos los coches importados y montados en Ecuador se deben equipar con sistemas de aire acondicionado cargados con HFC-134a.
- Prohibición del registro de productos en aerosol que contienen CFC, excepto los inahaladores de dosis medida.
- Autorización previa obligatoria de los ministerios de Agricultura y de Salud para la importación del metilbromuro.

Sector de aerosoles

6. En 1993, en su 9a. Reunión, el Comité Ejecutivo aprobó un proyecto general de aerosoles para 18 empresas, que se terminó en 1995 y eliminó el consumo de CFC en el sector, equivalente a 190 toneladas PAO. Ecuador no produce inhaladores de dosis medida .

Sector de espumas

7. En 1993 se aprobó un proyecto general de espumas rígidas para la eliminación de 51 toneladas PAO, y en 1998, se aprobó otro proyecto del sector de espumas flexibles para la eliminación de 32 toneladas PAO. Ambos proyectos lograron eliminar un total de 83 toneladas PAO. Actualmente, hay 12 empresas productoras que producen espumas del poliuretano en pequeña escala y que consumen un total de 25,4 toneladas PAO de CFC-11, y una empresa que produce poliestireno extruido con un consumo de 30 toneladas PAO de CFC-12.

8. En noviembre de 2002 el Comité Ejecutivo aprobó un proyecto general de eliminación definitiva, destinado a eliminar CFC-11 en la fabricación de espumas del poliuretano. Basado en la encuesta realizada para la preparación del proyecto, se descubrió que en 2001 alrededor de 165 toneladas PAO de CFC se utilizaron en la producción de espumas (principalmente espumas rígidas). Del total de empresas identificadas como usuarios de CFC como agente de espumación (585), sólo 42 empresas, con un consumo total de 33,2 toneladas PAO de CFC, eran admisibles para recibir la ayuda del Fondo. El consumo remanente de CFC se está abordando a través del componente de asistencia técnica dentro del proyecto general.

Subsector de fabricación de equipos de refrigeración

Fabricación de equipos de refrigeración domésticos

9. Al final de 2002 todas los fabricantes de equipos de refrigeración domésticos se habían convertido a tecnologías sin SAO con la ayuda del Fondo Multilateral. En la 26a. Reunión de 1988 se aprobaron los proyectos para dos empresas que consumían un total de 44,1 toneladas PAO y que fueron terminados en 2001 y 2002.

Fabricación de equipos de refrigeración comerciales

10. En este subsector no ha habido mucha actividad relacionada con la eliminación. Se identificaron siete empresas que consumen un bajo volumen de CFC para asistarlas a eliminar su consumo total de 1,2 toneladas de CFC-11 y de 2,52 toneladas de CFC-12. Se informó que en el sector de transporte refrigerado se consumió un total de 0,8 tonelada de CFC-12 y 0,7 tonelada de R-502. Sin embargo, debido a que estos equipos que usan CFC son viejos, se espera que para 2010 ya no funcionen. La estrategia propuesta en el plan nacional de eliminación considera proporcionar asistencia técnica a las tres compañías principales que sirven a la industria de embarque para que desarrollen habilidades para la transición a equipos sin CFC.

11. Otros ocho sistemas de refrigeración identificaron enfriadores y se estimó que en Ecuador funcionan unos 200 aparatos, lo que justifica las 7 toneladas de CFC aproximadamente que se eliminarán con la capacitación. Solamente el montaje de aire acondicionado de vehículos comenzó a usar HFC-134a como refrigerante desde 1996. Todos estos aparatos en vehículos importados se cargan con HFC-134a.

Subsector del servicio y mantenimiento de refrigeración

12. El subsector del servicio y mantenimiento de refrigeración sigue siendo el área más importante y se calcula que consume unas 178 toneladas de PAO de CFC-12. Basado en el estudio realizado en 2002, el total de talleres del servicio se estimó en 863, clasificados de la manera siguiente:

- Equipos domésticos de refrigeración (exclusivamente) 104
- Equipos domésticos, comerciales y de aire acondicionado 378
- Aparatos de aire acondicionado para vehículos 198
- Equipos industriales de refrigeración 183

13. Los resultados del examen demostraron unos 850.000 refrigeradores domésticos y unos 200 000 refrigeradores comerciales. Basado en un promedio de vida útil de 20 y 10 años para los refrigeradores domésticos y comerciales, respectivamente, se estimó que 90 000 refrigeradores domésticos que usan CFC seguirán recibiendo mantenimiento durante el período de 2010 a 2022, y 40 000 refrigeradores comerciales con CFC pueden necesitar servicio y mantenimiento de 2010 a 2012. Para reducir la demanda de CFC usado en servicio y mantenimiento, se proyecta fomentar la modificación de estos equipo por medio de asistencia técnica ofrecida a través de los talleres de capacitación de técnicos.

14. Los datos del Ministerio del Transporte mostraron que 6 000 vehículos de unos 82 700 estaban en circulación, lo que justificaba en 2002 las 6 toneladas PAO de CFC-12. Los cálculos basados en un promedio de vida útil de vehículos de 20 años en Ecuador y en el índice y la frecuencia de carga del refrigerante mostraron que todavía se necesitarían unas 3,4 toneladas de CFC-12 para el servicio y mantenimiento de aparatos de aire acondicionado de vehículos que usan CFC.

Sector de solventes

15. Los usos de solventes en Ecuador no son significativos. La Cámara de Industria identificó el uso del metilcloroformo como agente de proceso, pero su nivel real de uso no pudo confirmarse. El CTC se utiliza principalmente en laboratorios y solamente se importó alrededor de 0,6 tonelada de CFC-113. No se piden fondos para este sector, puesto que en Ecuador no hay compañías admisibles todavía que usan solventes con SAO.

Plan de eliminación

16. El plan de eliminación tiene tres componentes principales:

- Proyectos de inversión en el sector de espumas y el subsector de refrigeración comercial para eliminar 55,43 toneladas PAO y 3,72 toneladas PAO de CFC, respectivamente, por un total de 59,15 toneladas PAO
- Asistencia técnica, capacitación y recuperación y reciclado en el sector de servicio y mantenimiento de refrigeración.
- Medidas institucionales y reglamentarias

17. El resumen del componente de inversión se da a continuación:

Subsector	Consumo de CFC toneladas PAO	Costo $EUA $EUA/kg	Costo a eficacia $EUA/kg
Espumas de poliuretano	25,43	312 619	12,29
Espumas del poliestireno	30,0	246 600	8,22
Refrigeración comercial	3,72	57 493	15,46
Total	**59,15**	**616 712**	**10,43**

Actividades de sector de servicio de refrigeración

18. Basado en el número estimado de 863 talleres se calculó que había 1.726 técnicos que necesitaban capacitación en buenas prácticas de gestión de refrigeración.

19. La estrategia propuesta es proporcionar ayuda a las compañías de servicio para asegurar que tienen las habilidades para gestionar la transición a los refrigerantes sin CFC y al manejo adecuado de toda la gama de refrigerantes, abordando así los problemas del agotamiento del ozono y el calentamiento de la Tierra. Esto asegurará que los trabajadores tendrán la capacidad de gestionar bien la transición a las alternativas sin que haya un impacto adverso importante en la economía ecuatoriana.

20. El programa de capacitación implicaría la capacitación en buenas prácticas de gestión en refrigeración para las tecnologías con CFC y sin CFC, la recuperación y el reciclado y, específicamente, incluiría la capacitación en modificación de equipos para las alternativas sin CFC, especialmente en el caso de los refrigeradores domésticos. El plan nacional de eliminación de CFC propone que, además de recibir capacitación, estos trabajadores o técnicos podrían comprar el equipo necesario para el servicio y mantenimiento de los sistemas de refrigeración sin CFC y equipos modificados (como bombas de vacío, manómetros y detectores de fugas) a un precio reducido. Estas medidas asegurarán que cualquier equipo con CFC todavía en operación en 2010, pueda de hecho recibir el mantenimiento adecuado.

21. El programa de capacitación contiene los siguientes componentes:

- Programa de capacitación de instructores, que comenzará a mediados de 2004
- Capacitación y acreditación de los técnicos de servicio, que se comenzarán a mediados de 2005
- Capacitación en servicio y mantenimiento de enfriadores

22. El programa de capacitación de instructores que elaborarán los expertos internacionales y locales basados en materiales locales y del PNUMA se organizará en 9 centros autorizados de capacitación, en instituciones académicas técnicas y de nivel terciario del país. Cada centro de la capacitación recibirá dos juegos de equipos básicos para la capacitación, como manómetros,

bombas de vacío, bombonas para cargar refrigerantes, máquinas de recuperación y reciclado, y detectores de fugas.

23. La capacitación y la acreditación se organizarán después de un programa de promoción pública sobre la eliminación de CFC y sobre su impacto en el sector de servicio y mantenimiento. Se preven 70 talleres de capacitación con 25 técnicos por taller.

24. El objetivo del componente de servicio y mantenimiento de enfriadores es proporcionar asistencia técnica en estas actividades específicas. Además de recibir capacitación, las compañías deberán poder comprar, con el plan nacional de eliminación, el equipo necesario para realizar el servicio y mantenimiento de los sistemas de refrigeración sin CFC y los equipos modificados (como bombas de vacío, manómetros y detectores de fugas) a un precio reducido. Estas medidas asegurarán que cualquier equipo con CFC que todavía siga funcionando en 2010, pueda de hecho recibir el mantenimiento adecuado y reducir emisiones.

Subsidio financiero para las herramientas de servicio de refrigeración y mantenimiento de aparatos de aire acondicionados de vehículos y recuperación y reciclado

25. Basado en el estudio realizado en el sector, 103 equipos de recuperación y reciclado estarían disponibles para el programa y se distribuirían entre los técnicos, en 10 ciudades con el mayor consumo de SAO. Se establecerá un centro de regeneración en una de las ciudades por un costo de 100 000 $EUA para servir al programa. Otros aspectos del programa son:

- Se proporcionará asistencia financiera para permitir a los talleres de servicio la compra del equipo necesario.
- En el Ministerio se creará una base de datos para controlar los refrigerantes recuperados y reciclados.
- Se elaborarán criterios para la distribución de equipos entre los talleres, basados en el número de aparatos de refrigeración que reciben mantenimiento anualmente y el volumen de CFC-12 recuperado.

26. A continuación se da el resumen del programa de asistencia técnica y capacitación del sector de refrigeración.

Artículo	**Costo $EUA**
Programa de capacitación de instructores	120 450
Capacitación de los técnicos de servicio y mantenimiento de refrigeración	83 875
Capacitación en servicio y mantenimiento de enfriadores	106 260
Máquinas de recuperación y reciclado	583 968
Centro de regeneración	110 000
Total	1 004 553

Impacto del programa del sector de servicio en refrigeración

27. Se estima que cada máquina recuperaría diariamente un promedio de 1 kg de CFC-12. Basado en un cálculo de 280 días laborables al año, se espera que el promedio anual de CFC-12

recuperado sea de unas 28,84 toneladas. Al asumir que 90% de la sustancia química recuperada puede reciclarse, se estima que usando las máquinas de reciclado se dispondrá de 26 toneladas de CFC-12. Se espera que se recuperarán unas 90 toneladas de CFC-12 durante el período de 2005 a 2010.

28. También se espera que el uso del componente de recuperación y reciclado en el país produzca una reducción rápida y sostenida en el consumo de CFC-12, que el gobierno considere indispensable para que Ecuador cumpla con la reducción en 2005 y 2007.

Mejora de la capacidad de las instituciones y asistencia técnica

29. Además de las actividades de asistencia técnica que son específicas del sector, en el plan nacional de eliminación de CFC se incluye la mejora de la capacidad de las instituciones y las actividades de asistencia técnica. Estas incluyen la ejecución y la supervisión del proyecto por un costo de 253 000 $EUA y de 55 000 $EUA, respectivamente, y capacitación de funcionarios de aduana por un costo de 101 000 $EUA.

Ejecución y supervisión

30. Se pide financiamiento para una dependencia de ejecución y supervisión con personal a tiempo completo, puesto que la ejecución del plan implicará un gran cantidad de trabajo administrativo para facilitar el desarrollo de criterios y reglamentaciones, el diseño y la ejecución de un sistema que autorice la importación/exportación, la identificación de usuarios finales adicionales, una base de datos de los usuarios de CFC, el desarrollo de propuestas de proyectos a nivel de empresa, la asignación de recursos para las actividades de inversión, las actividades de concientización, y otras actividades incluyendo la auditoría necesaria. Se establecerá un equipo de gestión de proyecto, que trabajará bajo la supervisión del MICIP, con las responsabilidades de gestión y supervisión que se hayan descritas detalladamente en el plan de eliminación. El costo total del componente de ejecución y supervisión es 308 000 $EUA, lo que representa el 15% del costo del plan de eliminación.

Capacitación de funcionarios de aduana

31. Se propone un programa del capación de instructores para la Oficina de Administración de Aduana en Guayaquil (jefatura nacional). Se espera que la capacitación de los funcionarios de aduana de Ecuador inicialmente sea proporcionada por expertos del exterior que estén familiarizados con el tráfico ilegal de CFC, pero después de esta capacitación inicial, se desarrollará un curso específico para los funcionarios de aduana. Este "programa de capacitación de instructores" comenzará en 2005, una vez que entre en vigor el sistema que autorice la importación/exportación propuesto en el plan. Después de terminado este programa de capacitación de instructores, se formará a grupos de funcionarios provenientes de cada uno de los puertos de entrada en sesiones de capacitación de tres o cuatro días.

32. Los costos estimados para el taller de capacitación de instruccióres para el servicio de aduana, el desarrollo del curso de capacitación y los procedimientos de muestreo equivalen a 55 000 $EUA (20 000 $EUA para el desarrollo del curso de capacitación, 20 000 $EUA para los expertos internacionales, 10 000 $EUA para los expertos nacionales y 5 000 $EUA para el

material didáctico). Además, el suministro de dos dispositivos de detección portátiles a cada uno de los nueve puertos de entrada, evaluados en 1 500 $EUA cada uno, costará 13 500 $EUA en total. Se identificará y mejorará un laboratorio existente por un costo de 10 000 $EUA para servir de instalaciones de ensayo.

Costo del plan nacional de eliminación de CFC

33. El costo del plan nacional de eliminación de CFC se resume en la tabla siguiente. Se espera que el monto pedido se desembolse en seis cuotas, desde 2003 hasta 2008.

Resumen del costo

Subsector/actividad	**Eliminación de SAO toneladas PAO**	**Costo $EUA**
I. Inversión		
a) espumas	55,43	559 219
b) refrigeración comercial	3,72	57 493
Subtotal de inversión	*59,15*	*616 712*
II. Sin inversion		
a) servicio y mantenimiento de refrigeración		
i) capacitación de instructores		120 450
ii) capacitación de técnicos de servicio y mantenimiento		83 875
iii) capacitación de técnicos de servicio y mantenimiento de refrigeradores		106 260
iv) recuperación y reciclado		583 968
v) centro de regeneración		110 000
Subtotal		1 004 553
b) ayuda para mejorar la capacidad de las instituciones/ténica		
i) ejecución del proyecto		253 000
ii) supervisión del proyecto		55 000
iii) capacitación de funcionarios de aduana		101 300
Subtotal		409 300
Subtotal sin inversión		*1 413 853*
Total (inversión + sin inversión)		**2 030 565**

COMENTARIOS Y RECOMENDACIONES DE LA SECRETARÍA

COMENTARIOS

34. En su 36a. Reunión, el Comité Ejecutivo aprobó para el Banco Mundial un pedido destinado a la preparación de un plan nacional de eliminación de CFC para Ecuador, que es un país con bajo nivel de consumo (LVC). La Secretaría observó que hasta ahora, no se financió

ninguna actividad para Ecuador destinada a eliminar el CFC usado en el sector de servicio y mantenimiento de refrigeración. Basado en esto, la Secretaría examinó la propuesta de proyecto que incluye proyectos en los sectores de espumas y refrigeración comercial como un plan nacional de eliminación de CFC (y no como un plan de gestión de refrigerantes).

Componente de inversión

35. La Secretaría identificó cuestiones referentes al cálculo de los costos adicionales admisibles, en especial, los umbrales de relación de costo a eficacia aplicables a las empresas.

36. La Secretaría y el Banco Mundial examinaron las cuestiones planteadas y convinieron que los umbrales de relación de costo a eficacia de los proyectos no deben exceder los establecidos para los varios sectores. Con respecto al sector de servicio y mantenimiento de refrigeración, habiendo considerado los insumos esenciales para lograr el objetivo del plan y de proyectos similares, se convino que la relación de costo a eficacia del proyecto no debe sobrepasar 5,31 $EUA/kg. En base a esto se logró un acuerdo de entendimiento sobre los costos del plan de eliminación, según lo indicado en la tabla siguiente.

Sector/Actividad	**Consumo de CFC por eliminar (toneladas PAO)**	**Relación de costo a eficacia ($EUA)**	**Costo ($EUA)**
Espumas	55,43	9,78	541 900
Refrigeración comercial	3,72	15,21	56 600
Servicio y mantenimiento de refrigeración (todos los aspectos, incluyendo la capacitación de funcionarios de aduana)	183,26	5,3	971 000
Subtotal	242,41	6,48	1 569 800
Gestión			120 000
Total	**242,41**	6,97	1 689 800

37. Se está todavía deliberando sobre el proyecto de acuerdo del plan de eliminación. El proyecto de acuerdo final y el programa de trabajo anual inicial se comunicarán al Subcomité de Examen de Proyectos.

38. Con respecto al componente de servicio y mantenimiento de refrigeración del proyecto, la Secretaría y el Banco Mundial convinieron que se deberá dar al gobierno de Ecuador flexibilidad en el uso de los recursos disponibles bajo el programa de recuperación, reciclado y regeneración, cuando se presenten necesidades específicas durante la ejecución del proyecto (por ej., proporcionar más máquinas del reciclado en el caso de una subida pronunciada del precio de CFC, o comprar las herramientas de servicio básicas, si los técnicos tiene dificultades para aplicar buenas prácticas de gestión). El objetivo sería supervisar y examinar en forma continua las necesidades de los técnicos y adaptar el proyecto en consecuencia. El resumen del acuerdo

alcanzado sobre el componente de servicio y mantenimiento en refrigeración del proyecto es el siguiente:

a) El gobierno de Ecuador tendría flexibilidad para utilizar los recursos disponibles del programa de recuperación, reciclado y regeneración con el fin de satisfacer las necesidades específicas que puedan presentarse durante la ejecución del proyecto; y

b) Se espera que el programa de recuperación, reciclado y regeneración sea puesto en ejecución en etapas, de modo que los recursos puedan racionalizarse y reasignarse a otras actividades, tales como capacitación o adquisición de herramientas de servicio adicionales, con una mejor probabilidad de lograr los resultados deseados;

c) el Banco Mundial proporcionaría la supervisión apropiada del programa mediante la ejecución del plan de eliminación.

RECOMENDACIONES

39. Destacando que la Secretaría y el Banco Mundial llegaron a un acuerdo sobre la admisibilidad y el costo, se presenta el plan nacional de eliminación de CFC de Ecuador para consideración individual contra los antecedentes de los comentarios antedichos de la Secretaría.

Project Cover Sheet

COUNTRY:	Ecuador	**IMPLEMENTING AGENCY**:	The World Bank
PROJECT TITLE:		Ecuador National CFC Phase-out Plan	
PROJECT IN CURRENT BUSINESS PLAN:		Yes	
SECTORS/SUB-SECTORS		Multi-sector	
TOTAL ODS USE:		(2002):	246.4 ODP tons (Annex A, Group I)
PROJECT IMPACT		Annex A, Group I:	242.95 ODP tons
PROJECT DURATION:		84 Months (7 years)	

PROJECT COSTS:

Investment Activities	
Incremental Capital Cost	US$ 616,712
Contingency (10%)	Included above
Incremental Operating Cost	Included above
Sub-Total	US$ 616,712
Non-investment Activities	US$ 1,413,843
Total Project Cost	**US$ 2,030,555**

LOCAL OWNERSHIP:	100 %
EXPORT COMPONENT:	0
TOTAL REQUESTED MLF GRANT:	**US$ 2,030,555** (to be released in six tranches)
Investment:	US$ 616,712
Non-investment:	US$ 1,413,843
IMPLEMENTING AGENCY SUPPORT COST:	**US$ 152,292**
TOTAL COST OF PROJECT TO MLF:	**US$ 2,182,847**
OVERALL COST-EFFECTIVENESS:	US$ 9.01 / kg ODP
STATUS OF COUNTERPART FUNDING:	Submission requested by the Government of Ecuador
PROJECT MON. MILESTONES INCLUDED:	Yes
NATIONAL COORDINATING AGENCY:	Environmental Management Unit of MICIP.

PROJECT SUMMARY

The National CFC Phase-out Plan will phase out the remaining consumption of Annex A, Group I chemicals of 242.95 ODP in Ecuador over the period of 2004–2010. To achieve this target, a series of investment, non-investment, technical assistance, and capacity building activities will have to be carried out. The National CFC Phase-out Plan will enable Ecuador to ban the use of CFC in the manufacturing sector by the end of 2006 and the use of CFC in the servicing sector by 2010.

The Government of Ecuador is requesting financial support of $2,030,555 from the MLF to cover part of the phase-out costs. This requested amount will be allocated to Ecuador over a period of six years in instalments as specified in the Agreement attached. Being a performance based Agreement, future payments will be conditioned to meeting the targets and conditions specified in the Agreement.

Considering this multi-faceted approach it is crucial that flexibility be given to the Government of Ecuador to adapt or modify its strategies during implementation of this plan as the need arises.

IMPACT OF PROJECT ON COUNTRY'S MONTREAL PROTOCOL OBLIGATIONS

The approval of this project will result in the elimination of CFCs consumption in Ecuador and will enable the country to meet its Montreal Protocol obligations.

Prepared by: Horacio Terraza, Roberto Aiello **Date:** September 2003

Reviewed by: Lambert Kuipers, Mike Jeffs (OORG) **Date:** September 2003

ECUADOR CFC Phase out Plan

September 5, 2003

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CHAPTER 1
INTRODUCTION

1. PROGRAM OBJECTIVE

The main objective of this program is to assist the Government of Ecuador to completely phase out its CFC consumption in accordance with the phase-out schedule stipulated by the Montreal Protocol. A total consumption of 242.95 ODP tons of Annex A, Group I chemicals in 2002 will be phased-out under this program.

To achieve these objectives, the national CFC phase-out program proposes to (i) utilize a combination of policies, regulations, financial support to subsidize the phase-out cost of the industrial sector and (ii) promote refrigerant recovery/recycling, training and technical assistance activities to minimize and eventually eliminate import of CFCs. The program includes necessary technical assistance component for strengthening capacity of the industry and concerned agencies to carry out investment, regulations, and public awareness and participation activities. It also proposes the implementation modality, including a monitoring program, to ensure the successful and effective implementation of this complete CFC phase-out program.

2. THE MONTREAL PROTOCOL (MP) OBLIGATIONS

Background. Ecuador ratified the Vienna Convention for the Protection of the Ozone Layer on 10 April 1990 and the Montreal Protocol on Substances that Deplete the Ozone Layer on 30 April 1990. It has also ratified the London Amendment on 23 February 1993 and the Copenhagen Amendment on 24 November 1993.

Ecuador is classified as a country operating under Article 5 of the Montreal Protocol as its consumption per capita of Annex A, Group I chemicals is less than 0.3 kg ODP per year. Ecuador does not produce any of the substances controlled under the Montreal Protocol or any of the substitutes for these chemicals. Total demands for Annex A, Group I and Annex B Group I, II and III chemicals are met through imports.

Ability to meet the obligations. Like other Article 5 countries, Ecuador has entered into the compliance phase of the Montreal Protocol. It is legally binding for Ecuador to comply with all its obligations to reduce consumption (i.e., 50% consumption reduction in 2005, 85% reduction in 2007, and complete phase-out in 2010) in addition to meeting the 1999 freeze.

Based on Government data, to comply with the Montreal Protocol, Ecuador has frozen its consumption of the Annex A CFCs at 328 ODP tons by 2000, and then will have to reduce this to 164 ODP tons by 2005 and 49 ODP tons by 2007, before the final phase-out in 2010.

By 2002 Ecuador had reduced its consumption to about 246.4 ODP tons which is well below the target it must meet for the "freeze" but not well on track to meet its target of 164 ODP tons in 2005. It is important to note that in 2002, additional 16.87 MT of R-11 were imported in pre-mixed polyols, which did not account for the reported consumption to the Secretariat since they

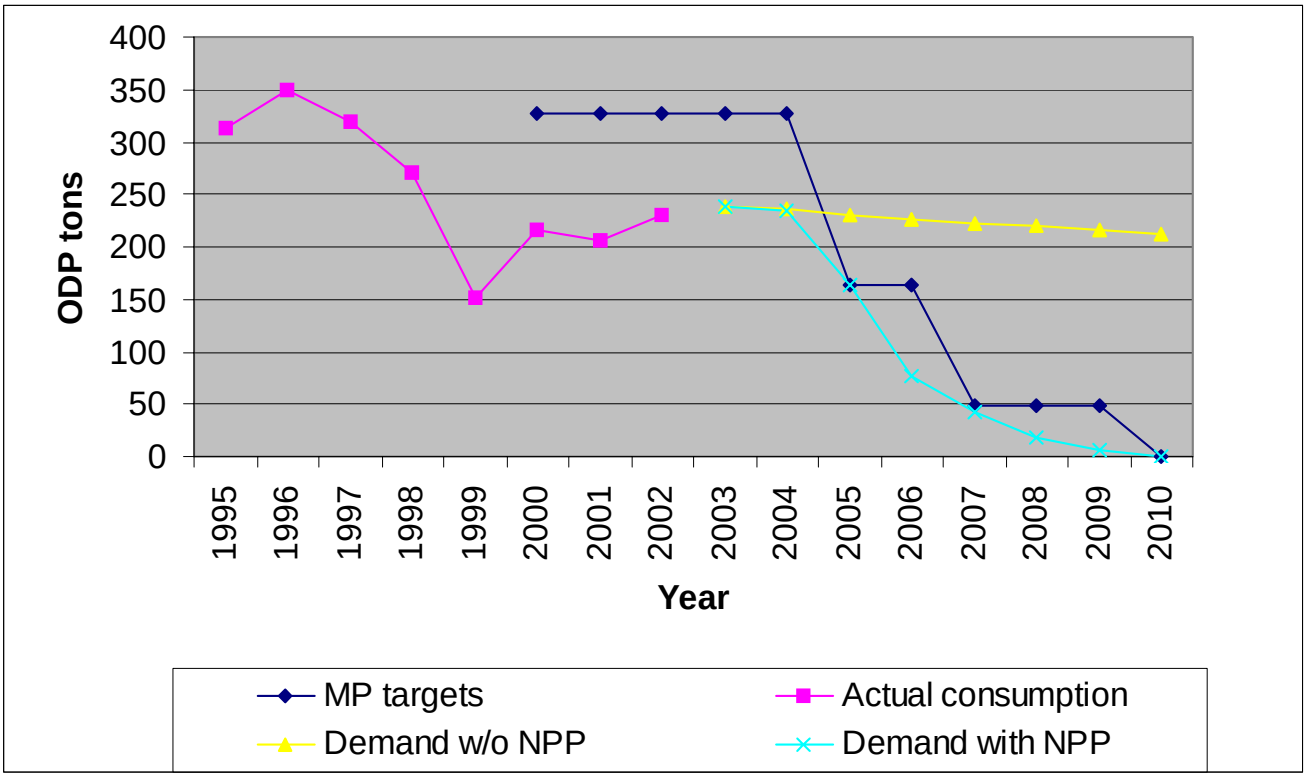
were considered products instead of pure substance. Based on the survey carried out during 2002, if no further actions are carried out to tackle the remaining consumption of CFCs, the demand will be approximately 231 ODP tons in 2005, which is considerably over the maximum allowable according to the control measures. Additionally, this scenario suggests that if the current trends continue, Ecuador will not reach its 85% reduction target in 2007. Table 1 summarizes the maximum consumption levels of CFC allowed by the Montreal Protocol, the projected consumption based on trends in demand, as well as the trends if this Plan is implemented.

A straight-line extrapolation as a means for determining future import quotas for CFCs without any due consideration to minimize the CFC demand on the end-user side, is not realistic particularly for the servicing sector, hence it was not used for these estimations. Instead, volumes based on the remaining lifetime of existing equipment were projected. The phase out of CFCs in the servicing sector will take longer time than the phase out of CFCs already achieved in the manufacturing sector.

Table No 1 Ecuador CFCs projected consumption

Year	Actual Consumption (ODP Tons)	MP targets (ODP tons)	Estimated demand without NPP (ODP tons) *	Consumption trends with NPP (ODP tons)
1995	314			
1996	349			
1997	320			
1998	271			
1999	152			
2000	217	328		
2001	207	328		
2002	230	328	246	246
2003		328	239	239
2004		328	236	235
2005		164	231	163
2006		164	227	77
2007		49	223	42
2008		49	220	18
2009		49	216	6
2010		0	212	0

* Total consumption of R-11 in 2002 was of 28.85 MT since the difference between the reported 11.98 MT was due to pre-mixed polyols.



Graph No 1 Ecuador Consumption and projected demand

Table No 1.2 Projected consumption of CFCs (Annex A Group 1) from 2002 – 2005

	2002	2003	2004	2005
Max. Consumption allowed under Montreal Protocol (ODP tons)	328	328	328	164
Maximum CFC to be phased-out from already agreed projects due for completion in given year and retirement of existing CFC equipment (ODP tons)		0	0	0
Consumption trend with no additional activity (ODP tons)	246	239	236	231

Table 1.2 provides a projection for the future demand of CFCs based on the demand side. Without any further intervention from the Government and the Multilateral Fund and no reverse retrofit or backward conversion, it is expected that the demand for CFCs in 2005 will approximately be 231 ODP tons and slowly reduce further to 212 ODP tons in 2010.

Conclusion. While Ecuador has already achieved its 1999 freeze, it is not likely to meet the 50% reduction target in 2005 unless immediate action is undertaken. Ecuador cannot afford to be complacent and the expectation that Ecuador will not meet the 50% reduction target in 2005 is made on the basis of the following assumptions:

a) There are no illegal imports leading to a reduction in consumption of legal imports, and no actual drop in demand.
b) There could be a significant level of topping up new HFC-134a systems with CFC-12, especially in the MAC service sector (though no new demand will be created).
c) From the year 2001 onwards, a slow recovery is observed as a consequence of the monetary shift to the US dollar. Hence, a reactivation of manufacturing capacity is occurring.
d) There are no ongoing phase-out projects under the MLF.

It is important to note that most of the reduction in consumption that has been achieved so far has been in the manufacturing sector with due focus on large or medium enterprises which are easily identified.

By far, the greatest challenge for all the developing countries is to phase out the use of CFCs in the servicing sector which entails a large number of small workshops scattered throughout the country. Unfortunately, phasing out CFCs in the servicing sector is the most important factor affecting the achievement of the CFC phase out targets in years 2005, 2007 and 2010.

Given the difficulties and uncertainties mentioned above, Ecuador will almost certainly face difficulties in meeting its 2005 and 2007 reduction targets.

Therefore, actions are urgently required to address the CFC use in the servicing sector, in particular those required to prevent back-conversion from CFC-free technology to CFCs and to ensure that those enterprises in the manufacturing sector that have already converted to non-ODS technology do not revert to CFCs.

Given the decreasing trend of the world supply for CFCs, it is the Government policy to continue its proactive measures to assist remaining CFC-consuming enterprises to convert to non-ODS technology and to provide technical assistance and promote awareness of the SMEs so that negative impacts of the CFCs phase out are minimum. To facilitate an equal level playing field, the Government will impose new bans and enforce existing bans on the use of CFCs in all parts of the manufacturing sub-sectors as soon as possible. The National CFC Phase-out Plan sets out the steps needed in order to meet these objectives.

To achieve significant and sustainable phase-out of CFCs in the servicing sector, a series of investment and non-investment activities, which are necessary to change the behaviour of end-users and service technicians, will have to be carried out as soon as possible. It is recognized that these types of activities require a long lead time before substantial reduction of CFCs can be achieved. The National CFC Phase-out Plan also sets out the steps needed in order to ensure Ecuador meets these objectives.

This proposed funding will phase out 225.3 ODP tons of Annex A, Group I chemicals (remaining eligible consumption as per Decision 35/57) comprised of 59.15 ODP tons through investment activities and 166.15 ODP tons through non-investment activities.

The Government of Ecuador commits to phase out the total of 242.95 ODP tons (225.3 + 17.65) over the period 2003-2010 by means of this plan.

3. PROJECT SUMMARY

The National CFC Phase-out Plan will phase out the remaining consumption of Annex A, Group I of 242.95 ODP tons over the period of 2003–2010. To achieve this target, a series of investment, non-investment, technical assistance, and capacity building activities will have to be carried out. The National CFC Phase-out Plan will enable the Ecuadorian Government to ban the use of CFC in the manufacturing sector by the end of 2006 and the use of virgin CFC in the servicing sector by 2010.

It is important to note that no Refrigerant Management Plan activities have been funded previously by MLF for Ecuador. Thus, this action plan does also include support for training refrigeration technicians and Customs officers, and the design of an import/export Licensing system. Detailed activities are discussed in the subsequent chapters.

Considering this multi-faceted approach it is crucial that flexibility is given to the Ecuador Government to be able to adapt or modify its strategies during implementation of this plan as needs arise. Due to complex and dynamic nature of SMEs, some proposed strategies or approaches to deal with the CFC phase-out in this sector should be able to evolve over time. This is to ensure that the agreed phase-out targets will be met.

The Government of Ecuador is requesting financial support of $2,030,555 from the Multilateral Fund to cover part of the phase-out costs to Ecuador. This requested amount will be allocated to Ecuador over a period of six years.

This proposed funding will phase out 225.3 ODP tons of Annex A, Group I chemicals (remaining eligible consumption as per Decision 35/57) comprised of 59.15 ODP tons through investment activities and 166.15 ODP tons through non-investment activities.

The total overall cost-effectiveness of the National CFC Phase-out Plan is $9.01. The Government of Ecuador commits to phase out the total of 242.95 ODP tons (225.3 + 17.65) over the period 2003-2010 by means of this plan.

CHAPTER 2
ODS CONSUMPTION AND DISTRIBUTION BY SECTOR

1. SOURCES OF ODS SUPPLY

In previous years, Ecuador has imported CFCs from a range of countries including USA, Venezuela, UK, Mexico, France and Belgium. However, recent imports have been from Colombia and China. The four larger importers are ANGLO ECUATORIANA, BRENNTAG (HOLANDA ECUADOR), AGROQUIMICA INDUSTRIAL and QUIMIPAC. There are no known cases where CFCs are imported directly by manufacturers of CFC-based products. A list of the existing importers is included in Annex 1. No new importers will be allowed to import CFCs to Ecuador as per this plan.

2. ODS CONSUMPTION BY SECTOR

The ODS consumption in MT as reported to the Ozone Secretariat is shown in Table 2.1. And the Table 2.2 provides estimates for ODS consumption in various sectors in 2002

Table No 2.1 ODS consumption (import data) Metric Tons

Reported ODS Annex A, Group I	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**Freeze Consumption***
CFC-11	51.31	32.39	54.81	17.60	7.98	5.79	18.89	11.98	46.17
CFC-12	263.37	271.45	239.75	238.30	132.70	189.12	172.81	214.33	258.19
CFC-113	0.00	0.00	0.34	0.00	1.34	0.67	0.25	0.64	0.11
CFC-114 + CFC-115	0.00	45.45	25.59	15.84	10.67	21.89	15.06	4.57	23.68
Total	**314.68**	**349.29**	**320.49**	**271.74**	**152.69**	**217.47**	**207.01**	**231.52**	**328.15**

* Freeze Consumption = Average 95-97

CFC consumption data is reported to the Montreal Protocol Secretariat according to the definition of the Montreal Protocol; i.e., Consumption = Production + Import – Export. The split of the CFC usage in respective consumption sectors and sub-sectors was determined based on the data collected through a comprehensive survey of consumption by end use sectors carried out by a specialized consulting firm during 2002, and updated and verified by MICIP as part of the process of preparing this National CFC Phase-out Program. As from the last years, import figures normally coincide with the actual consumption figures since there has been no relevant stockpiling.

However, it is important to note that imports of pre-mixed polyols with CFC-11 and CFC volumes in imported MDI aerosols, are not included in the reported figures since they are considered products and not pure substances.

The survey aimed to estimate actual demand for CFCs and solvents (1,1,1-trichloroethane and carbon tetrachloride) in various sub-sectors and the consumption estimates are summarized in

Table 2.2. As far as possible, the consumption estimates are based on information provided by CFC importers and known users.

Table No 2.2 Import and consumption data by sector in 2002

			MT by Sector	Total (MT)
CFC-11 *				
	Consumption			11.98
		Aerosol	0.00	
		Foam *	9.76	
		Refrigeration (Manufacturing) *	0.00	
		Refrigeration (Servicing)	2.22	
CFC-12				
	Consumption			214.33
		Aerosol	0.00	
		Foam	30.00	
		Refrigeration (Manufacturing) **	6.00	
		Refrigeration (Servicing)	178.33	
CFC-113				
	Consumption			0.64
		Solvent	0.64	
CFC-114				
	Consumption		0.00	
CFC-115				
	Consumption			
		Refrigeration (Manufacturing)	0.00	
		Refrigeration (Servicing)	4.57	
Total CFC Consumption				231.52
1,1,1-TCA				
	Consumption			28.31
		Solvent	10.00	
		Process agent	18.31	
CTC				
	Consumption			0.20
		Solvent	0.20	

* These figures do not include additional 16.87 MT of CFC-11 contained in premixed polyols.
** This figure includes remaining consumption in not funded enterprises and manufacture in projects that were completed during 2002.

Total use of R-11 in 2002 was of 28.85 MT comprised of the following:

- 26.63 MT (foam manufacturing 25.43 MT + comm. refrig manufacturing 1.2 MT)
- 2.22 MT servicing

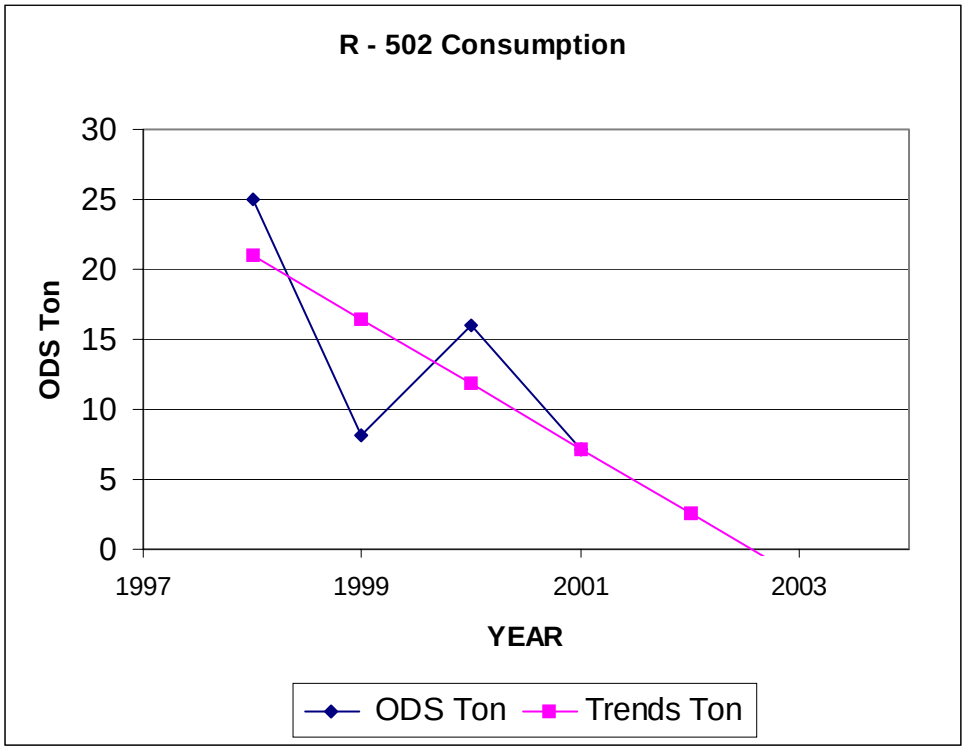
The total use of R-12 in 2002 was of 214.33 Mt comprised of the following:
- 30 MT extruded polystyrene foam
- 2.52 comm refrig manufacturing
- 3.48 MT in projects completed by October 2002
- 178.33 MT servicing

There is no official information of the imports of R-502, since still there is not a specific customs code for this substance. However, this breakdown is proposed in the plan.

Table 2.3 and the corresponding graph No 2.1 are based on information obtained from the refrigerants importers. The average consumption of R-502 for the period 1998-2001 is 14.1 MT and, according to the lineal tendency (which does not necessarily have to be totally realistic), its use would be ultimately eliminated by the end of 2003. The remainder consumption in the refrigeration service sector is expected to be managed through good practices in refrigeration and by means of recovery and recycling.

Table No 2.3 R– 502 Consumption

YEAR	ODS Tons
1998	25.06
1999	8.17
2000	16.02
2001	7.13
2002	4.57



GRAPH NO 2.1 ECUADOR R– 502 CONSUMPTION TRENDS

CHAPTER 3
EXISTING POLICIES AND REGULATIONS

1. MONTREAL PROTOCOL AND COUNTRY'S FRAMEWORK FOR COMPLIANCE

Through Executive Decision No. 1429, published in the Official Registration No. 420 in April 19th 1990, the country approved the Montreal Protocol and elaborated the Country Program in order to eliminate the chlorofluorocarbons (CFCs), generally known as "freons", that are used in some industrial processes such as refrigeration, rigid and flexible foams, aerosols, automobile and industrial air conditioning, solvents, etc. and set down a reduction program in the production and consumption of controlled substances, as well as a search for substitute technologies.

In order to carry out the Country Program and fulfill the different commitments acquired by the country, the Ministry of External Trade, Industrialization, Fish and Competitiveness (MICIP) was designated as the official entity executor of Montreal Protocol activities in Ecuador, as well as the Program's focal point. This was done by Executive Decision No. 3289 in April 28th 1992, published in the Official Registration No.930 in May 7th 1992.

2. ENVIRONMENTAL REGULATIONS IN ECUADOR

MICIP was designated as the lead agency for implementing the Montreal Protocol in Ecuador by presidential Decree No. 3289 in 1992.

The External Trade and Investments Council (COMEXI) is the government agency in charge of dictating policy and regulations regarding international trade. By means of the Resolution No. 182 (April 2003) COMEXI imposed a ban to the importation of refrigeration equipment that contain R-12 and R-502. However, in order to comply effectively with this resolution, several non-investment activities are proposed in this plan, such as the design of a licensing system and the training of customs officers.

There are no MAC manufacturers in Ecuador, only assemblers. As from 1996, all imported and assembled new cars in Ecuador with air conditioning systems are charged with HFC-134a.

The Ministry of Health has banned the Registration of aerosol products that contain ODS, except for MDI.

The importation of Methyl Bromide requires a previous authorization from the Ministry of Agriculture and the Ministry of Health.

MICIP, with the assistance of the World Bank, assessed the need for further regulations in order to meet compliance with the Montreal Protocol, which are part of this Program.

CHAPTER 4
SECTOR BASELINE INFORMATION

1. AEROSOL SECTOR

1.1. NON-MEDICAL PRODUCTS

There are no known aerosol manufacturers in Ecuador that continue to use CFCs as propellants. The consumption of CFCs in the aerosol industry has decreased steadily from about 290 ODP of CFCs in 1993 to almost zero (0) MT consumption in 2002.

Due to the completion of the reconversion project of 18 aerosol plants to hydrocarbon propellants [Laboratorios Windsor (60 ton CFC/year), Pro Quim (6 ton CFC/Year) Jabonería Nacional (50 ton CFC/Year), Camposa (5 Ton CFC/Year) and 14 other plants (169 ton CFC/Year)], there are no investment projects currently under execution, nor remaining eligible consumption in this sector (Table 4.1). The referred project covered all eligible companies in the sector.

Table No 4.1 Status of MLF approved projects in Ecuador Aerosols Sector

Status of MLF Approved Projects	ODP Phased out by projects				
	No. of Projects	Total	ExCom meeting	Year of approval	Year of completion
Completed Projects	1*	290	9	1993	1995
On-going Projects	0	0	-	-	-
Cancelled Projects	0	0	-	-	-
Total	**1**	**290**			

* Conversion of 18 aerosol plants to hydrocarbon propellants.

1.2. METERED-DOSE INHALERS (MDI)

Ecuador does not produce any CFC MDIs. All MDIs are imported, mainly from developed countries. Currently, there are six suppliers of MDI in Ecuador: GlaxoSmithkline, Boehringer Ingelheim, Genamerica, AstraZeneca, Grunenthal and Bago. In 2002, approximately 19,482 units were sold containing an estimated figure of 0.32 MT of CFCs.

2. SOLVENT SECTOR.

In Ecuador, solvents have not been very much used in metal cleaning, electronic cleaning, and correction fluid industry. CFC-113, carbon tetrachloride, and 1,1,1-trichloroethane (1,1,1-TCA) are the most common substances used in this sector. It is noted that common names and abbreviations known in the market for CTC and TCA generated some difficulties in tracking down the actual type and quantities of solvents being used by the industries.

Annual consumption of CFC-113 has often been less than one (1) ton and in some years no imports were registered. The survey carried out in 2002 did not identify any company that would still be using CFC-113 in its manufacturing process. The reported import of CFC-113 was not relevant and indicated a figure of 0.64 MT for which technical assistance to switch to alternatives will be provided under this plan.

In the case of TCA, the reported import in 2002 was of 28.31 MT. After some consultations with industrial chambers, MICIP reported 18.31 MT of TCA used as process agents, but this still needs to be explored in detail. Therefore, to determine the precise the use of this substance further analysis is required and is not included in this plan.

CCL_4 in Ecuador is used as a chemical agent in laboratory for investigation and its use is minimal. Solvent application of this substance in Ecuador is not convenient due to its high cost compared to substitutes with similar characteristics. Hence, imports of CTC have been reduced in the last years and there is only one importer which is MERCK ECUADOR.

3. FOAM SECTOR

In Ecuador, CFC-11 is still used as a blowing agent to manufacture a range of foam products. Most of the production is either soft foam for cushioning and furniture, or insulation foam. The insulation foam is sold either as rigid sheets of solid foam for applications such as cold storage, or it is foamed in place in refrigeration cabinets and insulation on piping (sprayfoam).

The consumption of R -11 fell in the last years, as shown in Table No 4.5, due to the already two (2) completed investment projects funded by the MLF, resulting in the elimination of 83 ODP tons of CFC-11 (Table 4.2). Alternative technologies employed through these projects include methylene chloride (MeCl) and HCFC-141b.

Table No 4.2 Data on Ecuador Foam Sector Projects

Sub-Sector	No. of Approved Projects	ExCom Meeting	Grant approved (US$)	Year approved	Year completion	ODP Phased out	C-E (US$/kg ODP)
Rigid PU Foam *	1	9	$665,000.00	1993	1995	51	$13,04
Flexible Foam **	1	26	$187,286.00	1998	2002	32	$5.85
Total	**2**		**$852,286,00**			**83**	

* Umbrella project for the phase out of R-11 at three (3) refrigerators manufacturing plants: Durex, Indurama and Ecasa.
** Phase out project in the manufacture of flexible foams at an automobile and furniture component manufacturing plant: Elasto.

Table 4.3 Status of MLF approved projects in Ecuador in the Foam Sector

Status of MLF Approved Projects	ODP Phase out by projects			
	No. of Projects	CFC-11 ODP tons	CFC-12 ODP tons	Total ODP tons
Completed Projects	2	83	0	83
On-going Projects	0	0	0	0
Cancelled Projects	0	0	0	0
Total	**2**	**0**	**0**	**83**

The total amount of CFC-11 imported in 2002 was 11.98 ODP tons. The survey done in 2002 indicates that the remaining consumption of CFC-11 in the foam enterprises that have not received funding from the MLF is 26.63 MT (25.43 tons in Foam + 1.2 MT in Comm. refrigeration manufacturing). The difference is explained by the purchase of premixed polyols with CFC-11, which do not account in the data reported by the government as pure CFC-11 for being considered as products.

There are 13 companies still producing foams with CFC-11 and CFC-12. These companies reported an overall annual consumption of 25.43 MT of CFC-11 and 30 MT of CFC-12. The sub-sectoral breakdown of the companies is summarized in Table 4.4 below:

Table 4.4 CFC consumption by sub-sector in Ecuador - Foam enterprises that have not received funding from the Multilateral Fund

Sub-Sector	Application	Number of companies	CFC-11 Consumption ODP tons	CFC-12 Consumption ODP tons
Rigid Polyurethane Foam	Thermal Insulation and panels	3	9.40	0.00
Flexible foam	Moulded foam	7	7.90	0.00
Polystyrene Foam	Food trays	1	0.00	30.00
Multi-sector	Rigid / Flexible / Integral Skin Foam	2	8.13	0.00
Total		**13**	**25.43**	**30**

4. REFRIGERATION SECTOR

4.1 REFRIGERATION MANUFACTURING SUB-SECTORS.

4.1.1. Domestic Refrigeration – Manufacturing.

The domestic refrigeration sub-sector includes domestic refrigerators and freezers. All manufacturing facilities for domestic refrigeration in Ecuador have converted to non-CFC technologies by the end of 2002. The Multilateral Fund approved funding to support two (2)

investment projects in this sub-sector, which already phased out 44.11 ODP tons of CFC-12 by converting to HFC-134a technology (Table 4.5).

Table No 4.5 Status of MLF Approved Projects in Refrigeration Sector

Status of MLF Approved Projects	No. of Projects	ODP Phased out by Projects		
		CFC-11	CFC-12	Total ODP
Completed Projects	2	0.00	44.11	44.11
On-going Projects	0	0.00	0.00	0.00
Cancelled Projects	0	0.00	0.00	0.00
Total	**2**	**0.00**	**44.11**	**44.11**

Table No 4.6 Data on approved Refrigeration projects for Ecuador

Sub-Sector	No. of Approved Projects	ExCom Meeting	Year approved	Year completion	Grant approved (US$)	ODP Phased out	C-E (US$/Kg ODP)
Domestic refrigeration (Ecasa)	1	26	1998	2001	$188,545	15.73	$13.76
Domestic refrigration (Indurama)	1	26	1998	2002	$174,792	28.38	$10.22
Total	**2**				**$363,337**	**44.11**	

4.1.2. Commercial Refrigeration – Manufacturing.

The commercial refrigeration sector includes the use of CFCs as refrigerant in display cabinets, food storage equipment, refrigerated transport ("reefer" containers) and commercial cold storage facilities. Commercial refrigeration is important to Ecuador because it is primarily used for food storage and transport.

Seven companies were identified and included in this program, while a small number of other enterprises undertake these tasks on demand.

4.1.3 Other Refrigeration Systems.

The study did not find any companies that still use CFC refrigerants in the manufacturing of refrigerated transport vehicles in Ecuador.

The refrigerated transport sub-sector consumed 0.8 MT of CFC-12 and 0.7 MT of R-502 in 2001. Since there is no production of CFC refrigerated transport in Ecuador, it is expected that the demand for CFCs in this sub-sector will gradually decline over the next ten years. At the time

the survey was conducted, it was reported that most refrigerated transports that used CFCs were more than 10 years old. Therefore, it is expected that by 2010 all these units will be out of work.

The three main companies that serve as shipping fleets are: BLASTI, AMARESA and TRANSMABO. The proposed strategy in this National Plan will provide assistance to these companies to develop the necessary skills to manage the transition to non–CFC refrigerants. The training program will specifically include training in retrofitting equipment to non–CFC alternatives and in good practices in refrigeration, including recovery and recycling of refrigerants.

4.1.4. Chillers

Chillers are large centralized cooling devices that are usually used for air conditioning in larger buildings and can also be used for cooling in industrial processes. A former study carried out in Ecuador shows that, at least, the equipment shown in Table No 4.7 is still in operation:

Table No 4.7 - Chillers

OWNER	REFRIGERANT	CFC KG
SOME (6)	R – 11	1,782
Banco Previsora	R – 123	1,450
Fundación Centro Cívico	R – 113	594
TOTAL		**3,826**

However, the survey estimated that approximately 200 chillers are still in use in Ecuador, with an overall annual consumption of 3 MT of CFCs. In order to address this remaining consumption, a training activity for the servicing sector is included in this program.

4.1.3. Mobile Air-Conditioning (MAC) – Manufacturing

There are no MAC manufacturers in Ecuador, only assemblers. As from 1996, all imported and assembled new cars in Ecuador with air conditioning systems are charged with HFC-134a.

4.2. Refrigeration Servicing Sub-Sectors

4.2.1. Domestic and Commercial Refrigeration --Servicing

The survey indicated that service provided to household and commercial refrigerators may be due to one of the following three main circumstances: (1) about 80% of all servicing jobs is related to failure in the refrigerant circuit; (2) about 10% is due to wear and tear; and (3) about 10% is related to the electrical wiring system. It was also found that the cause of failure in 60% of all refrigerators with failed refrigerant circuits was leakage in the refrigerant piping circuits, 35% in compressor units, and another 5% due to clogging in refrigerant piping circuits.

When servicing household and commercial refrigerators, it is common for technicians to release the remaining charges of CFC-12 to the atmosphere. Most service technicians learned servicing

techniques by means of on-the-job training. Therefore, the level of skill varies significantly from one technician to another.

The training program considered in this plan is expected, among other things, to help minimize the current practice of topping up refrigerant without fixing the leak.

Servicing HFC-134a-based units requires a higher level of skill and most technicians are not adequately prepared for handling the alternative lubricant, which is much more humidity-sensitive than mineral oil. In addition, the significant price differential between CFC-12 and HFC-134a proved to be a major reason for technicians to charge the repaired units with CFC-12 without any consideration as to whether the units were originally designed for that refrigerant or another.

The study carried out in 2002 identified, at a national level, an estimated number of 863 workshops that provide services for all kind of refrigeration systems. They are classified as follows, according to the service they provide:

- 104 deal only with domestic refrigeration
- 378 deal with domestic and commercial refrigeration and air conditioning
- 198 only deal with MACs
- 183 for industrial refrigeration.

Total = 863 workshops

The survey involved detailed data collection in 464 representative workshops and the use of CFC-12 in the whole sector during 2002 was estimated in 178 MT. As a result of the methodology employed during the survey (questionnaires, field visits, etc) the following conclusions can be addressed:

- 90% of the workshops need training in appropriate handling of refrigerants
- 80% need training in recovery and recycling.
- 30% have to enroll in a technicians association.
- 90% ignore the refilling technique

Estimations regarding existing CFC-12-based refrigerators in operation in 2002 throughout the country are:

- 850,000 domestic refrigerators
- 200,000 commercial refrigerators

It is noted that Ecuador has banned the import of CFC-12 & R-502 refrigeration systems in April 2003.
With an average lifetime of 20 years for domestic refrigerators and 10 years for commercial ones, it is expected that all CFC-12-based domestic refrigerators will be out of use by 2022 while commercial ones by 2012.

This means that after 2010, there will still be an important number of CFC-12-based refrigerators that will require servicing. It is estimated that during the period 2010 – 2022, there will be 90,000 CFC-12-based domestic refrigerators that may need servicing, and for the period 2010 – 2012 there may be 40,000 CFC-12-based commercial refrigerators under the same situation. CFC demand for servicing these units can be reduced by means of retrofitting. No compensation for direct retrofitting is requested under this plan, although technical assistance will be provided in the training workshops for technicians to perform these tasks in order to ensure compliance with the reduction schedules. Based on these figure, Table 5.1 shows the expected phase out volumes of CFC-12 derived from the retirement of old equipment.

4.2.2. MAC- Servicing

As from 1996, all imported and assembled new cars in Ecuador with air conditioning systems are charged with HFC-134a. The study identified 198 workshops that provide servicing for MACs in 2002.

The number of nationally produced vehicles is shown in Table No 4.8a while imported ones in Table No 4.8b. Most vehicles do not have A/C and those that do have, currently utilize HCF-134a.

Table No 4.8a Vehicles - National Production

Year	1993	1994	1995
Total number of vehicles	23,872	27,414	35,535
With A / C	2,910	3,099	2,876
% of vehicles with A / C	9.2 %	11.3 %	8.1 %
With CFC – 12	2,191	2,859	86
With HFC – 134a	0	240	2,790

Source: Usuarios de Refrigerantes Ecuador

Table No 4. 8b Vehicles - Imported

Year	1993	1994	1995
Total number of vehicles	18,446	27,414	25,028
With A / C	6,855	10,010	12,229
% of vehicles with A / C	37.16 %	36.09 %	48.86 %
With CFC – 12	5,407	4,147	2,043
With HFC – 134a	1,448	5,863	10,186

Source: Usuarios refrigerantes Ecuador.

Table No 4.9 Vehicles National Production and Imported

Year	National	Imported	Total
2000	7,906	8,805	16,711
2001	20,263	46,329	66,592
2002	21,860	60,833	82,693

Based on data provided by the Department of Transportation, there were 6,000 vehicles in Ecuador with CFC MACs in 2002 and the estimated figure for 2010 is 3,300.

Since the average lifetime expectancy of vehicles in Ecuador is approximately 20 years, and 1.0 kg the average charge every 3 years, it is expected that by 2013 most vehicles that were equipped originally with CFC-12 MACs will be out of circulation. Within the life span of the vehicles, owners may need to have their MACs repaired. It is, however, expected that most owners of vehicles with CFC-12 MACs will replace the old CFC-12 units with a new or rebuilt unit. Using these assumptions, it is possible to estimate the demand of CFC–12 for servicing MAC through 2010 as show in Table 4.10.

Table No 4.10 Estimated CFC-12 Demand for MACs 2002 – 2010.

Year	Number of Vehicles with CFC-12	Demand of CFC – 12 MT
2002	6,000	6.0
2003	5,600	5.7
2004	5,300	5.4
2005	5,000	5.0
2006	4,600	4.7
2007	4,300	4.3
2008	4,000	4.0
2009	3,600	3.7
2010	3,300	3.4

Table 5.1 shows the expected phase out volumes of CFC-12 derived from the retirement of old equipment.

CHAPTER 5
NATIONAL CFC PHASE-OUT PLAN

1. INTRODUCTION

As mentioned in Chapter 1, to comply with the Montreal Protocol, Ecuador must freeze its consumption of Annex A CFCs at 328 ODP tons by 2000 and then reduce this to 164 ODP tons by 2005 and 49 ODP tons by 2007, before complete phase-out in 2010.

The study showed that without further action taken by the Government and without additional intervention from the Multilateral Fund, Ecuador will not meet its 50% reduction target for Annex A, Group I chemicals in 2005. This conclusion is based on the assumptions that (i) there are no illegal imports leading to a reduction in consumption of legal imports, and no actual drop in demand; (ii) there could be a significant level of topping up new HFC-134a systems with CFC-12, especially in the MAC service sector (though no new demand will be created); (iii) from the year 2001 onwards, a slow recovery is observed as a consequence of the monetary shift to the US dollar. Hence, a reactivation of manufacturing capacity is occurring; (iv) there are no ongoing phase-out projects under the MLF.

With regard to the 85% reduction target in 2007, Ecuador will have to phase out an additional 181 MT of Annex A, Group I chemicals from the current trends in consumption. As Chapter 1 has shown, the progress made by Ecuador in ODS consumption phase-out can be easily erased if no steps are taken in the critical years of the compliance period.

2. PROPOSED POLICIES AND STRATEGIES

It is the Ecuadorian Government policy to meet the MP obligations while reducing the potential negative impacts on the country. Recognizing these commitments, the Government plans to phase out the remaining CFC-uses in the manufacturing sector by the end of 2006 by means of applying a series of phase out activities and targets that will be implemented through existing controls and new regulations issued under COMEXI and MICIP. In particular, the Government intends to impose a ban in the use of CFCs in the manufacturing sector by January 2007, and to establish legal requirements to pre-empt back-conversion of non-CFC equipment as soon as possible. The latter is critical to the success of sustainable phase-out of CFCs in the servicing sector.

Based on the survey results, the total overall use of Annex A, Group I chemicals in enterprises in the manufacturing sector that are eligible but have not received any assistance from the Multilateral Fund is 59.15 MT. The Ecuadorian Government is seeking funding from the Multilateral Fund to support conversion at these enterprises and plans to complete them by the end of 2006, banning in consequence the use of Annex A, Group I chemicals for the manufacturing sector by 1 January 2007.

With the whole manufacturing sector eventually becoming CFC-free, the amount of Annex A, Group I chemicals to be imported from 2007 onwards will be for meeting the demand in the servicing sector only. To meet the 85% reduction target in 2007, an additional CFC phase-out of

181 MT, in addition to CFC reduction from attrition of existing CFC equipment, must be accomplished within the next three years (2004 – 2007).

To quickly reduce the demand of CFCs in the servicing sector, the Government plans to create a Technical Consultive Group (involving both the public and private sectors and stakeholders), to assess the possible economic incentives and regulations necessary to ensure compliance with the control measures, as soon as this Plan is approved by the Executive Committee.

Activities to be carried out by the Government by means of this plan include:

- Develop specific elimination programs for remaining ODS consuming sectors
- Complete the breakdown of specific customs codes to establish an effective monitoring of imports/exports data regarding all controlled substances (including R-502 and premixed polyols).
- Design and implement an import/export licensing system for all controlled substances and import quotas based on demand and under the maximum allowable annual consumption included in this program .
- Enact complementary regulations to ensure compliance of the present program
- Assess the possibility to ban the import of refrigerated containers which involve the use of CFCs or CFC-based blends.
- Ban the use of CFCs in the manufacturing sectors involved in this program as from completion dates.
- Include the CFC-11 premixed polyol for foam production in the restricted list of imports as from completion date of this program
- Ban the use of disposable CFC cylinders as per agreed date, in order to promote recovery & recycling (R&R) activities
- Develop economic incentives to promote R&R activities
- Regulate R&R activities in authorized workshops

3. IMPACT OF APPROVED PROJECTS AND NEWLY PROPOSED ACTIVITIES

The starting point established by Decision 35/57 was 225.3 ODP tons; there was no consumption funded since the starting point in this sector, and the remaining eligible consumption un-funded as of submission of the proposal is 5 ODP tons.

Impact of various investment, technical assistance, and regulatory activities proposed under this National CFC Phase out Plan is shown in Tables 5.1 and 5.2. In 2002, Ecuador reported the importation of 231.52 metric tons of Annex A, Group I chemicals. It is imported to recall that additional 16.87 MT of CFC-11 were consumed in 2002, hence accounting for a total of 28.85 MT of R-11 in 2002. The survey conducted during the preparation of this plan determined that the total amount of all CFCs actually consumed by end-consumers is about the same as the amount imported.

Ecuador has stopped the import of CFC-12 and R-502 based refrigeration systems in April 2003.

With no further intervention from the Multilateral Fund or from the Government, it is expected that the current consumption level of 242.95 ODP tons a year will reduce very slowly in the following years. A reduction in the consumption of CFC-12 is only foreseen due to the lifespan expiration of refrigeration equipment which involves its use. Any measures focusing only on the supply side could lead to illegal imports of CFCs.

Based on the industrial survey carried out in 2002, where information on the existing number of equipment in operation installed throughout the country was contrasted with their lifetime expectancy, it is expected that as from 2010 -, when imports of this chemical will not be allowed any longer - there will still be a considerable volume of CFC-12 required for servicing.
For this reason, recovery & recycling activities, as well as training in good practices in refrigeration is inevitable and, hence, considered in this program. CFC demand for servicing can be reduced by means of retrofitting, implying additional costs. No compensation for retrofit is requested under this plan, although technical assistance for these tasks will be provided in the training activities.

In refrigerated transport, the survey confirmed that currently no new CFC-12 or R-502 refrigeration systems are installed in pick-up trucks and 10-wheel trucks. CFC-12 has completely been replaced by HFC-134a in the new system while R-502 has been replaced by R-404a. The use of CFC-12 and R-502 is limited to servicing old units.

Regarding MACs, it is estimated that by 2010 there will still be about 3,300 vehicles -that were manufactured before 1996 and originally equipped with CFC-12 MACs- in operation.

The training program to be provided to refrigeration technicians is expected to avoid the current practice of topping up refrigerant without fixing the leak. The training program is expected to reduce topping up by almost 2 ODP tons a year.

It is important to note that figures included in Table 5.1, particularly those representing non-investment activities, are potential phase out estimates based on the survey.

Table No 5.1 CFC Phase out by On-going and Newly Proposed Activities (MT)

	2002	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
CFC-11 (Initial demand)	28.85	28.85	28.85	28.35	14.9	0	0	0	0
Impact of On-going Phase out Activities									
Completion of On-going Projects: Foam		0	0	0	0	0	0	0	0
Completion of On-going Projects: Comm. Ref.		0	0	0	0	0	0	0	0
Impact of New Phase out Activities									
Investment Activities in the Foam Sector		0	0	12	13.43	0	0	0	0
Investment Activities in the Comm refrig. Sector		0	0	0.2	1	0	0	0	0
Train-the-Trainer Program Certification of Service Technicians			0	0.25	0.22	0	0	0	0

	2002	2003	2004	2005	2006	2007	2008	2009	2010
Training in chiller sector			0.5	1	0.25				
CFC-11 Expected consumption Schedule	28.85	28.85	28.35	14.9	0	0	0	0	0
Virgin CFC-12 (Initial demand)	214.33	210.73	207.13	203.53	146.53	75.43	41.93	18.33	6.6
Impact of On-going Phase out Activities									
Completion of On-going Projects: Comm. Ref.	0	0	0	0	0	0	0	0	0
Retirement of CFC-12 Domestic Refrigerators	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Retirement of CFC-12 Comm. Refrigerators	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Retirement of CFC-12 Refrig. Containers	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Retirement of Vehicles with CFC-12 MACs	0.3	0.3	0.3	0.4	0.3	0.4	0.3	0.3	0.3
Impact of New Phase out Activities									
Investment: Activities in Comm Refrigerator				0.5	2.5	0	0	0	0
Train-the-Trainer Program Certification of Service Technicians				18	20	10	5	2	0
Financial Subsidy for R&R Machines				25	25	20	15	6.13	3
Investment Activities in the Foam Sector				10	20	0	0	0	0
CFC-12 Expected consumption Schedule	210.73	207.13	203.53	146.53	75.43	41.93	18.33	6.6	0
CFC-113 (Initial demand) ODP	0.512	0.512	0.512	0.512	0.212	0	0	0	0
Impact of New Phase out Activities									
New Investment Projects									
Technical Assistance for Contact Cleaners				0.3	0.212	0	0	0	0
CFC-113 Expected consumption Schedule	0.512	0.512	0.512	0.212	0	0	0	0	0
CFC-114 Expected consumption Schedule	-	-	-	-	-	-	-	-	-
CFC-115 (Initial demand) ODP	2.75	2.75	2.75	2.1	1.4	0.7	0.2	0	0
Train-the-Trainer Program Certification of Service Technicians			0.45	0.5	0.5	0.3	0		
Retirement of R-502 Cold Stores			0.2	0.2	0.2	0.2	0.2	0	0
CFC-115 Expected consumption Schedule	2.75	2.75	2.1	1.4	0.7	0.2	0	0	0

Table No 5.2. CFC consumption Schedule based on the Proposed Plan (ODP Tons)

	2002	2003	2004	2005	2006	2007	2008	2009	2010
MP Reduction Targets for Ecuador	328	328	328	164	164	49	49	49	0
Estimated consumption for Ecuador with NPP	246	239	235	163	77	42	18	6	0

CHAPTER 6
ACTION PLAN

The action plan comprises activities to be carried out under the National CFC Phase-out Program in order to enable Ecuador to completely phase-out the use of CFCs in the country in line with the MP obligations. The proposed plan entails investment, technical assistance, and regulatory actions for the aerosol, solvent, foam, and refrigeration sectors of which the latter accounts for more than 75% of the current CFC use. MICIP will be the lead-executing agency of the action plan in close co-operation with other key agencies concerned and with assistance from consultants. The action plan also includes a building capacity program to ensure adequate capacity of the enterprise and the executing agencies.

It is important to note that no Refrigerant Management Plan activities have been funded previously by MLF for Ecuador. Thus, this action plan contains also support for training refrigeration technicians, customs officers and designing of a Licensing system. Detailed activities are discussed below.

1. AEROSOL SECTOR

At the end of 2002, were are no companies that continue to manufacture aerosols which involve the of CFCs as propellants.

1.1. INVESTMENT COMPONENT

No additional funds are sought for this sector.

1.2. TECHNICAL ASSISTANCE COMPONENT

Even though the use of CFCs in MDIs is currently exempted under the Montreal Protocol and there is no local manufacture of these products, Ecuador is planning proactive steps to eventually assess the sector's requirements and needs in detail.

1.3. REGULATORY COMPONENT

The Ministry of Health has banned the Registration of aerosol products that contain ODS, except for MDI.

2. SOLVENT SECTOR

At present there are no regulations controlling the use or sale of ODS solvents in Ecuador. Those in the solvents industry generally agree that there are alternatives available to replace all uses of ODS solvents. However, no product has the same properties as 1,1,1-TCA or CFC-113. Some companies continue to use ODS solvents because they are cheaper. It is clear that while it remains legal to use these substances, companies will continue to do so. Some companies have raised concerns over the flammability and in some cases; toxicity of the replacements but this

appeared to be much less of a concern than price. Though consumption is very low, to phase-out the remaining use of ODS solvents, technical assistance and regulations will be required.

2.1. TECHNICAL ASSISTANCE AND REGULATORY COMPONENTS

At present there are no regulations controlling the use or sale of ODS solvents (CFC-113, CTC and 1,1,1-TCA) in Ecuador. To ensure compliance with the control measures, all three chemicals will be included in the licensing system through annual import quotas.

For 1,1,1-TCA and CTC, the Government will set up an exemption mechanism for applications that have not been identified under this study. Exemption may be given however to some enterprises which meet criteria to be developed by the Government, including those uses exempted by the Montreal Protocol such as "laboratory and analytical uses".

Early next year, the Government will double-check the usage of these substances and develop an action plan accordingly, to provide end-users of the technical assistance to shift to alternatives.

3. FOAM SECTOR

3.1. INVESTMENT COMPONENT

Recipients and funding level. Based on data provided by chemical suppliers and government agencies, the study identified several companies that still use CFCs within this sector, which can be divided in two groups:

a) Medium size group: 5 companies were identified with an overall annual consumption of 21.23 MT of CFC–11 and 30.00 MT of CFC-12. Four companies within this group use CFC-11 as a blowing agent and one – Plásticos litoral – CFC-12 in the manufacture of extruded polystyrene foam

b) Small size group: 8 companies were identified with an overall annual consumption of 4.2 MT of CFC-11. These companies deal with rigid and flexible foams in applications such as insulation for commercial refrigerators, small trucks, seats of buses, piping insulation, etc. They do manual blending in a ratio depending on the density of the final product and they use premixed polyol mainly from United States, Colombia, Mexico and Korea. Table 6.2 shows annual consumption in each case

The total amount of CFC–11 imported in 2002 was 28.85 MT (11.98 MT as pure substance + 16.87 MT contained in pre-mixed polyol). The survey result indicates that the remaining consumption of CFC-11 in the foam enterprises that have not received funding from the MLF is 25.43 MT. The difference between reported values and actual ones is explained due to the fact that in the production of foams, most enterprises also use premixed Polyol. On average, the formulation in weight is: of 100 parts polyol, 35 parts CFC-11, 135 parts in weight of the Isocyanate. (74% Polyol; 26% CFC-11; 100% ISO)

Table 6.1 shows annual consumption for each company belonging to both groups.

Table No 6.1 Annual Consumption by enterprise

Companies	Activity	CFC–11 (MT)	CFC–12 (MT)	Location
Médium size				
Marco Mora	Rigid PU foam	7.50	0.00	Quito
Verton	Rigid / flexible PU foam	7.33	0.00	Quito
Rojas Cepero	Rigid PU foam	1.40	0.00	Quito
Plásticos Litoral	Polystyrene foam	0.00	30.00	Guayaquil
Ecua Espumas	Flexible foam	5.00	0.00	Cuenca
Subtotal		***21.23***	***30.00***	
Small size				
Simec	Rigid Foam	0.50	0.00	Quito
Esprom	Flexible Foam	0.60	0.00	Ambato
Piasa	Flexible Foam	0.40	0.00	Latacunga
Plastex	Flexible - Foam	0.50	0.00	Quito
Amoter	Flexible/ Rigid	0.80	0.00	Quito
Romott	Flexible Foam	0.40	0.00	Cuenca
PlastiMueble	Flexible Foam	0.50	0.00	Cuenca
Resiflex	Flexible Foam	0.50	0.00	Quito
Subtotal		***4.2***	***0.00***	
Total		**25.43**	**30.00**	

CFC-11 will be replaced by HCFC-141b and CFC-12 by hydrocarbons. The choice of technology is explained in detail in chapter 7.

Funding mechanism. MICIP will invite all foam enterprises that are still using CFCs in their foam production to submit proposals for financial assistance for conversion to non-CFC alternatives. Funding priority will be given to enterprises established before July 1995. All proposals must provide information pertaining to non-CFC alternatives, baseline equipment, and equipment disposal plans. All proposals must have conversion processes completed before the end of 2006 at the latest.

Enterprises will be invited to submit proposals to MICP, not later than the 1 May 2004, to convert their existing facilities to CFC-free technology. Proposals must include a list of new and old equipment items and safety devices, if any, and a specific completion date which cannot be later than December 2006. The conversion plan must include a plan and method to render the old equipment unusable.

The Government plans to phase out the remaining consumption of 25.43 MT of CFC-11 and 30.00 MT CFC-12 used by the eligible companies in the foam sector by converting all of them to non-CFC alternatives and would like to request an amount of US$559,219 from the MLF. The funding level is calculated based on the ODP tons consumed by the remaining eligible

enterprises and the average cost-effectiveness levels of foam projects in relevant foam sub-sectors that were previously approved for Ecuador and typical threshold values according to the sub-sectors. All of these foam enterprises except one, meet the conditions of being small-and medium-scale enterprises established by the ExCom (Dec. 25/56). Accordingly, in those cases where there is no previous reference fro approved projects for the country and meet this criteria, 150% of the cost-effectiveness threshold levels are used for determining the funding levels (Table 6.2).

Table No 6.2 Requested Funding for Remaining Foam Enterprises in Ecuador

Sub-sector	ODP tons	Average C-E (US$/kg ODP)	Funding Request (US$)
Rigid Polyurethane Foam			
Large enterprises	-	-	-
SMEs	9.4	13.04	$122,576
Flexible PU Foam			
Large enterprises	-	-	-
SMEs	7.90	9.345	$73,825
Extruded Polystyrene Foam			
Large enterprises	30.00	8.22	$246,600
SMEs	-	-	
Multi-sector			
Large enterprises	-	-	-
SMEs	8.13	14.295	$116,218
Total	**55.43**		**$559,219**

Assistance for any additional foam enterprises that may be identified during implementation of this plan will be covered by the funds already approved for this national CFC phase out plan.

3.2. REGULATORY COMPONENT

In addition to the recon version process, the Government will ban the use of CFC-11 in pre-mixed CFC-11 polyol, through restrictions in the importation of this product. A task force comprising of chemical importers, polyol suppliers, major foam producers, COMEXI, and Customs will be established. The main responsibility of this task force is to monitor distribution of CFCs and HCFC-141b in the foam sector. A list of foam enterprises that are buying only base polyol or polyol mixed with additives will be developed. With this list, MICIP will then be able to approach each of these enterprises to verify the types of blowing agents used in their processes.

4. REFRIGERATION SECTOR

4.1. DOMESTIC AND COMMERCIAL REFRIGERATION MANUFACTURING SUB-SECTOR

In Ecuador, all manufacturing facilities for domestic refrigeration have been converted to non-CFC technologies. A small number of manufacturers and installation of commercial refrigeration equipment continues to use CFC-12 as the refrigerants and CFC–11 to make the insulating foam. These are all small operations and it is likely that there are still others of a similar scale, which have been identified by the national CFC phase out study. A combination of assistance to the remaining enterprises, enforcement of existing regulations and, if needed, new regulations will be required to phase out all remaining consumption in this sector by the end of 2006.

4.1.1. Investment Component.

Recipients and funding level. The study identified seven eligible companies still using CFCs in the production of commercial refrigeration equipment with a total consumption of 3.72 ODP tons of CFCs per year.

Commercial refrigeration sector includes the use of CFCs as refrigerant in display cases, food storage equipment, refrigerated transport ("reefer" containers) and commercial cold storage facilities. Table 6.3 shows the identified eligible remaining companies in this sub-sector.

Table No 6.3 Commercial Refrigeration.

Company	Location	CFC-11 ODP tons	CFC-12 ODP tons
SEIMALSA	Quito	0.50	0.50
CRISMETAL	Quito	0.00	0.44
COLDMETAL	Quito	0.35	0.31
IND. CHIMBORAZO	Riobamba	0.00	0.25
VITRINAS CORONA	Quito	0.00	0.20
IRSA	Latacunga	0.00	0.15
FRIOS	Cuenca	0.35	0.11
Others on demand		0.00	0.56
Total		**1.20**	**2.52**

Funding mechanism. MICIP will invite all enterprises that are still using CFCs in their commercial production to submit proposals for financial assistance for conversion to non-CFC alternatives. Funding priority will be given to enterprises established before July 1995. All proposals must provide information pertaining to non-CFC alternatives, baseline equipment, and equipment disposal plans. All proposals must have conversion processes completed before the end of 2006 at the latest.

Enterprises will be invited to submit proposals to MICIP, not later than the 1 May 2004, to convert their existing facilities to CFC-free technology. Proposals must include a list of new and old equipment items and safety devices, if any, and a specific completion date which cannot be later than December 2006. The conversion plan must include a plan and method to render the old equipment unusable.

The Government plans to phase out the remaining consumption of 1.2 MT of CFC-11 and 2.52 MT CFC-12 used by the eligible companies in the commercial refrigeration sector by converting all of them to non-CFC alternatives and would like to request a fund of US$57,493 from the MLF. The funding level is calculated based on the ODP tons consumed by the remaining eligible enterprises and the cost-effectiveness level of a foam project in the relevant sub-sector that has been previously approved for Ecuador, and typical threshold values for the sub-sectors. All of these refrigeration enterprises meet the conditions of being small-and medium-scale enterprises established by the ExCom (Dec. 25/56). Accordingly, in those cases where there is no previous reference fro approved projects for the country, 150% of the cost-effectiveness threshold levels are used for determining the funding levels (Table 6.4).

Table No 6.4 Requested Funding for Remaining Foam Enterprises in Ecuador

Sub-sector	CFC-11 ODP tons	CFC-12 ODP tons	CE foam (US$/kg ODP)	CE Comm. Refrig. (US$/kg ODP)	Funding Request (US$)
Commercial refrigeration					
Large enterprises	-	-	-	-	-
SMEs	1.20	2.52	13.04	15.21	**$57,493**
Total					**$57,493**

Assistance for any additional enterprises in this sector that may be identified during implementation of this plan, will be covered by the funds already approved for this national CFC phase out plan.

4.1.2. Regulatory Component

Ecuador has banned the import of CFC-12 refrigeration systems in April 2003. By the end of 2006, the Government will enforce regulations to ban the use of CFCs in the manufacture of refrigeration systems.

4.2. REFRIGERATION SERVICE SECTOR

Ecuador has been in process of eliminating CFC consumption according to the Montreal Protocol control measures, and its use the refrigerant servicing sector still accounts for an important volume. As the restrictions to the imports of CFC-12 apply, the need for recovery & recycling activities is expected to increase proportionally. In this sense, a training program for technicians in good practices in refrigeration turns a key factor.

The study identified the existence of 863 workshops that provide refrigeration services throughout the country. Considering that each shop has two technicians in average, a minimum of 1,726 technicians will require appropriate training in good practices in refrigeration.

As many of the CFC replacements require different skills to use them and different specific knowledge of correct procedures, technicians in this sector must be retrained in order to handle

this transition process. MICIP recognizes this and will work with national training providers to develop new courses that include information on new refrigerants, new lubricants and recovery and recycling activities.

The proposed strategy is to provide assistance to service companies to ensure they have the skills to manage the transition to non-CFC refrigerants and adequate handling of the whole scope of refrigerants, thus tackling both ozone depletion and global warming concerns. This will ensure that workers have the ability to successfully manage the transition to alternatives without significant adverse impact on the Ecuadorian economy.

This training program would involve training in good practices in refrigeration for CFC and non-CFC technologies, recovery and recycling and, specifically include training in retrofitting equipment to non-CFC alternatives, especially for domestic refrigerators. The National CFC Phase-out Plan proposes that as well as receiving training, these workers or technicians would be able to purchase the equipment necessary to carry out servicing of non-CFC refrigeration systems and retrofits (such as vacuum pumps, pressure gauges and leak detectors) at a reduced price. These actions will ensure that any CFC equipment still in operation in 2010, can in fact be serviced properly.

4.2.1 Train- the-Trainers Program

A train-the-trainer program will be developed by international and local experts from domestic and commercial refrigerator manufactures and technical institutes. Training materials will be developed by using, to the extent possible, information already available in the country and materials already produced by UNEP. All training materials will be prepared in the local languages. The content of the training program should include how to properly repair CFC-12 and HFC-134a refrigeration systems, including MACs, the need for proper labeling of all repaired units, and procedures for retrofitting CFC-12 refrigerators to non-CFC alternatives. The duration for each train-the-trainer session should not be longer than 5 days.

Once training materials are available, MICIP will invite potential training centers and technical institutes, including Government operated centers to submit a proposal to be "Authorized Training Centers" for this sub-component. Before submitting proposals, copies of training materials including the overall objectives of this project component will be given to all potential training centers.

Proposals submitted by training centers should provide information related to the competency of their staff members in charge of the training courses, descriptions of their existing facilities, proposed duration for its service technician training course (it should not be longer than 2 days), and how much they intend to charge service technicians. Part of that cost will be covered by the next component (training of technicians).

Based on this information, MICIP will select, in principle, 9 training centers across the country to be their authorized training centers for this sub-component. Potential training centers already identified are: National Polytechnic School (Quito), Superior Polytechnic School of the Coast (Guayaquil), Salesiana Polytechnic University (Cuenca), Equinoccial Technological University (Santo Domingo), Babahoyo Technical University (Babahoyo), Luis Vargas Torres Technical

University (Esmeraldas), Eloy Alfaro Technical University (Manta), Guayaquil Technical High School (Ambato), Petroecuador training centre (Nueva Loja).

The local experts to assist MICIP in developing the training materials will carry out two five-days workshops to train 18 trainers, two from each of the 9 selected training centers. Training will include hand-on sessions. At the end of training, participants will be required to take an examination. Those who pass the examination will receive certificates from MICIP. For those who fail they will be required to undertake make-up classes before certificates are given to them. The training centers will not receive basic equipment free of charge until all of their trainers have received certificates from MICIP.

After completion of each training course, the authorized training centers will be obliged to provide MICIP with a list of all technicians who have passed their courses along with names and addresses of service shops that they are working with. MICIP will develop a database containing names of the certified technicians and names and addresses of service shops and will publish names of the companies, which have qualified technicians, in news media as an incentive for participation.

It is proposed that each of the participating training centers would receive two sets of basic equipment for training such as pressure gauges, vacuum pumps, refrigerant charging cylinder, recovery and recycling machines, and leak detectors. The selected authorized training centers will use these equipment items for training and certifying service technicians for the next four years (2006- 2009) with the intention of generating a sustainable momentum to keep the program running once this project is completed. A detailed budget is shown in Table 6.5.

Table No 6.5 Train-the-Trainer Program in the Refrigeration Servicing Sector

Description	US $
Development and Production of Training Materials	$10,000
Training of trainers (2 five-days courses, 9 persons for each course) by local experts	$5,000
Basic Equipment for 9 Training Centers (2 sets each)*	$94,500
Sub-total	**$109,500**
Contingency 10%	$10,950
Total	**$120,450**

*Based on a standard cost of $5,250

4.2.2 Training of refrigeration service technicians - Certification of Technicians

There are at least 863 workshops that provide refrigeration services in Ecuador, comprising domestic, commercial and industrial refrigeration, air conditioning and MACs, and involving a minimum of 1,726 technicians in the country. To reach out this target group, MICIP will conduct a public outreach program including articles in newsletters, trade magazines and radios. The objectives of the public outreach program are as follows:

- To inform service shops of the need to phase out CFCs;
- To inform service shops of the future plan of MICIP to restrict the sales of CFCs only among those who have been trained on proper handling of CFCs;
- To inform service shops of the future import quotas of CFC-12;
- To provide service shops with information pertaining to how and where to obtain the training;
- To inform service shops of MICIP's assistance to provide basic equipment (i.e. vacuum pumps, pressure gauges, and leak detectors) that is required for proper maintenance of HFC-134a refrigeration systems. Assistance in a form of a financial subsidy for the procurement of basic equipment will be given to the service shops at which at least one of their technicians has already received training from one of the authorized training centers.

At the same time, MICIP will carry out a local shopping procurement process in order to identify qualified suppliers to provide basic equipment items for this project. Service shops that have at least one of their technicians trained and certified can contact one of the qualified suppliers in order to obtain the basic equipment. This topic is covered in item 4.3 Financial subsidy for refrigeration and MAC equipment tools. Qualified suppliers will ask for copies of training certificates, names of certified technicians, addresses and names of the service shops.

Prior to delivery of the products, qualified suppliers will provide this information to MICIP, who will review this information against its database in order to verify whether technicians have indeed undergone proper training.

Lists of service shops with certified technicians and with basic equipment for proper maintenance of refrigeration systems will be given to chambers of commerce of respective regions.

It is proposed that the train-the-trainer program starts by mid 2004, and training for service technicians should start from mid 2005. A budget for this component is shown in Table 6.6.

Table No 6.6 Training of refrigeration servicing technicians

Cost Item	**Amount (US $)**
Local Organization of 70 workshops (25 technicians per course * US$ 35 per person)	61,250
Training Material	15,000
Sub-total	**76,250**
Contingencies (10%)	7,625
Total	**83,875**

4.2.3. CHILLER- Servicing

Because of the very high cost of chillers and their complexity, the servicing is usually carried out by dedicated service companies. Servicing of chillers is most common in the coast of Ecuador

where weather conditions require constant use of the equipment. The estimated annual use in the country for this sub-sector is 3 MT.

The objective of this component is to provide technical assistance in these specific servicing activities. The National CFC Phase-out Plan proposes that as well as receiving training, these companies would be able to purchase the equipment necessary to carry out servicing of non-CFC refrigeration systems and retrofits (such as vacuum pumps, pressure gauges and leak detectors) at a reduced price. These actions will ensure that any CFC equipment still in operation in 2010, can in fact be serviced properly and reduce emissions.

Table 6.7 below, shows the estimated costs involved.

Table 6.7 Costs involved for training in chiller servicing

ITEM	US$
Training	
Production of training material	15,000
International / local experts	30,000
Recovery & Recycling Equipment	
10 R&R machines + hoses ($2,950)	29,500
10; 30 lb. refillable refrigerant cylinders with 2 ports and OFP ($65)	650
10 leak detectors ($550)	5,500
10 vacuum pumps ($950)	9,500
10; 100 lb. refillable refrigerant cylinder with 2 ports and OFP ($380)	3,800
10; 30 lb. refillable refrigerant cylinder with 2 ports without OFP ($65)	650
Spare parts	2,000
Sub total	**96,600**
Contingencies (10% of Sub Total)	9,660
TOTAL	**106,260**

Training materials will be developed by using, to the extent possible, information already available in the country and materials already produced by specialized engineering institutions. All training materials will be prepared in the local language.

It is important to allow the Government of Ecuador with flexibility in the use of these funds to partially subsidize all eligible companies in the country as the program progresses.

4.2.4. Regulatory Component

The Government does not intend to use this training scheme to introduce a formal accreditation or licensing scheme designed to limit access to refrigerants to licensed/certified technicians at this time. It considers that this would be logistically difficult and too likely to promote the sale of CFCs on the black market where they are not controlled. It may reconsider this issue of certification once the majority of the technicians have been trained and registered with MICIP.

No additional regulations are proposed for this sub-sector.

4.3. FINANCIAL SUBSIDY FOR REFRIGERATION AND MAC MAINTENANCE TOOLS

One of the first priorities of this component is to avoid emissions of CFC refrigerants into the atmosphere, due to leaks and inappropriate servicing of refrigeration systems, as well as ensuring the future supply of recycled CFCs once the complete restrictions apply in the country due to the Montreal Protocol control measures.

According to the study carried out by a consulting firm in 2002, 103 recovery and recycling equipment would be required to quickly address the servicing sector in Ecuador.

To ensure that trained service technicians strictly follow the code of good practice when servicing refrigeration and MAC systems, it is important that financial assistance to enable service shops to purchase necessary equipment be provided to them.

The level of subsidy should ensure that the available funds will be sufficient to provide the same number of maintenance tools to service shops for both the MAC and refrigeration servicing sectors. Funding of the two sectors will be done in a phased approach, whereby the most important sector, in terms of ODP impact, will be addressed first.

A data base to monitor recovered and recycled refrigerants will be established at MICIP in order to evaluate the progress of this component.

Economic incentives will be developed in order to promote these activities in a sustainable manner. In order to address other environmental problems such as global warming, this strategy applies to non-CFC substitutes with global warming potential.

Due to the high cost that would imply granting R&R equipment to each refrigerant workshop of country, this component focuses in cities with the most relevant ODS consumption. In this sense, 183 workshops were identified, from which 103 would act as recovery and recycling centers. A logistics and communication system is foreseen to ensure proper operation of participants of this strategy. Table No. 6.6 shows the distribution of the R&R equipment for each city.

Additionally, one reclaiming center would be installed in the city of Guayaquil in order to provide that service in the country, for which an estimated support cost of US$100,000 is considered.

Table No.6.6. Proposed location of R&R Centers

CITY	Number of R&R Equipment
Guayaquil	41
Quito	22
Manta	9
Ambato	6
Santo Domingo	6
Esmeraldas	5
Cuenca	5

Babahoyo	5
Machala	2
Nueva Loja	2
TOTAL	**103**

An average of 1 Kg of CFC-12 is expected to be recovered per machine per day. Considering 280 working days in a year, the average annual recovered CFC-12 would be approximately 28.84 MT. Assuming that 90% of the recovered chemical can be recycled, 26 MT of recycled CFC-12 would be available through these equipments. However, impulse in the sector is expected through this program to render approximately 90 MT of recovered CFC-12 through the entire period 2005-2010.

The application of the Recovery and Recycling component in the country will rebound in a rapid and sustained reduction in the consumption of CFC-12, indispensable for Ecuador meeting the 2005 and 2007 reduction steps.

Financial assistance in a form of a financial subsidy for the procurement of basic equipment will be given to the service shops at which at least one of their technicians has already received training from one of the authorized training centers. A specific criteria for the distribution of equipment among the workshops will be applied based on the number of units served per year and the volume of CFC-12 involved. It is important to allow the Government of Ecuador with flexibility in the use of these funds to partially subsidize all eligible workshops in the country as the program progresses. This will allow a multiplying effect in the sector rendering impulse for the conversion of all workshops before 2010. A regulatory framework for ruling the servicing sector will be developed through this program.

Table No 6.7, indicates the necessary budget for this component.

Table No 6.7 - R&R Machines and one reclamation center

ITEM	US$
Recovery & Recycling Equipment	
103 R&R machines + hoses ($2,950)	303,850
103; 30 lb. refillable refrigerant cylinders with 2 ports and OFP ($65)	6,695
103 leak detectors ($550)	56,650
103 vacuum pumps ($950)	97,850
103; 100 lb. refillable refrigerant cylinder with 2 ports and OFP ($380)	39,140
103; 30 lb. refillable refrigerant cylinder with 2 ports without OFP ($65)	6,695
Spare parts	20,000
One reclamation center in Guayaquil	100,000
Sub total	**630,880**
Contingencies (10% of Sub Total)	63,088
TOTAL	**693,968**

5. CAPACITY BUILDING AND TECHNICAL ASSISTANCE ACTIVITIES.

In addition to technical assistance activities that are sector-specific, it is proposed that two additional capacity building and technical assistance activities are included in the national CFC Phase out plan. These are:

1. Project Implementation and Monitoring Activity;
2. Customs Training.

5.1. Project Implementation and Monitoring Activity

It is proposed that a project implementation and monitoring unit be established to provide the Government with necessary support to carry out all activities proposed under this plan. The national CFC phase out plan entails CFC phase out activities in the manufacturing sector, and training of a large number of small- and medium-scale service shops. In total, this overall plan will involve CFC phase out activities in 20 enterprises and more than 860 servicing workshops, in addition to a series of activities to establish a policy and regulatory framework to support sustainable CFC phase out.

Implementation of this proposed plan will involve a significant amount of administrative work to facilitate the development of the policy and regulatory framework, design and implementation of an import/export licensing system, identification of additional end-users, database of CFC users, development of enterprise-level project proposals, resource allocation for investment activities, public awareness activities, and other activities including necessary audit works. Implementation of this plan requires a project implementation and monitoring unit with full-time staff.

The following activities, but not limited to, will be managed or carried out by the Project Implementation and Monitoring Unit:

5.1.1. Regulations

The project management team will assist MICIP to undertake the following:

- To assess the Government in the ratification of the pending Amendments to the Protocol.
- To design and implement a licensing system for controlled substances
- To develop sector specific phase-out schedules for CFC imports.
- To complete and amend the Ecuadorian tariff codes (HS system) to include codes for R-502 and other mixtures containing CFCs as per WCO guidance.
- To prohibit the import of the substances known as "Other fully halogenated CFCs" (Annex B Group 1) in the Montreal Protocol.
- To develop an exemption regime to allow imports of prohibited substances for, as yet unknown, essential uses.
- To consider a prohibition on the import of disposable refrigerant containers in 2005 to reduce refrigerant loss at time of disposal and to reduce opportunities for smuggling.
- To issue a schedule for import quotas for each chemical in Annex A, Group I of the Montreal Protocol for 2004 – 2010.
- To ban the use of CFCs in manufacturing of products once this plan is completed.

- To ban the use of CFC-11 in pre-mixed CFC-11 polyol;
- To include pre-mixed CFC-11 polyol in the list of restricted products whose imports require review and approvals of MICIP, once this plan is completed;
- To regulate R&R activities.

5.1.2. Project Implementation

The project management team will undertake the following activities under supervision of the MICIP:

- Prepare standard implementation procedures for eligible enterprises that would like to seek funding from the resources provided by the Multilateral Fund;
- Assist eligible CFC consuming enterprises prepare proposals to obtain financial support from the funds provided by the Multilateral Fund to phase out their use of CFCs;
- Arrange technical support, on a need basis, to assist enterprises to identify appropriate non-ODS technology;
- Review and approve proposals submitted by eligible enterprises;
- Co-ordinate the establishment of the networks of authorized training centers for the refrigeration and MAC servicing sectors;
- Facilitate the selection of qualified suppliers to supply tools and equipment for MAC and refrigeration servicing sectors to service shops;
- Provide MICIP with recommendations on the level of subsidy for MAC and refrigeration servicing tools and R&R machines;
- Develop and maintain a database of refrigeration and MAC certified technicians including names and addresses of service shops that already have their technicians trained;
- Prepare an annual progress report of the overall implementation of the national CFC phase out plan in accordance with any ExCom procedures for this task;
- Assess the possibility of imposing a duty on the import of all CFCs to increase their market price and to provide an increased incentive for implementing border controls;
- Investigate options for using licence fees to raise revenue to assist with phase-out of CFCs in the service sector.

5.1.3. PUBLIC AWARENESS

The project management team will undertake the following tasks under supervision of the MICIP:

- Disseminate information related to the Government's policy to phase out CFCs in the manufacturing sector by the end of 2006;
- Inform the industry of the availability of funds provided by the Multilateral Fund to support CFC phase out in Ecuador;
- Raise public awareness of the environmental and economic impact of ozone layer depletion to the public via newsletters, news articles, seminars, radio spots;
- Organize a promotional program to encourage the public to have their refrigeration and MAC systems repaired by certified technicians;

- Undertake the public outreach programs for the refrigeration and MAC servicing sectors as described in the previous sections.

Table No 6.8 a Project Implementation (2004 – 2008)*

Description	US $
Regulatory and Policy Support	60,000
Project Implementation and Management (including experts' fees)	120,000
Public Awareness	50,000
Sub-total	**230,000**
Contingency 10%	23,000
Total	**253,000**

*After the end of 2008, remaining tasks will be carried out by the National Ozone Unit

5.1.4. MONITORING

The project management team will assist MICIP to carry out the following tasks:

- Set up a web site with a list of importers, their annual quotas, and the actual amount already imported within the current calendar year;
- Update the information on the actual amount of imported CFCs with the Custom Department on a quarterly basis;
- Monitor import of HFC-134a, HCFC-22, and HCFC-141b;
- Train MICIP state officers to identify and monitor CFC use at the enterprise level;
- Inspect warehouse of CFCs, HCFCs, and HFC-134a importers;
- Report any incidents of illegal import of CFCs;
- Carry out safety and technical audits of all projects undertaken under this plan;
- Update the consumption data at the end-user level once every two years and prepare a revised strategy, if necessary, for MICIP;
- Prepare progress reports and annual work plans for submission to the ExCom;
- Maintain good account of all the expenditure incurred by this project.

Table No 6.8 b Project Monitoring (2004 – 2008)*

Description	US $
Monitoring Activities	50,000
Contingency 10%	5,000
Total	**55,000**

*After the end of 2008, remaining tasks will be carried out by the National Ozone Unit

5.2. CUSTOMS TRAINING PROGRAM

Ecuador does not produce any CFCs, therefore all of its CFC consumption must be imported. It follows that border controls will be vital to ensure that the Government's policies are implemented. In particular it will be important to ensure that CFCs are not smuggled into Ecuador. If illegal imports of CFCs become common or widespread, it will undermine the whole CFC NPP by postponing the phase-out and by penalizing those who remain law abiding.

It is, by definition, impossible to get an accurate picture of the amount of CFCs that might be being imported illegally into Ecuador. If Ecuador is to phase out its CFC use successfully there is an urgent need to train customs officers in recognizing CFCs and to provide them the equipment to detect them.

To strengthen the effectiveness of the import control systems for CFCs, it is proposed that a train-the-trainer program be provided to the Customs Administration Office in Guayaquil (national headquarters). It is expected that training of Ecuadorian Customs Officers will initially need to be provided by overseas experts that are familiar with illegal trafficking of CFCs, but following the initial training a specific course will be developed for Customs. This "train-the trainers" training will commence in 2005, once the import/export licensing system proposed in this plan is already in force.

It is unlikely to be practical or necessary to provide formal training to all customs officers. Groups of officers from each of the ports will be trained. This training should take three or four days to complete and will include Ecuadorian legislation, the Montreal Protocol recognition of packaging and storage containers and training in the use of the CFC detection equipment. This training course will be included as part of the standard curriculum of the institute.

To strengthen the enforcement capacity of the Customs officers, it is proposed that two refrigerant identifiers be given to each of the major port/entry points across the country and the training institute of the Custom Department. It is also important to ensure that there is at least one laboratory in Ecuador that can carry out a legally valid test to determine what any gas suspected might be. This testing can be done by most analytical testing laboratories. It will not be necessary to establish a dedicated facility. There may be some costs to establish calibrations for testing equipment at an existing laboratory. These are estimated at US$10,000.

Estimated costs for initial "train the trainers" workshop for the Customs Service, development of training course and sampling procedures are US$55,000 ($20,000 for development of training course, $20,000 for international experts, $10,000 for national experts and $5,000 for teaching material). In addition, each port will require a hand held testing device that can distinguish between various refrigerant types. According to the Customs Office there are nine official points of entry into Ecuador. Each of the 9 designated points of entry will be allocated two detection devices which are estimated to cost around US$ 1,500 each. In practice not all ports will be used to import CFCs and it is likely that the Customs Service may allocate more detection equipment to the seven main shipping ports where the bulk of CFCs are imported through. A decision on the best method of allocation of the detection equipment will be made by the Customs service in consultation with the international technical expert.

The development of the training courses, the selection of candidates and the distribution of detection equipment, training material and advice will be done in consultation and full co-operation with the Customs Department.

Table No 6.9 Custom Training Program

Description	US $
Development of Training Course and Sampling Procedures	$20,000
International Expert (Fees, Travel, Per Diem)	$20,000
National Experts	$10,000
Teaching material	$5,000
ODS Identifier Kits (2x9x $1,500)	$27,000
Calibrations for Testing Equipment at an Existing Laboratory	$10,000
Sub-total	$93,000
Contingency 10%	$9,300
Total	**$101,300**

To improve enforcement, the relevant Government agencies, including MICIP, COMEXI, Statistics and Customs have agreed to establish a group to meet regularly to discuss issues relating to controls on imports of CFCs and to allow rapid dissemination of information on any illegal imports among the enforcement agencies.

As well as increasing their own actions to enforce controls, MICIP also intends to investigate using its local state officers to enforce controls, especially those relating to requirements that workshops must have CFC recovery and recycling machines.

The training program will start once the country Licenses System is strengthened, in order to qualifying the customs officers in those control measures, as well as in the identification of chemicals.

The training program will be started approximately six months after the approval of the project and it is needed that the CFCs import licenses system is legally in validity.

This component will be carried out in the permanent training division of the Customs Administration and will be included as a routine training program after the project is completed.

CHAPTER 7
JUSTIFICATION FOR SELECTION OF ALTERNATIVE TECHNOLOGY AND ENVIRONMENTAL ASSESSMENT

1. AEROSOLS

No funds are requested for this sector since there are no eligible companies remaining still using CFCs in Ecuador in this sector.

2. FOAM

2.1. Rigid foam

The presently available ODS phase out technologies for rigid polyurethane insulating foams are:

CLASSIFICATION	LIQUID TECHNOLOGY	GAS TECHNOLOGY
LOW ODP TECHNOLOGIES ("INTERIM")	HCFC-141b HCFC-141b/22	HCFC-22, -142b HCFC-22/142b
NON-ODS TECHNOLOGIES ("PERMANENT")	(CYCLO)PENTANE, WATER, HFC-365, HFC-245fa	HFC-134a

The selection of the alternative technology is governed by the following considerations:

a) Proven and reasonably mature technology
b) Cost effective conversion
c) Local availability of substitute, at acceptable pricing
d) Support from the local systems suppliers
e) Critical properties to be maintained in the end product
f) Meeting established standards on environment and safety

The following is a discussion of the mentioned technologies:

HCFC-141b has an ODP of 0.11. Its application is proven, mature, and relatively cost-effective and systems that fit the enterprise's applications are locally available. HCFC-141b can, however, be destabilizing in higher concentrations, being a strong solvent, which would lead to the need to increase the foam density. Being an interim option, its application would only be recommended if permanent options do not provide acceptable solutions.

HCFC-22 has an ODP of 0.05 and is under ambient conditions a gas. It is not suitable for spray foam/slabstock applications. Its insulation value is somewhat less than with HCFC-141b.

HCFC-141b/HCFC-22 blends can reduce the solvent effect of HCFC-141b alone and therefore allow lower densities while maintaining acceptable insulation values. The technology is not proven for spray foam applications. Being an interim option, the same restrictions as for HCFC-141b would apply.

(CYCLO-) PENTANE meets all selection criteria. The use of hydrocarbons is a preferred solution when feasible from a safety and cost effectiveness standpoint. The relatively high investments for safety costs tend to limit pentane use to relatively large CFC users. In addition, the use of pentane is limited to those enterprises whose facilities can be adapted to meet safety requirements, and can be relied on to maintain safe operations. While it may be applicable—albeit connected with high investments and density limitations—for the slabstock operation, it cannot be used—and never has been used—for (on-site) spray foam applications, where ever-changing ambient conditions never could provide for the required safety.

WATER-BASED systems are an alternative in cases where pentane is not feasible due to safety concerns, cost efficiency or availability. Water-based systems are, however, more expensive (up to 50%) than other CFC-free technologies due to reductions in insulation value (requiring larger thickness) and lower cell stability (requiring higher densities). They are also currently not available in the regional area. Water-based formulations tend to be most applicable in relatively less critical applications, such as in situ foams and thermo ware. In sprayfoam, while in principle feasible, it is reported that the current technology does not allow for overhead spraying and is therefore limited. For boxfoam, the technology is not applicable, as it would lead to an unacceptably high increase in the reaction temperature, leading to severe scorching and even spontaneous combustion.

LIQUID HFCs do not meet requirements on maturity and availability. However, trials show that systems based on these permanent options would be feasible in spray foam as well as slabstock.

HFC-134a is under ambient conditions a gas. It is not offered in the applicable regional area as a premixed system and would require an on-site premixer. It is not suitable for spray foam applications. It is also less energy efficient, and expensive compared to most other technologies.

2.2. Flexible foam

The following technologies have been considered for the flexible polyurethane foam conversion:

The use of methylene chloride has been for long the standard replacement technology for the use of CFCs in flexible PU slabstock/box foam. Its use has been only limited by regulatory restrictions based on its perceived toxic character and processing problems when used in large amounts.

Recently more regulatory restrictions have emerged on the emissions of MC as well as on allowable workplace concentrations, leading to active searches for replacements. In slabstock, the emergence of liquid carbon dioxide (LCD) is quickly replacing any residual CFC use as well as MC in most developing countries. This technology does not yet apply to boxfoam, where the recent introduction of low index/additive (LIA) technology shows some promise for, at least a partial, replacement of CFCs/methylene chloride.

Enterprises will be informed by the sector expert of the available technical options. If methylene chloride is selected as an alternative technology, enterprises will be required to implement necessary safety measures to ensure occupational health safety of workers.

2.3. Integral skin

The following technologies have been considered for the integral skin foam conversion:
Accepted ODS phase out technologies for integral skin moulded foam are:

CLASSIFICATION	TECHNOLOGY
LOW ODP TECHNOLOGIES ("INTERIM")	HCFC-141b, HCFC-22
ODS-FREE TECHNOLOGIES ("PERMANENT")	PENTANE, ALL WATER BLOWN, HFC-134a, HFC245fa

The selection of the alternative technology would be governed by the following consideration:

a) Proven and reasonably mature technology;
b) Cost effective conversion;
c) Local availability of substitute, at acceptable pricing;
d) Support from the local systems suppliers;
e) Critical properties to be maintained in the end product;
f) Meeting established standards on environment and safety.

HCFC-22 and HCFC-141b are interim solutions, and as such are regarded as intermediate steps to a final solution. Companies may use HCFC-141b, where necessary, as an interim since it is commercially available and reasonably priced.

In the permanent solutions, pentane is a technologically feasible alternative, but would require extensive and costly safety modifications to implement. The use of pentane, in the case, would be prohibitive from the safety cost standpoint. Gaseous HFCs are used in the United States extensively for shoe soles and steering wheels. Economically, water-blown foams are a more attractive option than systems employing either HCFCs or HFCs, even though water-blown is more costly than CFC-11 blown foams. In addition, carbon dioxide, the resulting blowing agent from the water-blown technology, has no ODP, making water blown the most favorable final solution.

It should be noted that in some individual cases, methylene chloride has been utilized as an effective solution, but due to processing concerns, it cannot be seen as an overall permanent solution.

2.4. Extruded Polystyrene foam

The presently available alternative blowing agents for PSR foam sheets are:

Type	Cost	ODS	Technical Suitability	Flammability
1. HCFC-22	High	0.05	Possibly * Thin sheet products	Nil

2. HCFC-142B	High	0.06	Possibly *	Some
3. HCFC-142B/22 (60/40)	High	0.055	Possibly *	Nil
4. HFC-134A	V. High	Nil	Very difficult *	Nil
5. HFC-152A	V.V. High	Nil	Difficult *	High
6. Normal Pentane	Low	Nil	No	High
7. ISO-Pentane	Low	Nil	No	High
8. Normal Butane	Low	Nil	OK	High
9. ISO-Butane	Low	Nil	OK	High
10. CO_2	Low	Nil	Not suitable at low density. Difficult technology	Nil

* Few practical references exist for thin sheet foams at low density (25-30 kg/m3).

These materials can be classified into:

a) HCFC
b) Hydrocarbons
c) Inert Gases

The overall long-term acceptability of the HCFC products is uncertain and a disruptive production conversion at this stage followed by another in a few years time was considered unacceptable.

To this end, the use of HCFC-22, HCFC-142B/22, HCFC-134a or CO2 could be considered as possible alternatives.

(a) HCFC-22 (ODS 0.05) could be viable for thin sheets subject to trials
(b) HFC-134a (ODS Nil) while now technically accepted in PSR applications. It is generally considered difficult and expensive.
(c) CO2 is only viable in higher density foams (250 kg/m3 and above) and would not form a technically viable solution for this type of machine with the current product density requirements.

Hydrocarbon alternative: This alternative could be selected by the company as their preferred option due to the low formulation cost. There are three possibilities:

i. 96% purity deodorized Iso butane
ii. 96% purity deodorized Normal butane
iii. blends of Iso and Normal butane with propane content

The preferred hydrocarbon option would be 96% N-butane as there is an established history of its use within Europe. Normal butane must be free of Mercaptan.

The selection of the alternative technology is governed by the following considerations:

g) Proven and reasonably mature technology

h) Cost effective conversion
i) Local availability of substitute, at acceptable pricing
j) Support from the local systems suppliers
k) Critical properties to be maintained in the end product
l) Meeting established standards on environment and safety

The following is a discussion of the mentioned technologies:

In accordance with the Study on Safety Costs (UNEP/Ozl.Pro/ExCom/25/54) and common practice for conversion and operation of the extruded polystyrene foamed sheets production technology using HC as blowing agent, the following industrial safety related issues should be taken into consideration:

Approximately up to 60% of the blowing agent (butane) is emitted into the atmosphere during the extrusion process at the section between the die head and winding unit where take off cylinders and calibrating ancillary equipment is located. The section is approximately 5 m long and must be open and cooled by air.

One of the most hazardous zones is around the die head, due to the high emission of butane at this unit.

Due to the high probability of the polymer blocking inside the extruder (solidification in the case of electricity cut off, cooling problem of the extruder, mechanical defects, etc) butane can be detected in the feeding section of the extruder.

The remainder of approximately up to 40% of butane will be emitted into the atmosphere during storage of the final products. The speed of the emission process depends on the ambient temperature in the technological storage area. In the non-heated warehouses the emission process can last up to two weeks.

A safety certification of the plants converted to a hydrocarbon blowing technology is normally required by national rules and regulations. It is also required by the insurance regulations.

In addition to the industrial safety arrangements, human health related precautions should also be taken into account, as follows:

The national and international standards for food products packaging require application of high purity (food grade) of the packaging materials. Therefore, the butane supplying system must have a purification unit (molecular sieves based) to ensure separation of impurities (e.g. mercaptans and other sulphur containing impurities) or to use butane of high purity.

In view of the above mentioned reasons and taking into account the actual conditions at the factory, the following technical and other safety related arrangements are foreseen:

1. The primary extruder's feedthroat, screen changer, cooling extruder's sealing assembly, die head, sizing mandrel, take off and winding unit should be encapsulated or provided with an exhaust and ventilation system, connected to the central ventilation gas detectors, fans, air flow sensors, CO2 fire protection unit, etc.

2. All major electrical devices in the extrusion area including motors and control cabinets must be ventilated with "fresh air" from outside of the factory. All minor electrical devices should be replaced with "explosion proof" ones if this is cheaper than ventilating them.
3. The foam rolls should be stored for at least two days prior to thermoforming in a separate semi-open technological storage facility, designed in accordance with the safety standard requirements and the production capacity of the factory. All foam rolls should remain in this storage area until just prior to thermoforming.
4. The complete ventilation system for the production area and the butane pumping room/building will be designed by a specialized general supplier and fabricated locally. The butane high-pressure pump room/building must be separate from the main factory and should only be accessible from outside the factory.
5. The safety certifications of the converted factory will be done under the supervision of a tird party to be nominated by a general contractor/supplier of equipment and engineering services.
6. The automatic fire fighting system at the production area should be based on CO2/powder sprinklers. The system can be based on water sprinklers at the technological storage area. A standby auto-start pump should be installed to operate the sprinkler system in the event of a power failure.

According to common international practice of safety certification of similar industrial plants, an independent certification party is involved in all stages of the conversion process including:

- Certification of a technical specification of the production equipment, process control and safety instrumentation, ventilation and expendable materials.
- Certification of relevant electrical, mechanical and civil engineering drawings as well as of operational, maintenance, safety and training manuals.
- Supervision of the equipment installation and commissioning (to be decided by the party).
- Safety inspection of the converted production premises and issuance of a safety certificate for the factory.

3. SOLVENT

No funds are requested for this sector since there are no eligible companies remaining still using CFCs in Ecuador in this sector. Technical assistance for the selection of alternatives for solvent cleaning applications will be determined during the implementation and as part of the National CFC Phase out Plan. The report of the Solvents, Coatings, and Adhesives Technical Options Committee will be used as a guidance for selecting alternatives. All proposed alternative technologies would be reviewed by experts in this sector to ensure that all environmental, health, and safety requirements are adequately addressed.

4. COMMERCIAL REFRIGERATION

4.1. Refrigeration

The following are common possible substitutes for CFC-12 in commercial refrigerators:

HCFC-22

Advantages:

- Low GWP
- Compatible with mineral oil
- Widely used for many years

Disadvantages:

- High discharge temperatures require special engineering
- Small ODP

HFC-134a

Advantages:

- Zero ODP
- Non-flammable
- System capacity and efficiency unchanged when a specially optimized compressor is used.

Disadvantages:

- Special material required for system drier
- New compressors required
- Special lubricant required (polyol ester). It is very hygroscopic and attacks some seal and motor insulation materials
- Significant GWP

Hydrocarbons

Advantages:

- Same CFC-12 compressors could be used.
- Mineral oil can be used with hydrocarbons
- Zero ODP and GWP

Disadvantages:

- Flammable
- Design modifications required for safe operation

Conclusion

Taking all of the above factors into account it is decided that HFC-134a is the most appropriate choice for small and medium scale enterprises. All of the different components and materials required such as the compressor, polyol ester oil, and charging equipment have been developed for HFC-134a, the use of which is firmly established in developed countries. Additionally, all of the equipment and technical support required to switch to HFC-134a is widely available in the country.

4.2. Foam

Several blowing agents exist that in principle could be used to replace CFC-11 in commercial refrigerator production:

HCFC-141b

Advantages:

- Very low flammability
- Widely use in the US and Japan
- Extensive training not necessary

Disadvantages:

- Incompatible with some cabinet liner material
- Small ODP
- Export potential is reduced – some W. European countries prohibit the import of products containing HCFCs.

HFC-134a

Advantages:

- Zero ODP
- Non-flammable
- Compatible with all cabinet liner material
- No tendency to condense

Disadvantages:

- Special mixing equipment required
- Higher thermal conductivity than CFC-11
- Poor solubility in polyols
- Significant GWP
- Expensive

Cyclopentane

Advantages:

- Zero GWP
- Cyclopentane equipment can be used with other blowing agents if need arises.
- Low cost

- Only 70% pure cyclopentane is required. Higher purity levels do not improve heat insulation characteristics.

Disadvantages:

- Explosive in concentrations of 1.5% - 8.7% with air.
- Insulation needs to be increased by 5% to achieve the same thermal conductivity as CFC-11 blown foam.
- Special equipment and safety precautions are required.

Conclusion

Considering the foregoing, HCFC-141b is selected as the blowing agent for the remaining SMEs, which are part of this plan. Cyclopentane would have been ideal from an environmental point of view, but is rejected as uneconomical and impractical given the scope and nature of the operations at these enterprises. The Government of Ecuador will review the use of HCFC during the implementation of this plan. If HCFC-141b is the only possible solution, the Government agrees not to seek further funding from the Multilateral Fund to switch to a non-ozone depleting technology, such as cyclopentane, in the future.

5. GOVERNMENT'S STATEMENT ON THE USE OF HCFCS AS INTERIM SOLUTIONS

Ecuador is fully aware of the ExCom requirements pertaining to the use of HCFC. The Environmental Management Unit of MICIP will review the use of HCFC during the implementation of this national CFC phase out plan. Ecuador has a preference for non-ODS substances and will enforce the general policy when possible.

CHAPTER 8

COSTS OF NATIONAL CFC PHASE OUT PLAN

ACTIVITIES	No. OF ENTERPRISES	ODP Tons	REQUESTED AMOUNT US$
CFC phase-out in the foam sector	13	55.43	559,219.00
CFC phase-out in the commercial refrigeration manufacturing sector	7	3.72	57,493.00
Train-the-Trainer Program in the Refrigeration Service Sector	9	NA	120,450.00
Train and Certification of Refrigeration Service Technicians (70 seminars for 1730 technicians)	863	NA	83,875.00
Training in chiller sector		2.55	106,250.00
Financial Subsidy for Purchasing Refrigeration Servicing Equipment and R&R machines	183	26.8	693,968.00
Customs Training Program	9	NA	101,300.00
Project implementation			253,000.00
Project Monitoring			55,000
TOTAL			**2,030,555**

CHAPTER 9
NATIONAL CFC PHASE OUT SCHEDULE FOR ECUADOR

The Government of Ecuador will assess the actual import quotas required for local supply announce an import schedule for Annex A, Group I, chemicals for 2004 – 2010 within 12 months after funding for this national CFC phase out plan has been approved by the ExCom. Table 9.1 shows the maximum limit for quotas for each year. The remainder controlled substances will be included in the licensing system to ensure compliance with control measures.

No import licenses will be given to new importers. The proposed annual quota will be distributed among existing importers (the full list of importers that are currently importing CFCs to Ecuador is included in Annex 1).

Table No. 9.1. Maximum Import Quota for Annex A, Group I Chemicals

Import Quota	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Annex A, Group I (MT tons)	328	164	164	49	49	49	0

Table No. 9.2. Import Quota for Annex B, Group I Chemicals

Import Quota	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Annex B, Group I (MT tons)	0	0	0	0	0	0	0

CHAPTER 10
IMPLEMENTATION AND MONITORING

1. INTRODUCTION

The National CFC Phase out Plan in Ecuador employs a phase out strategy based on a combination of policy and regulatory support, investment and non-investment activities, including public awareness and other supporting measures. Instead of a traditional approach where enterprises are identified and individual projects prepared for each individual enterprise, the national CFC phase out plan requires enterprises to be proactive and apply for funds based on rules and guidelines established as part of this program, consistent with MLF funding principles.

According with the social and economic composition of the country people, activities only guided to achieve people's commitment are not enough to get the Plan objective. In addition a group of norms and regulations are required in order to allow in the first place, the control of substances import, preventing the participation of new importers in the market, establishing shares of production for the existent and regulating the users consumption through of economic incentives to replace with technology CFC free in the foams sector and in the refrigeration equipment manufacture.

The national CFC phase out plan covers a number of sectors and sub-sectors with different profiles. Phase out approaches are sector and sub-sector specific. The Environmental Management Unit of MICIP and the relevant industry sectors have agreed the national implementation modality for the different sectors and sub-sectors. The national CFC phase out plan also sets specific milestones to be achieved before MLF funds can be provided to Ecuador.

2. NATIONAL IMPLEMENTATION AND FINANCING MODALITIES

It’s required a full grant financing for activities as foam sector, commercial refrigeration, train-the-trainers refrigeration service programs, Customs training, and other activities.

(a) Advertising and promotion of the MLF funding and CFC phase out program will be done through workshops, broadcasters, national newspapers and trade magazines. All enterprises in these sectors will be invited to attend the project preparation workshops. At these workshops, the project management unit (to be appointed by the Environmental Management Unit of MICIP) will provide training to enterprises on how to prepare project proposals;
(b) For enterprises that require technical assistance to identify suitable non-ODS alternatives, they should submit their request to the Environmental Management Unit of MICIP. Sector experts would be hired as appropriates to assist these enterprises in selecting appropriate non-ODS technologies and/or alternatives;
(c) All enterprises are invited to submit requests for funding in line with the MLF guidelines (no production expansion nor technology upgrade, funding requests must exclude export components). Priority will be given to the most cost-effective proposals. In case, phase out costs requested by enterprises exceed the funding approved by the MLF, funding will be capped at the average level of cost-effectiveness of previously MLF approved projects in

respective sectors or sub-sectors. In case there are savings, the remaining funds will be used for financing additional enterprises that are not included in this plan;

(d) Enterprises are required to submit their proposals before 1 May 2004;

(e) Each enterprise is required to provide detailed information regarding baseline situation and CFC consumption. Before signing contracts, the information provided by enterprises will be verified by the project management team.

3. IMPLEMENTATION SCHEDULE

Table No 10.1.
Implementation Schedule

Task	2004				2005				2006				2007				2008				2009				2010			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Investment Projects in the Foam Sector																												
(i) Contract signed	X	X																										
(ii) Equipment delivered			X	X	X																							
(iii) Test and trials					X	X	X	X	X																			
(iv) Announce ban on CFC use in the foam sector											X	X																
(v) Activity Completed												X																
Investment Projects in the Commercial Refrigeration Sector																												
(i) Contract signed	X	X																										
(ii) Equipment delivered			X	X	X																							
(iii) Test and trials					X	X	X	X	X																			
(iv) Announce ban on CFC use in the refrigeration sector											X	X																
(v) Activity Completed												X																
Refrigeration Servicing Sector																												
(i) Train-the-Trainer Program		X	X	X	X	X																						
(ii)Training of Service Technicians						X	X	X	X	X	X	X	X	X	X	X												
iii) Training chillers		X	X	X	X	X	X	X	X	X	X	X																
(iv) Procurement of Refrigeration Service Tools and R&R machines							X	X	X	X	X	X	X	X	X	X	X	X	X	X								
Project Management Unit																												
(i) Implementation Assistance	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X								
(ii) Public Awareness Activities	X	X	X	X	X	X	X	X	X	X	X																	
(iii) Regulatory Support	X	X	X	X	X	X	X	X	X	X																		
(iv) Monitoring	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X								
(v) Activity Completed																				X								
Customs Training Program																												
(i) Development of a Training Course					X	X																						
(ii) Train-the-Trainer Program							X	X	X	X																		
(iii) Procurement of Equipment						X	X	X																				
(iv) Enforcement						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

4. CASH-FLOW FOR THE NATIONAL CFC PHASE OUT PLAN FOR ECUADOR

Table No. 10.2 Cash-Flow for the National CFCs Phase out Plan in Ecuador

Description	Total Request (US$)	2003	2004	2005	2006	2007	2008	2009	2010
Investment Projects – Foam	**559,219**	559,219							
Investment Projects - Comm. Refrigeration	**57,493**	57,493							
Train-the-Trainer - Ref.	**120,450**	120,450							
Train of service Technicians	**83,875**			83,875					
Training chillers	**106,250**		53,125	53,125					
Financial Subsidy for Purchasing Refrigeration Servicing Equipment and R&R machines	**693,968**			231,323	231,323	231,323			
Project Implementation	**253,000**	42,167	42,167	42,167	42,167	42,167	42,167		
Project Monitoring	**55,000**		9,166	9,166	9,166	9,166	18,333		
Custom Training	**101,300**			101,300					
Total	**2,030,555**	**779,329**	**104,458**	**520,956**	**282,656**	**282,656**	**60,500**		

5. KEY PROJECT IMPLEMENTATION MILESTONES

Milestone	Performance Target	Amount (US$)
1st Tranche (2003)	The national CFC phase out plan approved by ExCom.	779,329
2nd Tranche (2004)	CFC import in the previous year is within the respective limit proposed under this plan; Criteria and procedures for seeking financial support for investment projects completed and distributed to eligible enterprises	104,458
3rd Tranche (2005)	Import control policy in place and operational (import quota of CFCs from 2005 – 2010)	520,956
4th Tranche (2006)	CFC import in the previous year is within the respective limit proposed under this plan; Training workshops in refrigeration in execution	282,656
5th Tranche (2007)	Ban on the use of CFCs in the manufacturing sector in 2005 is in place; All CFC phase out activities in manufacturing sectors completed.	282,656
6th Tranche (2008)	CFC import in the previous year is within the respective limit proposed under this plan.	60,500
TOTAL		**2,030,555**

ANNEX 1: LIST OF IMPORTERS

1	ANGLOECUATORIANA DE GUAYAQUIL CIA LTD
2	AGROQUIMICA INDUSTRIAL S.A.
3	HOLANDA ECUADOR C.A.(BRENNTAG)
4	QUIMIPAC CIA LTD
5	Guillen Arica Vicente Antonio
6	Junin RamosChristiasen

ANNEX 2 : STANDARD COSTS

The following standard costs are applied to the National CFC Phase out Plan:

Recovery equipment.

Recovery Machine + Tank	$1,500.

Auxiliary equipment

Manifold and gauges	$ 350
Hoses (2 sets)	$ 200
Flushing Kits	$ 50
Total	$ 600

Recovery and Recycling equipment:

• Recovery and Recycling machine	$ 2,500
• Manifold and gauges	$ 350
• Hoses	$ 100
Total	$ 2,950

Refrigeration Servicing Equipment for Training Centers and R&R centers:

• Vacuum pump	$ 950
• Manifold and gauges	$ 350
• Hoses	$ 100
• Portable leak detector	$ 550
• Refrigerant charging cylinder	$ 800
• Recovery and Recycling machine	$ 2,500
Total	$ 5,250

• 30 lb refillable cylinders with 2 ports w/o OFP	$ 65
• 100 lb refillable cylinders with 2 ports and OFP	$ 380

MAC and Refrigeration Servicing Equipment for Service Shops:

• Vacuum pump	$ 950
• Manifold and gauges	$ 350
• Hoses	$ 100
• Portable leak detector	$ 600
• Refrigerant charging cylinder	$ 800
Total	$ 2,800

Equipment for Vehicle Inspection Stations and Customs Department

• Refrigerant Identifier	$1,500