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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Forty-fourth Meeting
Prague, 29 November-3 December 2004

PROJECT PROPOSAL: VIET NAM

This document consists of the comments and recommendation of the Fund Secretariat on the following project proposal:

Phase out

- National CFC and halon phase-out plan

World Bank

PROJECT EVALUATION SHEET - MULTI-YEAR PROJECTS
COUNTRY: VIET NAM

PROJECT TITLE	BILATERAL/IMPLEMENTING AGENCY
National CFC and halon phase-out plan	World Bank

NATIONAL CO-ORDINATING AGENCY:	Hydrometeorological Service (HMS)
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LATEST REPORTED CONSUMPTION DATA FOR ODS ADDRESSED IN PROJECT**A: ARTICLE-7 DATA (ODP tonnes, 2003, as of October 2004)**

CFC	243.00	TCA	0.00
CTC	0.00	Halon	0.00

B: COUNTRY PROGRAMME SECTORAL DATA (ODP tonnes, 2003, as of October 2004)

ODS	Foam	Ref.	Aerosol	
CFC	14.30	224.62	n.a.	

CFC consumption remaining eligible for funding (ODP tonnes; exclusively related to decision 35/57)	203.8
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CURRENT YEAR BUSINESS PLAN: Total funding US \$ 358,000; total phase-out 37 ODP tonnes.

PROJECT DATA		2004	2005	2006	2007	2008	2009	2010	Total
CFC	Montreal Protocol limits	500	250	250	75	75	75	0	n.a.
	Annual consumption limit	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	Annual phase-out from ongoing projects	0	39.8	0	0	0	0	0	28.5
	Annual phase-out newly addressed	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	Annual unfunded phase-out	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Halon (ODP tonnes)	Montreal Protocol limit	37.10	18.55	18.55	18.55	18.55	18.55	18.55	n.a.
	Annual consumption limit	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	Annual phase-out from ongoing projects	0	0	0	0	0	0	0	0
	Annual phase-out newly addressed	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	Annual unfunded phase-out	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
TOTAL ODS CONSUMPTION TO BE PHASED OUT		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	243.70
Total ODS consumption to be phased-in (HCFCs)		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Project cost as originally submitted (US \$)		1,232,500	0	0	1,232,387	0	0	0	2,464,887
Final Project costs (US \$):									
Funding for World Bank		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Total project funding		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Final Support costs (US \$)									
Support cost for World Bank		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Total support costs		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
TOTAL COST TO MULTILATERAL FUND (US \$)		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Final project cost effectiveness (US \$/kg)									n.a.

n.a.: Not available

FUNDING REQUEST: Approval in principle of total ODS phase-out, total project funding and total support costs

SECRETARIAT'S RECOMMENDATION	Pending
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PROJECT DESCRIPTION

1. On behalf of the Government of Viet Nam, the World Bank has submitted to the 44th Meeting of the Executive Committee a "Viet Nam National CFC and Halon Phase-out Plan". The Viet Nam National CFC and Halon Phase-out Plan will lead to the final phase-out of CFCs and halons in the country by the year 2010 and will assist the Government of Viet Nam to meet its 2005 compliance targets for halon consumption and 2007 compliance targets for CFC consumption.

Background Information

2. Viet Nam's reported consumption of Annex A controlled substances for the year 2003 was 243.70 ODP tonnes of CFC, a figure already below the 2005 compliance obligation of 250.00 ODP tonnes (50% of the baseline consumption level of 500.00 ODP tonnes). The remaining CFC consumption is distributed between several sectors, as shown in the following table:

Sector	CFC Consumption	Share of total consumption
Aerosols	39.0 ODP tonnes	16.0%
Foam (eligible)	10.0 ODP tonnes	4.1%
Foam (not eligible)	2.3 ODP tonnes	0.9%
Refrigeration manufacturing (not eligible)	10.0 ODP tonnes	4.1%
Domestic, commercial and fishery service sector	102.2 ODP tonnes	41.9%
MAC service sector	70.8 ODP tonnes	29.1%
Unknown/not identified	9.4 ODP tonnes	3.8%
Total	243.7 ODP tonnes	100.0%

3. So far, the Executive Committee has approved several projects for conversion of CFC use to non-CFC technologies. These projects amount in the aerosol sector to US \$854,010, in the foam sector to US \$40,000 and in the refrigeration manufacturing sector to US \$532,070. Projects related to the refrigeration servicing sector, including RMP components, amount to US \$1,655,106. The Secretariat took into account these projects while reviewing the activities proposed in the national phase-out plan.

4. Viet Nam is a country with a low level of installed capacity of halon. This is confirmed both from the last 10 years of data reported pursuant to Article 7 (installed capacity 407.8 ODP tonnes) as well as a survey undertaken by UNIDO (341.95 ODP tonnes). Viet Nam's baseline of 37 ODP tonnes further supports this low level of installed capacity since it is commonly accepted that the level of installed capacity is about 10 years of the baseline consumption, which in case of Viet Nam indicates an installed capacity of 370 ODP tonnes. However, the proposal indicates that there are substantial emissions of halons during servicing amounting to a 25 per cent loss.

5. Viet Nam acceded to the Vienna Convention and the Montreal Protocol as well as the London and Copenhagen Amendments in 1994. The Montreal and Beijing Amendments were not ratified.

6. The Country Programme for the Phase out of ODS in Viet Nam was approved by the Executive Committee of the Multilateral Fund at its 19th Meeting in May 1996. The Refrigerant Management Plan for Viet Nam was approved at the 34th Meeting in 2001.

7. Viet Nam neither manufactures CFCs or halons, and therefore the difference between imports and exports corresponds to the total consumption in the country. No export has been reported.

8. A joint ministry circular letter on guidance for managing and controlling import/export of CFCs was issued jointly by the ozone unit, Ministry of Industry and Ministry of Fisheries on 1st September, 2001. The Fund Secretariat requested clarification from the World Bank if either the Ministry of Finance, typically responsible for the customs, or the Ministry of Trade was involved. The Fund Secretariat requested also information on the legal status of this joint ministry circular letter, whether there is a legally based licensing system in place, and how the customs organisation is involved.

9. The Viet Nam National CFC and Halon Phase-out Plan contained also information that a decision had been issued by the Government allowing the Ministry of Trade to impose import restrictions on the import and export of all ODS. The document contained no mentioning if the Ministry of Trade had subsequently decided to use this decision to impose such restrictions. The World Bank was asked for clarification.

10. Upon finalization of this document, the reply of the World Bank on questions relating to the licensing system was still outstanding. Without this information, there is no clear indication that Viet Nam has a working ODS licensing system in place.

Eligibility

11. The World Bank requested, on behalf of Viet Nam, funding for the CFC component of the Viet Nam National CFC and Halon Phase-out Plan on the basis of a consumption of 243.2 ODP tonnes of CFCs. Viet Nam is a non-LVC, therefore the remaining eligible consumption according to Decision 35/57 of the Executive Committee has to be taken into account. The remaining eligible CFC consumption of Viet Nam calculated on that basis is 203.8 ODP tonnes, not taking into account additional commitments for further reductions.

12. In order to address the scattered consumption in the refrigeration servicing sector, the Executive Committee has developed the instrument of Refrigerant Management Plans. The concept was directed mainly towards low volume consuming countries, but large countries were also allowed to participate. The country received funding for projects which normally form components of a Refrigerant Management Plan at the 20th and the 28th Meetings. At the

34th Meeting, Viet Nam requested funding for a Refrigerant Management Plan. An overview of projects related to the refrigeration servicing sector is provided in below table:

Project title	Funding (US \$)	Meeting approved	Date approved
Demonstration project in CFC recycling and emissions reduction in the commercial refrigeration sector	\$168,216	20 th	Oct-1996
Demonstration project CFC recycling and emissions reduction in the commercial refrigeration sector	\$282,687	20 th	Oct-1996
MAC servicing demonstration project	\$300,000	20 th	Oct-1996
Technical assistance on alternative technologies for cold storage facilities and project preparation	\$40,000	20 th	Oct-1996
CFC emission reductions in spinning halls air conditioning systems chillers (pilot project)	\$197,340	28 th	Jul-1999
Sub-total	\$988,243		
Implementation of the RMP: workshop for finalization of regulations	\$4,350	34 th	Jul-2001
Implementation of the RMP: MAC recovery and recycling of CFC-12 refrigerant	\$50,500	34 th	Jul-2001
Implementation of the RMP: customs training programme	\$100,000	34 th	Jul-2001
Implementation of the RMP: monitoring the activities in the RMP	\$21,600	34 th	Jul-2001
Implementation of the RMP: train the trainer programme in the refrigeration servicing sector	\$200,000	34 th	Jul-2001
Implementation of the RMP: programme for recovery and recycling of CFC-12 refrigerant	\$290,413	35 th	Dec-2001
Sub-total	\$666,863		
Total	\$1,655,106		

13. The submission of the refrigerant management plan for the 34th Meeting was accompanied by a letter from the ozone unit of Viet Nam in which the ozone unit confirmed that the activities proposed in the Refrigerant Management Plan, if approved and implemented as planned, will achieve the required reductions in CFC consumption in the sector, namely freeze in 1999/2000, 50% reduction by 2005 and 85% reduction by 2007. The ozone unit also confirmed that, with the RMP, the phase-out targets for 2005 and 2007 are expected to be achieved with the proposed level of funding. Further, the ozone unit understood that, after 2005, the Executive Committee will review whether further assistance is needed for the period beyond 2007. The Executive Committee was informed accordingly in document UNEP/OzL.Pro/ExCom/34/49, and subsequently agreed to a recommendation of the project for blanket approval.

14. The Viet Nam National CFC and Halon Phase-out Plan contains data specifying the CFC consumption in the refrigeration sector for the baseline years. According to this data, the average

of the consumption in the refrigeration sector between 1995 and 1997 was 216.7 ODP tonnes. The 85% reduction would therefore leave the country with an eligible consumption in the refrigeration sector of 32.51 ODP tonnes. The Viet Nam National CFC and Halon Phase-out Plan specifies that in sectors other than the refrigeration sector, the only eligible CFC consumption consists of 10 ODP tonnes in the foam sector. The Secretariat understands therefore that the remaining eligible consumption for Viet Nam is 42.51 ODP tonnes.

15. It should be noted that the Secretariat performed a probability check on the data specifying Viet Nam's consumption in the refrigeration sector during baseline years so that the country could be alerted to any potential inconsistencies. This was performed by using Viet Nam's baseline consumption of 500 ODP tonnes and deducting from it all Multilateral Fund projects in Viet Nam in sectors, other than refrigeration, that were ongoing at the beginning of 1998, i.e. directly after the baseline years, or were approved later. The total of such non-refrigeration projects amounts to 231.8 ODP tonnes. Deducting this figure from the 500 ODP tonnes baseline, the probability check arrives at a baseline consumption in the refrigeration sector of less than 268.2 ODP tonnes, fairly well in line with the data provided by the World Bank and Viet Nam (216.7 ODP tonnes).

16. Halon bank funds were originally approved for the halon bank in Viet Nam for implementation by UNIDO. This approval was based on Decision 18/22, paragraph a (iii) that states that "countries with a low level of installed capacity{ XE "capacity" } should qualify for a one time funding of US \$25,000 which can be used for the acquisition of recycling{ XE "recycling" } equipment{ XE "equipment" } or as an incentive{ XE "incentive" } to recover halons{ XE "halons" } from existing systems, or the establishment of exchange programmes to be decided by the country". UNIDO returned US \$7,176 from the original approval of US \$25,000. Based on the decision, the remaining balance might be made available to Viet Nam through the Bank project at a minimum; however, more recently, countries with a low level of installed capacity of halon have received up to US \$64,000 for halon banking.

17. In agreeing that Viet Nam had returned to compliance in 2003, the 32nd Meeting of the Implementation Committee noted that Viet Nam might return to a state of non-compliance periodically owing to the need to replenish the halon fire protection systems in its oil vessels and platforms, and requested Viet Nam to consider adopting measures to avoid their return into a state of non-compliance such as importing only recycled halons and implementing emission minimization measures (Recommendation 32/14, 32nd Meeting of the Implementation Committee).

Content

18. The National CFC and Halon Phase-out Plan proposes to utilize a combination of policies, regulations and financial incentives to subsidize the phase-out costs of the industrial sector, and to promote refrigerant recovery and recycling, training, and technical assistance activities to minimize and eventually eliminate import of CFCs and consumption of virgin CFCs and halons.

19. The National CFC and Halon Phase-out Plan includes relevant technical assistance components for strengthening the capacity of industry and the Government. The Plan proposes to include a series of investment and technical assistance activities including their timing. This proposed Plan also includes a monitoring program in order to ensure its successful and effective implementation.

20. The CFC component of the Viet Nam National CFC and Halon Phase-out Plan for which support is sought from the Multilateral Fund consists of seven main operational components:

- (a) Technical assistance component for the MDI sector (US \$49,500)
- (b) Conversion project for one foam company, finishing off the foam sector (US \$69,687)
- (c) Refrigeration service technician training - domestic and commercial sub-sectors, finalizing training in all refrigeration servicing sub-sectors except MAC (US \$300,850)
- (d) Provision of service tool kits for the refrigeration servicing sub-sectors except MAC (US \$1,050,000)
- (e) MAC inspection program to enforce a CFC use ban in MAC (US \$169,400)
- (f) Provision of service tool kits for the MAC servicing sector (US \$225,000)
- (g) Project implementation, management, awareness, monitoring (US \$506,000); includes also the necessary project management components for the halon component.

21. Concerning the technical assistance component for the MDI sector, the World Bank informed that asthma is considered a major public health issue in Vietnam. Non-CFC MDIs have already been introduced in Vietnam, the main driving force mainly being the corporate environmental policies of MDI manufactures in developed countries. It was reported, however, that non-CFC MDIs have not received favorable acceptance from asthma patients as they have the perception that non-CFC MDIs are not as effective as CFC MDIs. At present, about 80% of all imported MDI products contain CFCs. About 20% are non-CFC MDI products, including HFC-134a MDIs and dry powder inhalers. It was reported that costs of non-CFC MDIs were slightly higher than CFC products. Viet Nam and the World Bank propose to develop a transition strategy to preempt new dependence of CFC MDIs, and to switch existing patients to new medication which is CFC free.

22. According to a detailed survey in the National Plan the total consumption in the foam sector is 12.3 ODP tonnes, but only the largest of six enterprises was established prior to June 1995. Consequently, support is only sought for the conversion of this enterprise. There is only one remaining domestic refrigeration manufacturer, with a capacity of 170,000 units per year, which continues to use CFC-12 for refrigerator production. Since the company is already fully equipped for use of non-CFCs and has actually already produced HFC-134a refrigerators

there are no incremental costs involved in the conversion, and no conversion funding has been foreseen. The mobile air conditioning sector does not use CFCs in new systems, since air conditioned cars are imported, and systems installed in the country in buses, trucks and the like are based on HFC-134a.

23. The refrigeration servicing sectors for domestic, commercial (including fishery systems) and MAC equipment are the remaining CFC users in the country. The World Bank suggests a bold training and equipment supply scheme, the former targeted at 100% of the technician population, to enable the servicing sector handling new technologies. (US \$1,575,850).

24. During the preparation of Viet Nam's National CFC and Halon Phase-out Plan, the World Bank found indications that HFC-134a MAC systems are being converted to CFC-12, and that this conversion activity might be the beginning of an increasing trend. The innovative approach proposed is that the mandatory car checks in Viet Nam will be extended to the check the type of refrigerant contained in the air conditioning system (US \$169,400).

25. Because of only sporadic and very small consumption of TCA and CTC with no consumption in 2002 and 2003, and a total lack of historical CFC-113 consumption, no solvent component is planned.

26. The previous halon project carried out by UNIDO collected data, held two stakeholders workshops, and developed terms of reference for a halon management working group. The halon management working group has already been set up. The halon bank management program prepared by UNIDO contained the following conclusions and recommendations:

- (a) Most halon used in fire protection and fire fighting in Viet Nam would qualify as essential use since 70 to 75 per cent of the use is on ships.
- (b) Users have agreed that a central halon banking facility could be set up in Viet Nam's shipping registry or fire protection department under the control of the Ozone Office.
- (c) The central bank would store halon from different sources and then recycle them for "essential uses".

27. The requested cost of the halon components of Viet Nam's CFC/halon phase-out plan was US \$84,450 plus agency fees. This included 2 technical assistance workshops (US \$26,000) for technical manuals (US \$3,000), recovery/recycling equipment/shipping/storage (US \$36,000), testing equipment (US \$10,000), data bank development (US \$10,000), training (US \$3,500) and contingency (US \$5,950).

28. Additional funding for the project would enable the Bank to address some of the issues mentioned in Recommendation 32/14 of the Implementation Committee. The World Bank's proposal would address emission minimization measures through technical assistance and workshops. Viet Nam would attempt to rely on the importation of recycled halon 1301, although Viet Nam would reserve its right to import virgin halon of up to 15.53 ODP tonnes under the proposed plan. Since almost half of Viet Nam's halon requirement is for halon 2402 that is no

longer produced, Viet Nam plans to use a halon recycling/reclamation unit to process surplus halon from ship decommissioning to provide halon 2402 for its shipboard systems and oil industry.

29. The World Bank stated that the situation of Viet Nam is unique in comparison to other Article 5 countries' with a low level of installed capacity and deserves special attention. It stated that due to Viet Nam's close historical cooperation with Russia, fire protection systems for the petroleum industry and on-board ships were mainly equipped with halon 2402. However, the World Bank points out that halon 2402 is still in great demand in Russia for servicing its existing fire protection systems, and therefore Viet Nam needs to set up a halon bank for halon 2402. As the scrapping of older ships is a large industry in Viet Nam, it is expected that halon 2402 could be recovered from ship scrapping and could be the main source for recycled halon 2402 in Viet Nam. The World Bank stated that Viet Nam is seeking assistance from the Multilateral Fund to establish a halon 2402 bank as this is considered critical for Viet Nam to ensure its smooth phase-out of halons, and to avoid disruption of the operation of the petroleum industry, which constitutes a major part of Viet Nam's economic activity.

Performance targets and disbursement schedule

30. The World Bank failed to submit a draft agreement consolidating and completing the information provided in the project document before this paper was finalized. Several previously approved CFC phase-out projects in Viet Nam are still ongoing. Ongoing CFC manufacturing sector phase-out projects are yet to achieve 39.8 ODP tonnes of phase-out. The refrigerant management plan undertaken by Viet Nam is not fully completed. There are no ongoing projects related to the halon sector.

31. No draft agreement was provided, and no information in the Viet Nam National CFC and Halon Phase-out Plan specifically refers to a consumption reduction schedule. The Secretariat assumes that table 9.1 of the Viet Nam National CFC and Halon Phase-out Plan, specifying import quotas for CFC and halon, is equivalent to performance targets for both substances. These performance targets are consistent with Montreal Protocol's reduction schedule.

Draft agreement and implementation programme

32. The draft agreement and the first annual implementation programme have not been submitted by the World Bank upon finalisation of this document. The draft agreement could therefore not be annexed to this document. The first annual implementation programme could not be assessed.

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

33. The Fund Secretariat's comments concerning the Viet Nam National CFC and Halon Phase-out Plan are mainly related to the eligibility of Viet Nam to receive the assistance requested.

34. The CFC component of the Viet Nam National CFC and Halon Phase-out Plan is targeting the present consumption completely, starting at today's consumption level. In doing so, the proposal ignores that the phase-out of part of that consumption has already been funded, and thus a request based on 243.7 ODP tones would, to a large extent, constitute double counting.

35. In the case of Viet Nam, two different approaches of the Executive Committee apply both of which are meant to ensure that double funding does not occur. One is to link to the concept of a Refrigerant Management Plan a request to the agencies and the Fund Secretariat to discuss with the country what level of mixed investment/non-investment support is necessary to reach a predetermined objective, i.e. a phase-out of 85% of the related consumption. Framework conditions for this concept have been defined in Decision 31/48 of the Executive Committee. In case of low volume consuming countries, the full remaining consumption at the time when these develop Refrigerant Management Plans is typically in the refrigeration sector. The other approach of the Executive Committee is the concept of a remaining eligible consumption, as defined in Decision 35/57. The World Bank and the Fund Secretariat have not reached agreement concerning either approach for Viet Nam.

36. According to the data at the Fund Secretariat the remaining eligible consumption for Viet Nam under Decision 35/57 is 203.8 ODP tonnes, if one does not take into account the additional commitments the country has made. The World Bank disputes this data in a letter sent to the Secretariat, claiming 220.84 ODP tonnes to be the correct value. At the time of finalization of this document the discussions were still ongoing.

37. In the view of the Fund Secretariat, the Government of Viet Nam accepted the approach of the Executive Committee to have a predefined outcome needed from a refrigerant management plan and subsequently to assess the means necessary to achieve this outcome. The country submitted the letter cited above, taking over responsibility to achieve the desired 85% phase-out in the sector, and through their agreement to the project to the level of funding determined to be eligible for this undertaking.

38. According to the interpretation by the World Bank, the reduction provision of Decision 31/48 does not apply to non-LVCs. The World Bank argues that therefore it appears that Decision 31/48 and its conditions pertaining to LVCs was mistakenly applied to Viet Nam, and that the Government of Viet Nam was wrongly requested to submit a letter committing itself to those conditions.

39. It is undisputed though that the country indeed put forward such a letter, and committed itself to 85% phase-out in the refrigeration sector; and it is equally undisputed that the country understood the responsibilities under the refrigerant management plan, weighed them against the support possible through the plan, and decided to accept the refrigerant management plan and the associated funding despite the approval specifying a lower level of funding than originally requested.

40. The World Bank maintains that when Viet Nam submitted the terminal umbrella project for the aerosol sector to the 37th Meeting of the Executive Committee, the country should have been informed about a cap on project submission. This is based on the - incorrect - understanding that Viet Nam committed to phase out 85% of its total consumption under the refrigerant

management plan. Instead, Viet Nam referred in its letter to a phase-out target specifically related to the sector and its consumption. The eligibility of consumption phase-out in other sectors remained. It should be noted that this is a meaningful specification for a non-LVC since there typically is significant consumption outside the refrigeration sector. Consequently, the funding of projects in sectors other than refrigeration did not constitute funding of ineligible consumption, or premature funding of phase-out before the agreed 2005 date.

41. The World Bank further provided an analysis of the usefulness of a refrigerant management plan for the country at the time of approval, the difficulties in its implementation and the limited results achieved so far in terms of reduction of Viet Nams CFC consumption. Indeed, the consumption of Viet Nam changed from 243 ODP tonnes in the year of approval of the refrigerant management plan to 243.7 ODP tones in 2003. The Fund Secretariat suggested to the World Bank repeatedly, and with reference to both Decision 31/48 as well as to the letter of the Government of Viet Nam relating to the Refrigerant Management Plan, to withdraw the National CFC and Halon Phase-out Plan and re-submit it in 2005. This way, the plan could have been discussed in the context of measures related to the phase-out of the consumption remaining in countries after the completion of refrigerant management plans. The World Bank insisted on having the National CFC and Halon Phase-out Plan presented at the 44th Meeting.

42. Refrigerant management plans as such consist not simply of implementation of components with immediate reduction of consumption. Instead, they represent a long term program of funded and non-funded activities, and can only yield sustainable results over time by combining the components with the country's determination. The World Bank argues that the refrigerant management plan in Viet Nam shows insufficient effect in terms of CFC consumption phase-out. Unfortunately, given the delayed implementation of the refrigerant management plan in Viet Nam, with certain components still ongoing, in the opinion of the Secretariat there has not been sufficient time to assess the effect of implementation on Viet Nam's consumption.

43. The project document presented by the World Bank contains a logical, consistent, country-specific approach, if indeed the Viet Nam National CFC and Halon Phase-out Plan were to be targeted at the present consumption, and without taking into account previous projects. A characteristic and very recommendable feature throughout the plan is the proposed close co-ordination and integration of support of phase-out or conversion with government incentives through use and import bans, certification and other measures. The co-ordination of measures with the Government of Viet Nam might turn out to be demanding.

44. Given the previous activities funded in particular for the refrigeration servicing sector, the actions proposed in the plan duplicate or extend, to a large extent, activities that were already undertaken with support from the Multilateral Fund. A total of US \$1,275,000 is related to the supply of equipment to the refrigeration servicing sector; the refrigerant management plan and other previous projects have already funded equipment for the servicing sector up to US \$1,091,816. Another component suggested by the Viet Nam National CFC and Halon Phase-out Plan relates to the establishment of training centers for refrigeration technicians, while the refrigerant management plan funded the train the trainer approach. It should be noted that according to the National Plan, Viet Nam has 659 refrigeration service shops. According to the same document, the Refrigerant Management Plan did already fund training of 1000 trainees, among them 727 service technicians (the rest being technicians employed at institutions,

teachers, etc.). The ratio between trainees and service shops being better than 1:1, Viet Nam has already received in relative terms more training support than several other countries would be able to receive.

45. The Fund Secretariat considers large portions of the CFC- component of the National CFC and Halon Phase-out Plan for Viet Nam as a request for double funding. The eligibility of other components, for example the innovative approach to fund enforcement of a CFC use ban in MAC equipment, is questionable.

46. Concerning the halon part of the Viet Nam National CFC and Halon Phase-out Plan, the World Bank indicated that the recovery and recycling equipment would be able to handle all types of halons. However, to process halon-1211 and halon-1301, site preparation is much more complicated as it requires that the ambient temperature of the operating room be maintained at low levels. In the case of Viet Nam, the recovery and recycling equipment will be dedicated for halon 2402 whose boiling point is above the average ambient temperature in Viet Nam. This equipment will restore halon 2402 to the international standards. The Ozone Office informed that there is no halon recovery and recycling equipment available in Viet Nam.

47. The recovery/recycling equipment for halon 2402 should enable sufficient quantities of halon to be recovered from the decommissioning of ships. The World Bank indicated that based on an average life expectancy of the existing fleets of oil tankers and oil platform of 25 years, it is expected that about 136 ODP tones of halon 2402 will be retired within the next 5-10 years. This amount of recycled/reclaimed halon is equivalent to 28 metric tonnes. The planned level consumption of halon 2402 is 6 metric tonnes per year over the next five years.

48. Pursuant to Decision 18/22, if halon reclamation is provided to the country, the country should agree to an import ban. The World Bank indicated that Viet Nam banned the installation of new systems in 1998. The halon management plan states that all importers of halons would be required to provide certificates proving that imported halons were indeed recycled halons.

49. The Fund Secretariat awaits at the moment the submission of relevant information and missing components of the project proposal, among them a draft phase-out agreement as well as a letter from the Government of Viet Nam referring to the intended use of HCFC as per Decision 27/13. Discussions with the World Bank are still ongoing. The Fund Secretariat will circulate additional documentation to the Executive Committee before the 44th Meeting.

RECOMMENDATION

50. The Secretariat can not currently recommend the National CFC and Halon Phase-out Plan of Viet Nam for approval. The eligibility of a large portion of the plan's CFC component has not been sufficiently determined yet and remains under discussion.

51. The Secretariat and the World Bank have discussed the halon component of the Viet Nam National CFC and Halon Phase-out Plan and agreed to costs amounting to US \$46,000 including the costs of technical assistance for one training workshop on alternatives/emissions reductions (US \$10,000), recovery/reclamation equipment and storage tanks. The Executive Committee

may wish to consider if these additional funds could be approved for the project, on an exceptional basis, in the light of the unique halon requirements for Viet Nam and its compliance needs and the level of support historically provided to countries in a similar situation.

52. The Executive Committee might consider the project in light of the comments provided above and additional information to be provided.

PROJECT COVER SHEET

COUNTRY:	Vietnam	IMPLEMENTING AGENCY:	The World Bank
PROJECT TITLE:	Vietnam National CFC and Halon Phase-out Plan		
PROJECT IN CURRENT BUSINESS PLAN:	Yes		
SECTOR/SUB-SECTOR	Multi-sector		
TOTAL ODS USE:	2003:	243.2 ODP tons (Annex A, Group I)	
		76 ODP tons (Annex A, Group II)	
		0.22ODP tons (Annex B, Group II)(2002)	
PROJECT IMPACT:	Annex A, Group I:	243.2 ODP tons	
	Annex A, Group II:	76 ODP tons	
	Annex B, Group II:	0.22ODP tons	
PROJECT DURATION:	60 Months		
PROJECT COSTS:			
Investment Activities:			
Incremental Capital Cost:	US\$ 2,760,700		
Contingency (10%):	Included above		
Incremental Operating Cost:	Not included		
Sub-total:	US\$ 2,760,700		
Non-investment Activities:	US\$ 584,500		
Total Project Cost	US\$ 3,345,200		
LOCAL OWNERSHIP:	100%		
EXPORT COMPONENT:	0%		
TOTAL REQUESTED MLF GRANT:	US\$ 2,464,887 (to be released in two tranches)		
Investment:	US\$ 1,880,387		
Non-investment:	US\$ 584,500		
IMPLEMENTING AGENCY SUPPORT COST:	US\$ 184,867		
TOTAL COST OF PROJECT TO MLF:	US\$ 2,649,754		
OVERALL COST-EFFECTIVENESS:	US\$ 7.74 /kg ODP		
STATUS OF COUNTERPART FUNDING:	Submission requested by the Government of Vietnam		
PROJECT MONITORING/MILESTONES:	Included		
NATIONAL COORDINATING AGENCY:	Ministry of Natural Resources and Environment		

PROJECT SUMMARY

The National CFC and Halon Phase-out Plan will phase out the remaining consumption of 243.2 ODP tons of Annex A, Group I chemicals, 76 ODP tons of Annex A, Group II chemicals, and 0.22 ODP tons of Annex B, Group II chemical during the period of 2005 – 2010. To achieve this target, a series of investment, non-investment, technical assistance, and capacity building activities will be carried out. The National CFC and Halon Phase-out Plan will enable the Government of Vietnam to ban the use of CFC in the manufacturing sector by 2006 and the use of CFC in the servicing sector by 2010.

The Government of Vietnam is requesting financial support of US\$ 2,464,887 from the Multilateral Fund to cover part of the phase-out costs to Vietnam over a period of 5 years. This proposed funding request will phase out of a total of 318.32 ODP tons.

IMPACT OF PROJECT ON COUNTRY'S MONTREAL PROTOCOL OBLIGATIONS

The project will enable the Government of Vietnam to meet all its Montreal Protocol obligations pertaining to Annex A and B chemicals.

Prepared by: The Government of Vietnam and the World Bank

Date: 8.18.2004

Vietnam National CFC and Halon Phase-out Plan

18 August 2004

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CHAPTER 1 INTRODUCTION

1. PROGRAM OBJECTIVE

The objective of this program is to assist the Government of Vietnam to completely phase out its consumption of Annex A chemicals, CTC, and 1,1,1-TCA in accordance with the phase-out schedule stipulated by the Montreal Protocol. A total consumption of 243.20 ODP tons of Annex A, Group I chemicals, 76 ODP tons of Annex A, Group II chemicals, and 0.22 ODP tons of Annex B, Group II chemical, will be phased out under this plan.

To achieve this objective, the National CFC and Halon Phase-out Plan proposes to utilize a combination of policies, regulations, financial incentives - to subsidize phase-out costs of the industrial sector, and to promote refrigerant recovery and recycling, training, and technical assistance activities to minimize and eventually eliminate import of CFCs and consumption of virgin CFCs and halons. The proposed activities will build on the results already attained by earlier investment and non-investment activities financed by the Multilateral Fund.

The National CFC and Halon Phase-out Plan includes relevant technical assistance components for strengthening capacity of industry and the Government. The Plan proposes to include a series of investment and technical assistance activities including their chronology. This proposed Plan also includes a monitoring program in order to ensure successful and effective implementation of this complete CFC and halon phase-out program.

2. BACKGROUND

Vietnam ratified the Vienna Convention for the Protection of the Ozone Layer, the Montreal Protocol on Substances that Deplete the Ozone Layer, and subsequent amendments (London Amendments and Copenhagen Amendments) in January 1994. Immediately after becoming a Party to the Montreal Protocol, the Government of Vietnam assigned the former Hydrometeorological Service (HMS) of Vietnam as its executing agency responsible for Vietnam's implementation of all Montreal Protocol obligations. In 2003, the Ozone Office established originally under the HMS has been mapped to the Ministry of Natural Resources and Environment (MONRE).

Former HMS, with assistance of the Multilateral Fund through United Nations Environment Programme (UNEP), developed a Country Program for phasing out of ozone depleting substances in Vietnam. Based on the findings of the Country Program, the per capita consumption of Annex A, Group I chemicals in Vietnam in 1993 was 0.004 kg ODP per year. The Country Program was endorsed by the Government of Vietnam on 12 June 1995. This Country Program was submitted to and approved by the Executive Committee of the Multilateral Fund in the same year. At the time the Country Program was approved, the Executive Committee also approved an institutional strengthening project for Vietnam. Under this project, the Ozone Office was established in 1995 within

HMS. After the major institutional restructuring program undertaken by the Government of Vietnam in November 2002, the Ozone Office has been mapped to the newly created Ministry of Natural Resources and Environment (MONRE) that was established by the Government, in 2003.

Vietnam is classified as a Party operating under paragraph 1 of Article 5 of the Montreal Protocol as its per capita consumption of Annex A, Group I chemicals is less than 0.3 kg ODP per year. As an Article 5 country Party, Vietnam is eligible for financial and technical assistance from the Multilateral Fund.

Vietnam is not a producer of any substances controlled by the Montreal Protocol, or of any substitutes of these chemicals. The total demand of all ozone depleting substances (ODS) has been met through imports. The average consumption level of all Annex A, Group I chemicals from 1995 – 1997 inclusive, is 500 ODP tons and 37 ODP tons for Annex A, Group II chemicals.

Table 1.1 Baseline Consumption for Annex A, Group I and Group II Chemicals

Chemical	1995	1996	1997	Baseline
Annex A, Group I (CFCs)	480	520	500	500
Annex A, Group II (Halons)	22	23	66	37

According to the provisions of the Montreal Protocol, this average consumption level has been used as a baseline for establishing subsequent interim reduction targets during the compliance period 1999 – 2010. The maximum allowable consumption levels for Annex A, Group I and Group II chemicals applicable to Vietnam during the compliance period are shown below.

Table 1.2 Max. Allowable Consumption Levels as per Montreal Protocol Requirements

Chemical	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Max. Annex A, Group I (CFCs) consumption level allowed by the Montreal Protocol (ODP tons)	500	500	500	500	500	500	250	250	75	75	75	0
Max. Annex A, Group II (Halons) consumption level allowed by the Montreal Protocol (ODP tons)	N/A	N/A	N/A	37	37	37	18.5	18.5	18.5	18.5	18.5	0

Based on the 2003 statistical import data collected from the Customs Bureau, the total import of Annex A, Group I chemicals was 243.20 ODP tons. Annex A, Group I chemicals imported in 2003 include 19.6 MT of CFC-11, 223.06 MT of CFC-12 and 1.77 MT of R-502¹. The information provided by the industry suggested that the total import of Annex A, Group I chemicals in 2003 was more than 500 MT. This significant difference was caused by the report of one importer. In addition, it was reported that about 150 – 170 MT was exported to Cambodia. No documents to substantiate the large

¹ Ozone Depleting Potential (ODP) of CFC-11 and CFC-12 is equal to 1. R-502 is an azeotropic mixture of 49 percent by weight HCFC-22 and 51 percent by weight CFC-115. ODP values for HCFC-22 and CFC-115 are 0.055 and 0.6, respectively.

import and export claimed by this enterprise. Moreover, the total amount of Annex A, Group I chemicals consumption in Cambodia is less than 100 MT. It was also pointed out in the Country Program of Cambodia that its sources of supply of CFCs were Thailand and Vietnam. As reported evidence from other sources could not support the high import data as claimed by the industry, the high import/export data provided by the industry in Vietnam was not used as a basis for the development of this National CFC and Halon Phase-out Plan.

As of the end of 2003, the Multilateral Fund has approved 40 ODS activities for Vietnam since 1994. The total MLF funding associated with these approvals is US\$ 4,251,662. These activities include investment projects, project preparation activities, demonstration projects, country program development, training, institutional strengthening, and technical assistance projects. When completed, these projects should phase out 326.26 ODP tons of CFCs in Vietnam.

As the majority of approved projects have already been completed, the contribution of these activities has already been realized. In fact, these projects have contributed in part to the success of the Government of Vietnam in reducing CFC consumption from its peak in 1996 from 520 ODP tons to 243.20 ODP tons in 2003.

Table 1.3 Multilateral Fund Supported Activities in Vietnam

Type of Activity	No. of Approved Projects	No. of On-going Projects	No. of Completed Projects
Investment	7	1	6
Demonstration	3	0	3
Country Program	2	0	2
Technical Assistance	7	2	5
Training	2	0	2
Institutional Strengthening	4	1	3
Project Preparation	15	1	14
Total	40	5	35

While the status of approved projects indicates that there are still five on-going projects, their ODP impact has already been realized. Therefore, no additional ODP phase-out will be achieved when these projects are completed. Assuming that no new consumption of CFCs is allowed from 2004 onwards and that any CFC consumption reduction can only be achieved through Multilateral Fund financed projects, it is expected that CFC consumption in Vietnam will remain unchanged. Based on this assumption, the projected consumption of Annex A, Group I chemicals from 2004 – 2010 is shown in Table 1.4.

Table 1.4 Projected Consumption of Annex A, Group I Chemicals from 2004 - 2010

Chemical	2003	2004	2005	2006	2007	2008	2009	2010
Max. Annex A, Group I (CFCs) consumption level allowed by the Montreal Protocol (ODP tons)	500	500	250	250	75	75	75	0
CFC phase-out from completed projects (ODP tons - direct impact)	-	-	-	-	-	-	-	-
Consumption with no additional activity (ODP tons)	243.2	243.2	243.2	243.2	243.2	243.2	243.2	243.2

While it appears that Vietnam will meet the 50% reduction target in 2005, Vietnam cannot afford to be complacent as the actual CFC demand in Vietnam in 2003 is more than 97% of the maximum allowable consumption in 2005. Moreover, the CFC consumption in Vietnam is on the rise during the past few years. In addition, major efforts are required to ensure that Vietnam will be able to reduce its consumption by 168 ODP tons in order to comply with the 2007 85% consumption reduction target of the Montreal Protocol.

Vietnam has banned the new installations of fire extinguishers and systems using halon since 1995. However, the demand for halons in Vietnam for servicing existing fire protection installations still remains significant in comparison with its baseline level. Effective measures must be put in place expeditiously to ensure Vietnam's full compliance with the Montreal Protocol and to preempt any undue economic burden to the country.

Based on the statistical import data of halon 1301 and halon 2402 from 1997 – 2000, it clearly shows that the annual demand of these chemicals is 4 MT and 6 MT, respectively. The recent drop in the import of these chemicals in the last three years did not result from the lower demand of these chemicals but rather the difficulty in accessing to the supply of these chemicals. The largest halon user in Vietnam reported that its inventory of halon-1301 and halon-2402 has depleted to the level that is lower than the level required by law.² Therefore, it is anticipated that the demand of these two chemicals in the future will remain at the same level during 1998 – 2000.

Table 1.5 Projected Consumption of Annex A, Group II Chemicals from 2004 – 2010 (ODP tons)

Chemical	2004	2005	2006	2007	2008	2009	2010
Halon 1301	40	40	40	40	40	40	40
Halon 2402	36	36	36	36	36	36	36

² Vietnam's regulations required that all fire protection systems in the petroleum industry and other critical applications must maintain an additional inventory equal to 100% of the total halon installed in their systems at all time.

According to the survey conducted during the preparation of this Plan, the level of consumption of Annex B chemicals is insignificant (less than 1 MT) in the past few years. No 1,1,1-TCA has been imported to Vietnam since 2002. CTC is still being imported in a small quantity. About 0.2 MT of CTC was imported in 2002. It is believed that CTC is being used for laboratory purposes. While investment activities are not required, the proposed Plan recommends that policy actions to stop import of 1,1,1-TCA be introduced and the maximum import quota for CTC should be established by the Government of Vietnam.

3. PROJECT SUMMARY

The National CFC and Halon Phase-out Plan will phase out the remaining consumption of 243.20 ODP tons of Annex A, Group I chemicals and 76 ODP tons of Annex A, Group II chemicals over the period 2005 – 2010. To achieve these targets, a series of investment, technical assistance, and capacity building activities, will be carried out. The National CFC and Halon Phase-out Plan will enable the Government of Vietnam to ban the use of CFC in the manufacturing sector by 2006 and the use of CFC in the servicing sector by 2010. In addition, the proposed Plan will allow Vietnam to impose an import quota on CTC (Annex B Group II chemical) and to stop importing of 1,1,1-TCA (Annex B, Group III chemicals) and virgin halons.

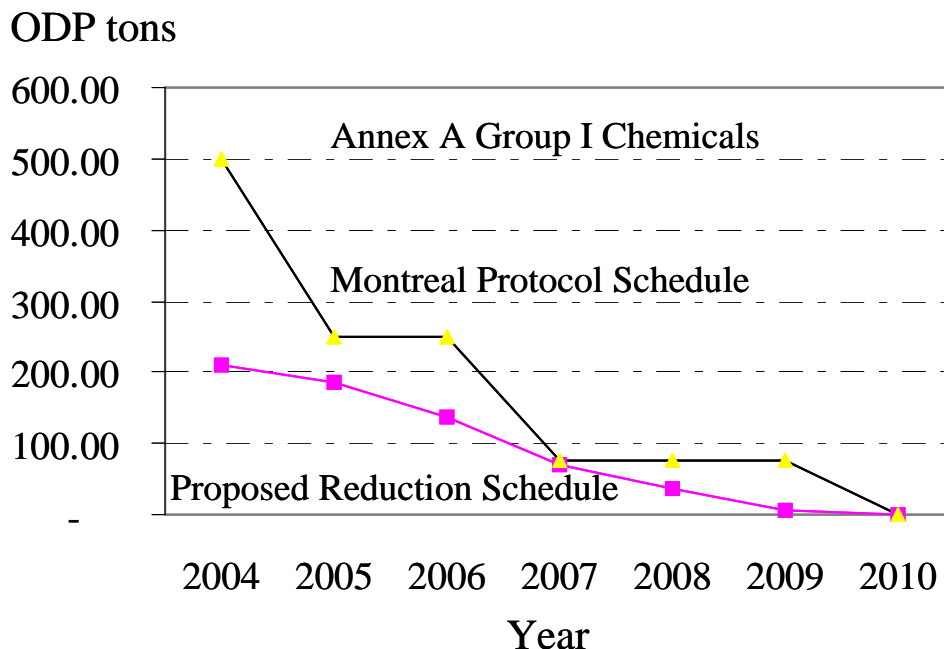


Figure 1.1 Proposed Reduction Schedule for Annex A Group I Chemicals

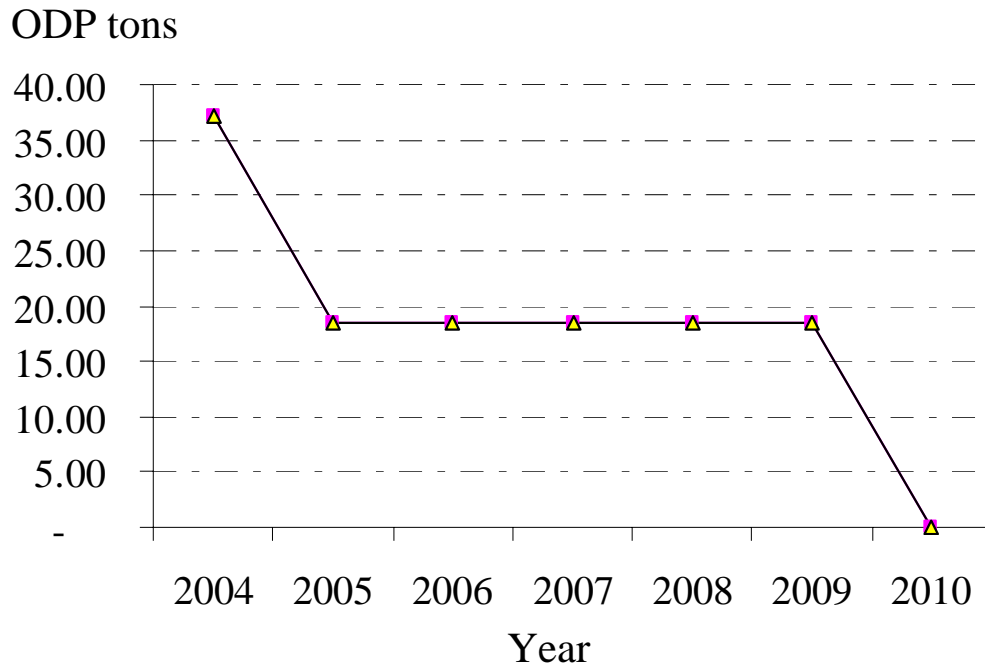


Figure 1.2 Proposed Reduction Schedule for Annex A Group II Chemicals

Considering this multi-faceted approach, it is critical that flexibility is given to the Government of Vietnam to be able to adapt or modify its strategies during implementation of this plan as needs arise. Due to complex and dynamic nature of small and medium scale enterprises (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 Vietnam is requesting financial support of US\$ 2,464,887 from the Multilateral Fund to cover part of the phase-out costs to Vietnam. This requested amount would be allocated to Vietnam in two tranches over a period of five years. This proposed funding request will phase out additional 243.2 ODP tons of Annex A, Group I chemicals³, 76 ODP tons of Annex A, Group II chemicals, and 0.22 ODP tons of CTC (Annex B Group II chemical) in the consumption sector. Therefore, the overall cost-effectiveness of this National CFC and Halon Phase-out Plan is US\$ 7.74 per kg ODP.

³ The total impact of the phase-out of Annex A, Group I is slightly less than 243.2 ODP tons as phase-out of CFC-11 in the foam sector is being replaced by HCFC-141b.

CHAPTER 2

ODS CONSUMPTION AND DISTRIBUTION BY SECTOR

1. SOURCES OF ODS SUPPLY

Vietnam imports CFCs from France, Germany, Spain, Singapore, India and China. There are seventeen importers importing CFCs during the last three years. There are a few cases where CFCs are imported directly by manufactures of CFC products. The list of importers is included in Annex I.

Vietnam also imports halon-1301 and halon-2402. Halons are imported directly by end-users, which are mainly in the oil and gas industry.

2. ODS CONSUMPTION

ODS consumption in MT as reported to the Ozone Secretariat is shown in Table 2.1. This table also provides estimates of ODS consumption in various sectors and the amount of ODS consumption captured by completed MLF-approved activities.

Table 2.1 ODS Consumption by Chemical and by Sector

	1995	1996	1997	1998	1999	2000	2001	2002
Annex A, Group I	480	520	500	392	295	257	243	236
Annex A, Group II	3	3	9	10	10	10	-	14
Annex B, Group I								
Annex B, Group II	0.50	0.50	1.20	1.40	1.50	0.60	-	0.20
Annex B, Group III	0.50	0.50	1.00	1.00	2.00	0.20	0.20	-
ODS for the aerosol sector	270	250	230	180	50	80	35	29
ODS for the foam sector	30	35	35	30	75	2	60	-
ODS for the solvent sector	1.00	1.00	2.20	2.40	3.50	0.80	0.20	0
ODS for the refrigeration sector	180	235	235	182	170	175	148	207
ODS for the fire protection sector	3.00	3.20	9.00	10.20	10.00	10.00	-	14.00
Captured by MLF approved projects*	192	28	-	-	4	11	23	29

*Additional MT of ODS captured by approved projects in 1994 and 2003 is 53.3 MT.

A comprehensive survey of the end-use consumption by sector was carried out in 2003 and the early part of 2004 as part of the preparation of this National CFC and Halon

Phase-out Plan. The total consumption based on this survey is slightly different from import data collected by the Ozone Office and the Customs Bureau. The survey results are shown in Table 2.2.

Table 2.2 Import and Consumption Data by Sector for 2003

	MT	Total (MT)
CFC-11		
Import		19.60
Consumption		12.90
Aerosol		
Foam	12.30	
Refrigeration (Manufacturing)	0	
Refrigeration (Servicing)	0.60	
MAC (Servicing)	0	
CFC-12		
Import		223.06
Consumption		206.40
Aerosol ⁴	0.00	
Refrigeration (Manufacturing)	33.75	
Refrigeration (Servicing)	101.83	
MAC (Servicing)	70.82	
CFC-115		
Import ⁵		0.90
Consumption		0.90
Refrigeration (Servicing)	0.90	
Halon 1301		
Import		0.00
Consumption		
Halon 2402		
Import		0.00
Consumption		
CTC		
Import		0.00

⁴ All remaining enterprises that are covered by investment projects already financed by the Multilateral Fund, have completely stopped using CFC in 2003 while carrying out full conversion to hydrocarbon.

⁵ CFC-115 is one of the two major component of R-502. Vietnam imported 1.77 MT of R-502 in 2003. R-502 is an azeotropic mixture of 49 percent by weight HCFC-22 and 51 percent by weight CFC-115. CFC-115 has an ODP value of 0.6.

Consumption		0.00
1,1,1-TCA		
Import		0.00
Consumption		0.00

The survey could not identify any imports of CTC in 2003. However, the Government of Vietnam believes that there is still small consumption of CTC for laboratory applications. CTC imports could return in 2004 when the stock of CTC is depleted. No funding requests to phase out CTC are proposed in the Plan.

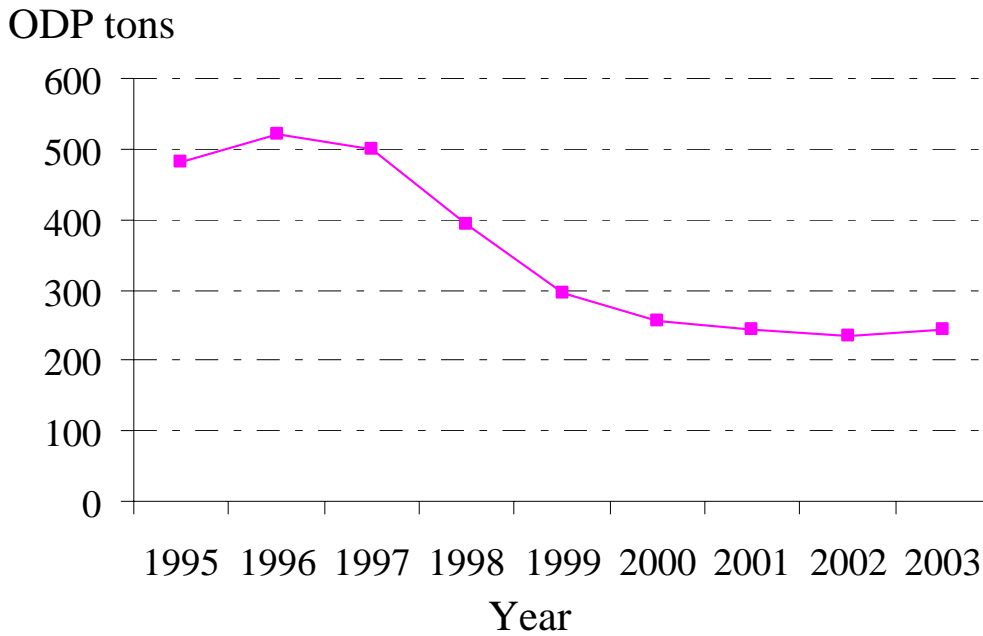


Figure 2.1 Statistical Import Data of Annex A Group I Chemicals for 1995 - 2003

CHAPTER 3

POLICIES AND REGULATIONS ALREADY IMPLEMENTED

1. IMPORT CONTROL

A joint ministry circular letter on guidance for managing and controlling import/export and the use of ODS in the Annex A of the Montreal Protocol on Substances that Deplete the Ozone Layer, was issued jointly by the Hydrometeorological Service of Vietnam, Ministry of Industry, and Ministry of Fisheries, on 17 September 2001. Based on this circular letter, any importers wish to import chemicals in Annex A of the Montreal Protocol in the upcoming year must register with the relevant government organizations by 30 October of the year prior to the import or export will take place.

Importers must provide information related to the maximum amount they wish to import in the upcoming year including the type of chemicals and intended applications. Within 30 days after the receipt of registration applications from importers, relevant Ministries should seek an agreement in writing from the Ozone Office of MONRE on the quantity and type of chemicals to be imported by importers.

In addition, the Government of Vietnam has already issued Decision 46 allowing the Ministry of Trade to impose import/export control on any goods controlled by international treaties. Decision 46 could be used to place further control on import/export including quotas for all ozone depleting substances (ODS).

2. USE CONTROL

Users of Annex A chemicals must have an action plan to phase out the use of these chemicals. Line Ministries with state-owned enterprises using a large quantity of Annex A chemicals are responsible for undertaking research development activities in order to promote replacement of controlled substance with environment and ozone layer friendly alternatives.

In 1995, the General Department of Police under the Ministry of Home Affairs issued Decision No. 34/PCCC-QD. As a result of this decision, new installation of halon fire protection systems has been banned since 1995. In addition, refilling of halons in portable fire extinguishers has also been prohibited since 1995.

3. REPORTING REQUIREMENT

Both users and importers are required to submit reports to the line ministries updating their consumption of these controlled chemicals on an annual basis. The Ozone Office is responsible for collating these reports for the purposes of future ODS phase-out planning.

4. OTHER REGULATORY AND POLICY MEASURES COVERED BY THE REFRIGERANT MANAGEMENT PLAN

Within the context of the Refrigerant Management Plan of Vietnam, which was approved and financed by the Multilateral Fund in July 2001, the Government of Vietnam has proposed to undertake reviews of the feasibility and viability of the following regulatory and policy actions:

- Ban the domestic manufacturing, import or export of CFC domestic (household) and commercial refrigeration sectors;
- Ban all installations of CFC industrial refrigeration equipment;
- Compulsory requirement to dismantle CFC industrial refrigeration equipment;
- Ban the manufacturing, import and/or export of motor vehicles equipped with CFC mobile air-conditioning systems;
- Ban the manufacturing, import, export, and sale of any CFC mobile refrigeration and air-conditioning systems;
- Ban the manufacturing, import, and/or export of CFC air-conditioning compressors;
- Reduce import duties of CFC and HCFC recycling machines; and
- Compulsory requirement that all personnel handling CFC equipment must be licensed.

Thus far, the Government of Vietnam plans to ban the use of CFC in the manufacturing of refrigeration systems (domestic and commercial). As part of the implementation of the on-going refrigerant management plan and the preparation of this National CFC and Halon Phase-out Plan, the Government of Vietnam has undertaken a process to review other policy measures proposed above including their timeframe. The final decision regarding these proposed policies and regulatory measures to support permanent phase-out of CFCs is described in the subsequent chapters.

CHAPTER 4

SECTOR BASELINE INFORMATION

1. AEROSOL SECTOR

1.1. NON-MEDICAL PRODUCTS

According to the 1994 Country Program, it was estimated that the total Vietnamese aerosol market in 1993 was slightly over 5 million cans per year. The total quantity of CFCs consumed by this sector at that time was about 200 MT. CFC-12 was a common chemical used in this sector. It was also observed that in a few cases HCFC-22 was also used by the aerosol industry. The main reason for using HCFC-22 was the unavailability of CFC-12.

The aerosol market in Vietnam comprised of two major products: perfumes and colognes; and hair spray. The total production of perfumes and colognes was about 5 million units per year while the total production of hair spray was only 150,000 units per year.

The phase-out strategy of Vietnam was to convert the few larger enterprises first. For small aerosol manufacturers, the Government of Vietnam would address their CFC phase-out through a terminal umbrella project. Once funding has been provided to all aerosol manufacturers, the Government of Vietnam would then prohibit the use of CFC in the aerosol industry.

The Multilateral Fund has already approved five aerosol investment projects in Vietnam. The last aerosol project approved for Vietnam is a terminal umbrella project. These five investment projects cover CFC phase-out in six aerosol enterprises. These enterprises are Saigon Cosmetics, Daso, Cosmetics Producing and Trading, Nam Do, Dong A, and Thorakao Cosmetics. The total funding approved by the Multilateral Fund for this sector is US\$ 809,010. The total phase-out covered by these five projects is 231.8 ODP tons of CFC-12.

Table 4.1 Status of MLF Approved Projects in the Aerosol Sector

Status of MLF Approved Projects	No. of Projects	ODP Phase-out by Projects (ODP Ton)		
		CFC-11	CFC-12	Sub-total ODP Ton
Completed Projects	5	0	203.3	203.3
On-going Projects	1	0	28.5	28.5
Cancelled Projects	0	0	0	0
Total	6	0	231.8	231.8

It is important to point out that the remaining on-going project is the terminal umbrella project that was approved by the Executive Committee of the Multilateral Fund in July

2002. The planned completion date as proposed in the project document was April 2005. However, during the preparation of this National CFC and Halon Phase-out Plan it was confirmed that the two companies covered by this terminal umbrella project had already stopped their production since 2003 as they were in the process of installing new hydrocarbon aerosol filling stations. Therefore, the total phase-out of 28.5 MT of CFC-12 has already been achieved in 2003.

The survey conducted as part of the preparation of the National CFC and Halon Phase-out Plan did not identify any additional CFC users in the aerosol industry. Moreover, since Vietnam has already had its terminal umbrella project for the aerosol sector approved by the Executive Committee, Vietnam is, therefore, not entitled to any additional funding from the Multilateral Fund for this sector.

1.2 METERED-DOSE INHALER

Asthma is considered a major public health issue in Vietnam. Due to a large number of asthma patients, the Government of Vietnam requires all public hospitals to include MDIs and other asthma treatment drugs in the list of essential drugs. Based on interviews with the Drug Administration of Vietnam, non-CFC MDIs have already been introduced in Vietnam. The main driving force for the introduction of non-CFC alternatives is mainly corporate environmental policies of the MDI manufactures in developed countries. It was reported, however, that non-CFC MDIs have not received favorable acceptance from asthma patients as they have perception that non-CFC MDIs are not effective as CFC MDIs.

Vietnam imports MDI products mainly from France, Australia, Switzerland, England and USA . At present, about 80% of all imported MDI products contain CFCs. About 20% are non-CFC MDI products, including HFC-134a MDIs and powder inhalers. It was reported that costs of non-CFC MDIs were slightly higher than CFC products.

It was suggested that to successfully introduce non-CFC MDIs, the Treatment Department of the Ministry of Health, and the medical community in Vietnam should be informed of the fact that while the use of CFCs in the MDI products is still considered as an essential use by the Montreal Protocol, most multinational companies have already had a plan to phase out the production of CFC MDIs. In addition, it was also agreed that a transition strategy to preempt new dependence of CFC MDIs, and to switch existing patients to new medication, which is CFC free, should be developed.

2. SOLVENT SECTOR

It was reported in the 1994 Country Program of Vietnam that there were two ODS chemicals used as solvent cleaning agents. These are methyl chloroform (1,1,1-trichloroethane) and carbon tetrachloride (CTC). The total consumption of methyl chloroform and CTC in 1993 in the solvent sector was 0.19 ODP tons and 1.87 ODP tons, respectively.

Based on Table 2.1, consumption of these two chemicals remained stable during the period 1995 – 2002. The recent survey conducted during the preparation of the National CFC and Halon Phase-out Plan indicated that Vietnam did not import any methyl chloroform or TCA in 2002 and 2003. There was only 0.22 ODP tons of CTC imported in 2002. However, no additional import of this chemical was made in 2003. It was also confirmed by the industrial survey and customs records that CFC-113 has never been imported by Vietnam.

During the preparation of this plan, an industrial survey with full cooperation of the Ministry of Industry was carried out. Interviews were made with 68 enterprises that are registered with the Ministry of Industry. Based on these interviews, it was found that there was only one enterprise reporting that it used a small quantity of CTC for laboratory testing purposes. No enterprises reported any uses of TCA or CFC-113. Common chemicals used for cleaning processes are iso-propanol, ethanol, acetone, trichloroethylene, and hydrogen peroxide.

Based on the above findings, no activities to phase out the use of ozone depleting substances in the solvent sector are included in this National CFC and Halon Phase-out Plan.

3. FOAM SECTOR

According to the 1994 Country Program of Vietnam, the total consumption of CFC-11 in the foam sector was approximately 20 ODP tons in 1993. Products producing with CFC-11 included insulation panels for commercial and industrial refrigeration systems. According to the annual reports on the progress of the implementation of the country program that Vietnam submitted to the Secretariat of the Multilateral Fund, it was estimated that consumption of CFC-11 in this sector increased to 30 ODP tons a year in 1995 and reached the maximum level of 75 ODP tons in 1999.

From 1995 to 2004, only conversion activity related to elimination of CFC-11 used for foam production was approved as part of the ODS phase-out at two industrial refrigeration plants. This project involved the phase-out of CFC-11 in the production of insulation panels at Searefico and Searee industrial refrigeration plants. The total funding approved for this project is US\$ 497,070. The total ODP impact of this project is 40 ODP tons of CFC-11. The cost-effectiveness of this project is, therefore, US\$ 12.43 /kg ODP. This project was considered, however, as an investment project in the refrigeration sector. Implementation of this project was completed in 1998.

With the completion of the above project, the total import of CFC-11 remained at 75 MT in 1999. Therefore, the Government of Vietnam decided to include a comprehensive survey of the foam sector as part of its preparation of the National CFC and Halon Phase-out Plan. The survey was conducted for both the supply and demand sides. For the supply side, the record of the Customs Bureau was used for establishing the total import of CFC-11 in 2003. Based on this record, there was 19.60 MT of CFC-11 imported in 2003.

For the demand side, a survey based on information provided by the Ministry of Industry, chemical suppliers, and polyol suppliers, was conducted. There were six major suppliers of foam systems and polyols. These are Huntsman, BASF, Bayer, Dow, Maskami, and Asahi. Based on information provided by these sources, there were 55 enterprises identified as foam producers that could be potential users of CFC-11. These enterprises are located in Hanoi, Hai Phong, and Ho Chi Minh.

Out of the total of 55 enterprises interviewed during the survey, only 8 companies reported that they were still producing foam products with CFC-11 as a blowing agent. The two larger companies reported that they produced their foam products, PU foam, from polyol that was already pre-mixed with CFC-11 from Taiwan. The remaining six companies mix their polyol and CFC-11 in house. The list of these six enterprises and their baseline information is included in Annex III. The total CFC-11 consumption by these six enterprises was 12.30 MT tons in 2003. However, only one out of these six enterprises was established before July 1995. The total CFC-11 consumption of this enterprise was 10 MT in 2003.

Table 4.2 CFC-11 Consumption in Remaining Foam Enterprises by Sub-Sector and by Application

Sub-Sector	Application	CFC-11 Consumption (MT)
Rigid Polyurethane Foam	Insulation Panel	10.00
Flexible Polyurethane Foam	Flexible slabstock	2.30
Total		12.30

Table 4.3 CFC-11 Consumption in Remaining Foam Enterprises by Year of Establishment

Enterprises by Year of Establishment	No. of Enterprises	CFC-11 Consumption (MT)
Before July 1995	1	10.00
After July 1995	5	2.30
Total	6	12.30

Providing that there is no new use of CFC-11 in the foam sector and no growth in the demand of CFC-11 in the remaining 6 enterprises, the demand for CFC-11 in this sector will remain at 12.30 MT. Without any legal requirements to prohibit the use of CFC-11 in this sector, those who are still using CFC-11 would prefer to prolong their use of CFC-11. Moreover, for those who have already phased out CFC-11, they may be forced to reverse to CFC-11 by the pricing pressure.

To achieve complete phase-out of CFC in the foam sector and to ensure sustainability of all converted projects, it is important to maintain a fair competition. It proposes that prohibition of the use of CFC in foam production by the end of 2006 should be

considered. To support this policy, conversion of the remaining CFC consuming foam enterprise should receive high priority.

4. REFRIGERATION SECTOR

4.1 CHILLERS

There are an increasing number of air-conditioning chillers installed in Vietnam. These chillers are installed in hotels, office buildings, and in the industrial set-up particularly in the textile industry. However, most chillers have been installed recently and none of them are CFC-based chillers. Most chillers currently in operation in hotels and office buildings were installed after 1996. Since chiller manufacturers had stopped offering CFC chillers in 1993, these units are, therefore, non-CFC based chillers.

For older units, CFCs are found to be common refrigerants. However, the number of old chillers is limited and these units are being retired. For example, all six units of CFC chillers installed in the Ho Chi Minh President Mausoleum have already been replaced by non-CFC chillers.

Because of limited applications of CFC chillers in Vietnam, the survey conducted during the preparation of this Plan, therefore, focused its scope to those installations in the textile industry. The findings of this survey confirmed the earlier survey carried out as part of the preparation of the pilot project for CFC emission reductions in spinning halls air-conditioning system chillers. That is, there were 14 CFC chillers installed between 1979 and 1993, of which 11 are still in operation.

Table 4.4 List of Enterprises with CFC Chillers and Reported CFC Consumption

Enterprise	Year of Installation	No. of Units	Cooling Capacity (Ton/unit)	Refrigerant	Annual Requirement (kg)
Hanoi Textile	1979	2	700	CFC-12	100
Nha Trang Textile	1982	5	600	CFC-11	200
Thang Loi Textile	1986	1	540	CFC-11	60*
Viet Thang Textile	1990	1	350	CFC-11	40*
Phong Phu Textile	1988	2	350	CFC-11	300
Total		11			700

*No information was available. Consumption at these sites is, therefore, just an estimate.

The above companies are owned by Vietnam National Textile-Garment Corporation (Vinatex). Vinatex is a state owned company which has 44 subsidiaries operating in the business areas including spinning, weaving, knitting, dyeing-finishing, printing, sewing with all kinds of fibers: cotton, synthetics, wool, silk, and etc. This company has about 80% of the total market share in the textile industry.

Vinatex and its subsidiaries included in Table 4.4 were direct beneficiaries of the pilot project for CFC emission reductions in spinning halls air-conditioning system chillers funded by the Multilateral Fund through the bilateral cooperation of the French Government. Under this pilot project, equipment items required for CFC emission reduction, including electronic CFC leak detectors, recovery machines, recycling machines, vacuum pumps, spare parts for air-handling units, and special tools, were provided. In addition, engineers and technicians who are responsible for operation and maintenance of these chiller units have been trained.

The survey also found that there were 11 ammonia-based air-conditioning systems installed in two textile factories during 1979 - 1993. The technology providers were companies in China and Germany. It was also reported that 10 non-CFC based chillers were installed in other three textile factories covered under this survey. Out of these 10 units, four of them were installed prior to 1988 while the remaining six units were installed after 2001. All these chillers, except one which HFC-134a based unit, are using HCFC-22 as refrigerant.

Currently, non-CFC chillers with HFC-134a, HCFC-22, and HCFC-123 refrigerants are commercially available in Vietnam.

4.2 DOMESTIC REFRIGERATOR MANUFACTURING SECTOR

Domestic refrigerators are manufactured locally and imported. There are six domestic refrigerator manufacturers in Vietnam. These are Daewoo-Hanel, Nam Ha Electronic Company (Zanucci), Sanyo, Toshiba, LG Meca Electric, and REE. Domestic refrigerators are also imported from Japan, Korea and China, by a large number of small enterprises.

Table 4.5 Production Capacity of Domestic Refrigerator Manufacturers in Vietnam

Enterprise	Production Capacity*
Daewoo – Hanel	170,000
Nam Ha Electronic	20,000
Sanyo	100,000
LG Meca Electronic	100,000
Toshiba	80,000
REE	20,000
Total	490,000

*Production capacity based on their licenses.

It was reported that all domestic refrigerator manufacturers, except Daewoo – Hanel, have already converted their production to non-CFC refrigerators. At these companies, HFC-134a was chosen as a replacement of CFC-12 while HCFC-141b was used as an alternative blowing agent for CFC-11.

Daewoo – Hanel, located in Hanoi, is the only remaining manufacturer that still produces CFC-12 refrigerators. The company reported that in fact its facility has already manufactured both CFC-12 and HFC-134a domestic refrigerators. However, the company decided to offer only CFC-12 domestic refrigerators in the local market as it felt that the existing service network and service technicians have not been properly equipped and trained to handle HFC-134a refrigerators. For the foam part, Daewoo – Hanel has already converted to HCFC-141b a few years ago. The company confirmed that it could switch to non-CFC technology with no additional investment and it could be done within a short period of time. At present, Daewoo – Hanel consumes 10 MT of CFC-12 per year for its production of domestic refrigerators for the local market.

4.3 COMMERCIAL REFRIGERATOR MANUFACTURING SECTOR

It was reported that production of commercial refrigerators is normally carried out by a large number of small enterprises. To collect information regarding production levels or production capacities of this large number of small enterprises was not possible. However, it was confirmed by the industrial working group for the refrigeration sector established by MONRE that these enterprises are the same group of enterprises that are active in the refrigeration servicing sector. More detailed information of these enterprises is provided in the following section.

To establish an overall production level of this sector, a survey was conducted to identify compressor suppliers and manufacturers in Vietnam. It was reported that almost all commercial refrigerators produced in Vietnam are assembled from rebuilt compressors. There are 10 large enterprises that repair old refrigerator compressors. These old compressors are imported to Vietnam as scrap metal. The list of compressor rebuilders and their production capacity is shown in Table 4.6.

Table 4.6 Production of Rebuilt Compressors

Enterprise	No. of Compressors Manufactured per year	Refrigerant Charge Size (kg)	CFC-12 Consumption (kg)
Nguyen Bao Cuong	6,000	0.5	3,000
Nguyen Van Nham	5,000	0.5	2,500
Dang Dinh Luc	4,500	0.5	2,250
Nguyen Van Nam	5,000	0.5	2,500
Hoang Van Viet	4,000	0.5	2,000
Duong Cong Da	5,000	0.5	2,500
Nguyen Van Ngu	7,000	0.5	3,500
Dang Dinh Hung	4,000	0.5	2,000
Nguyen Van Chinh	4,000	0.5	2,000
Dao Manh Hung	3,000	0.5	1,500
Total	47,500		23,750

Commercial refrigerators manufactured locally and equipped with these rebuilt compressors include chest freezers, display cabinets, and other non-standard commercial refrigerators. These units use CFC-12 as refrigerant. It was reported that for imported units, all of them are equipped with non-CFC based compressors, except those manufactured in China. While the life of imported units is estimated to be about 10 years, the local units seem to have a much shorter life of about 2 years. This is due to a shorter life of rebuilt compressors.

It was reported that there is no market for rebuilt HFC-134a compressors as the small commercial refrigerator manufacturers in Vietnam do not have proper equipment to handle HFC-134a. When imported units that are HFC-134a based equipment are due for repair, many of them have been converted to CFC-12.

For cold storages and large refrigeration systems, major equipment items are imported. Sources of supply of these equipment items include Australia, Canada, Japan, Denmark, Italy, and other countries in the European Union and Asia. These systems are not using CFC as refrigerant. The dominant refrigerants for these types of systems are HCFC-22 and ammonia.

4.4 MOBILE AIR-CONDITIONING MANUFACTURING SECTOR

It was reported that there is no local production of mobile air-conditioning systems in Vietnam. All MAC equipment items are imported mainly from Japan, Korea, Malaysia and Thailand. All new air-conditioning cars assembled in Vietnam are equipped with HFC-134a systems. For passenger cars, MACs are normally installed by the car manufacturers. However, for vans, buses and trucks, MACs are normally installed at larger MAC service shops. These units are also HFC-134a based systems.

4.5 DOMESTIC AND COMMERCIAL REFRIGERATION SERVICING SECTOR

Based on interviews carried out with service shops and suppliers of refrigeration components, it was confirmed that there are at least about 700 service shops in Vietnam. Findings from earlier surveys conducted a few years ago did not cover the sector fully. The recent survey, which included interviews with each of these service shops in 22 areas in Vietnam, reveals that the actual number of service shops is significantly higher as mentioned above. According to the interviews made with these 700 service shops, there are a total number of 3,415 service technicians working at these shops. Moreover, there seems to be a clear division between service shops for refrigeration systems and mobile air-conditioning systems. For the refrigeration servicing sector, it is confirmed that almost all service shops provide services to both domestic and commercial refrigerators. Only a few of them provide services for both refrigerators and MACs.

Based on the earlier estimate of the population of CFC refrigerators in Vietnam made in the Vietnam Refrigerant Management Plan, there are about 3.5 million units of CFC domestic refrigerators and 50,600 units of CFC commercial refrigerators that are still in operation. It is estimated that at least every year about 15% of the total population of

CFC domestic refrigerators and about 50% of the total population of CFC commercial refrigerators, require services. This high rate of repair reflects the quality of power supply in Vietnam and the fact that a large number of older CFC refrigerators were bought initially as second-hand units. These unfavorable conditions are further exasperated by inadequate capacity of service technicians whose only training is from the shop floor. In addition to these small commercial refrigerators, the refrigeration industrial group established by MONRE, reported that there were about 1,000 freezers in the brewery industry with capacity of 27,000 British Thermal Unit (BTU) of which about 70% of the total fleet is operating with CFC-12. The average charge size of these freezers is 2 kg. In average, these units require maintenance every six months. The popularity of this type of equipment grew during the past several years. Imported units are equipped with HCFC-22. Almost all display cabinets and freezers manufactured locally are equipped with second-hand compressors. There are about 60 enterprises selling second-hand compressors. Most second-hand compressors are made from units that were originally designed for HFC-134a. However, these units once they are repaired, they are made to work with CFC-12.

With a total refrigerant charge of 180 gm for servicing domestic refrigerators, 650 gm for servicing commercial refrigerators, and 2 kg for the freezers, the total CFC consumption for servicing these refrigerators is approximately 101.83 MT of CFC-12.

Consumption as reported by each refrigeration service shop suggests a much higher consumption of CFC-12 in this sector. However, having considered the population of refrigeration systems and the total import of CFC-12 in 2003, it could be concluded that the best estimate for the consumption of CFC-12 in the refrigeration servicing sector should be 101.83 MT.

The number of refrigeration service shops and the number of service technicians covered under the survey are summarized in Table 4.7.

Table 4.7 List of service shops and number of service technicians in larger provinces in Vietnam

No.	Provinces	No.of Service Shops	No. Service Technicians
1	Quang Ninh, Hai Phong	35	256
2	Lang Son, Bac Ninh, Bac Giang	25	85
3	Nam Dinh, Ha Nam, Ninh Binh	20	81
4	Thai Binh	4	27
5	Phu Tho, Vinh Phuc	6	34
6	Ha Tay, Hanoi	69	598
7	Hung Yen, Hai Duong	6	29
8	Thanh Hoa, Ha Tinh	23	91

9	Nghe An	14	73
10	Hue	15	87
11	Da Nang	57	296
12	Quy Nhon	14	63
13	Nha Trang	21	103
14	Phan Thiet	9	50
15	Ninh Thuan	5	24
16	Ho Chi Minh	253	1,154
17	Binh Phuoc, Tay Ninh, An Giang	6	39
18	Dong Nai	30	133
19	Dong Thap, Long An, Vinh Long	7	33
20	Ben Tre, Vung Tau	23	84
21	Can Tho, Soc Trang	11	55
22	Gia Lai	6	20
	Total	659	3,415

4.6 COLD STORAGE AND LARGE INDUSTRIAL REFRIGERATION SECTOR

Cold storage and large industrial refrigeration systems are normally found in the fishery industry. As the export market of fishery products has expanded continuously and has become one of the major economic sectors of Vietnam, the demand for these systems has increased significantly in the recent years.

To assess the CFC consumption in the cold storage and large industrial refrigeration sector, a survey was conducted in close cooperation with the Ministry of Fisheries and the Vietnamese refrigeration association. Members of the Vietnamese refrigeration association include contractors, refrigeration servicing companies, manufacturers and distributors of refrigeration equipment and chemical suppliers.

Based on this survey, it was reported that the number of fishery enterprises has increased continuously from 41 enterprises in 1985 to 171 in 1997. At present, there are about 266 enterprises in the fishery industry. Actual interviews were conducted with 251 enterprises out of the total of 266. All of them produce frozen food. Most of them are located in the southern part of Vietnam.

Main refrigeration equipment machines commonly used in the fishery industry are cold storages, quick-freeze machines, and ice flake making machines. At present, there are 836 of these equipment items installed in Vietnam. All of them are low temperature refrigeration systems using ammonia, R-502 and HCFC-22 as refrigerant. No CFC-12 system was identified during this survey. Low temperature refrigeration systems are imported from Japan, Italy, Denmark, United States, Canada, Australia, and other countries in the European Union and Asia.

It was reported that for minor repair and maintenance of this equipment, it is done by in-house technicians. For major repair work, enterprises are normally contracting it out to larger service shops that are specialized in this type of refrigeration systems like Searefico. Searefico informed that it has several branch offices in the southern part of Vietnam to provide maintenance services for the fishery industry and its market share is almost 100%.

The survey also identified a small usage of R-502 in the fishery industry. The total requirement of R-502 for servicing purposes in 2003 was 1.77 MT. The list of enterprises consuming R-502 for servicing purposes is shown in Table 4.8.

Table 4.8 Consumption of R-502 in the Fishery Industry in Vietnam

No.	Enterprise	Province	R-502 Consumption (kg)
1	Import - Export Stockholder Co.	Quang Ninh	5
2	Thai Binh Sea Food	Thai Binh	150
3	South Ha Tinh Import and Export	Ha Tinh	6
4	Quang Nam Aquatic Import and Export	Quang Nam	12
5	Anh Dao Food*	Khanh Hoa	63
6	Binh Thuan Import and Export	Binh Thuan	30
7	Toan Sang Trade	Toan Sang	150
8	Soc Trang General Import-Export Seafood	Soc Trang	50
9	Clasi Mope VN	Kieng Giang	104
10	Phu Yen Agriculture Produce	Phu Yen	200
11	Phu Bai Seafood	Binh Thuan	1,000
	Total		1,770

*No consumption data of R-502 was provided by the enterprise. The consumption shown above is an estimate based on the import data provided by the Customs Bureau and the Ozone Office.

For the refrigeration servicing sector, the Multilateral Fund, thus far, has already provided its financial support to a number of activities including a stand-alone recovery and recycling project, a stand-alone technical assistance activity for the cold storage sub-sector, and refrigerant management plan. The list of approved projects in this sector is listed in Table 4.9.

Table 4.9 Multilateral Fund Approved Projects in the Refrigeration Servicing Sector

Activity	Agency	Impact (ODP tons)	Approved Funds (US\$)	Status*
Recycling and Emissions Reduction in the Commercial Refrigeration Sector (Phase I)	UNDP/Australia	28.16	450,903	FIN

Technical Assistance on Alternative Technologies for Cold Storage Facilities	France		40,000	FIN
Implementation of the RMP**: Program for Recovery and Recycling of CFC-12 Refrigerant (Phase II)	UNDP	17	290,413	FIN
Implementation of the RMP**: MAC Recovery and Recycling of CFC-12 Refrigerant	UNDP	5.8	50,500	FIN
Implementation of the RMP**: Train the Trainer Program in the Refrigeration Servicing Sector	UNEP		200,000	ONG
Implementation of the RMP**: Monitoring the activities in the RMP	UNDP		21,600	ONG
Total		50.96	1,053,416	

*ONG = on-going; FIN = financial completion;

**RMP also includes workshop for finalization of regulations and other customs training program.

There were two activities already approved by the Multilateral Fund to support recovery and recycling of CFC-12 in the commercial refrigeration sector. These projects covered 90 enterprises: 45 of them are in the Northern and Central Part of Vietnam and another 45 enterprises in the Southern Regions of the country. The project components covering the Southern Regions of Vietnam were submitted as part of the Refrigerant Management Plan. Under these projects, a total of 150 recovery machines, 16 recycling machines, and 46 hand pumps were distributed. The objective of these activities is to assist Vietnam to reduce the consumption of CFC-12 in the commercial refrigeration sector and to familiarize technicians with proper recovery and recycling technologies and other good maintenance and service practices. These projects do not include any distribution of tools for servicing HFC-134a domestic and commercial refrigeration systems.

The Multilateral Fund also provided additional support for monitoring implementation of these activities. At the time of the preparation of this National CFC and Halon Phase-out Plan, all the equipment items have already been distributed to all participating service shops. Monitoring of these activities is still on-going. Based on interviews with the Ozone Office and the Food Industry Research Institute (FIRI), large service shops that participate in these projects are currently practicing recovery and recycling. Based on the amount of recovered refrigerant that is brought to the central facilities for recycling, it appears that the adoption of this practice among smaller service shops may not be as widespread as expected yet.

At the time of preparation of these activities and the Refrigerant Management Plan, it was estimated that there were 450 service shops and 1,800 service technicians in Vietnam. The recent survey reveals that in fact in the Southern Regions, there are 336 service shops with 1,518 service technicians. Presently, the total number of service shops in Vietnam is

expected to be at least 700 service shops with 3,415 service technicians providing services on domestic and commercial refrigerators throughout the country.

As part of the Refrigerant Management Plan, training components consisting of two components: (i) train-the-trainer program; and (ii) service technician training program, were included. Under the train-the-trainer program, about 30 trainers were trained. After this train-the-trainer program, the 30 trained trainers became the trainers for service technicians. The target of the service technician training program was to train about 1,000 service technicians on the issues related to CFC emission minimizations, proper practice for decommissioning old CFC equipment, good practices for service technicians, and retrofits.

The service technician training was carried out by three major networks of training centers in Hanoi, Ho Chi Minh, and Da Nang. One set of training equipment was provided to each of these three training centers. Training equipment items provided under this project include: 3 recovery machines; 6 recovery cylinders; 4 leak detectors; one two-stage vacuum pump; 5 R-134a gauges; 5 gauges for other refrigerants; one refractometer; and 6 liter of ester oil.

There were a total of 30 trainers and 970 technicians trained under the previously approved projects. Out of the total of 970 trained technicians, 727 were from the servicing sector, 203 from training colleges and the rest from other relevant government agencies and CFC consuming sectors.

To create an incentive for service technicians to undergo proper training provided by this project, it was proposed that the Government of Vietnam should make it mandatory that any persons who will handle and purchase CFCs, must be trained and certified by any one of these three centers. The evaluation report of this activity reveals that more than 70% of service technicians undertaking this training were not able to utilize their knowledge when returning to their service shops as no equipment is available in their shops. In this regard, it is not feasible for the Government of Vietnam to implement the proposed policy of a mandatory requirement to have any persons handling and purchasing CFCs certified.

However, the National Ozone Office in close cooperation with the General Department of Vocational Training, has already established a database system to maintain records of all technicians trained by the three training centers in Hanoi, Ho Chi Minh, and Da Nang.

4.7 MOBILE AIR-CONDITIONING SERVICING SECTOR

According to the statistical data for the number of vehicles registered in each city as provided by the Vietnam Register Office, there were a total of 429,163 and 460,932 vehicles registered in Vietnam in 2002 and 2003, respectively. These vehicles include small passenger cars, mini-buses, buses, trucks and others. Breakdown by type of vehicles is shown in Table 4.10.

Table 4.10 Type of Registered Vehicles in Vietnam in 2002 and 2003

Vehicle Type	No. of Vehicles in 2002	No. of Vehicles in 2003
Cars for less than 9 passengers	122,307	137,181
Buses (more than 10 passengers)	67,188	70,488
Buses (more than 46 passengers)	8,195	8,896
Trucks	157,207	166,985
Others	74,266	77,382
Total	429,163	460,932

For smaller vehicles (i.e., passengers and mini-vans with less than 9 seats), the total charge sized of their MAC system is about 0.8 – 1.2 kg. For larger vehicles, the charge size could be up to 5 kg or more. It was estimated that about 50% of the registered vehicles are equipped with CFC MAC systems. For trucks and other vehicles, the number of vehicles equipped with MACs is believed to be very small. Based on the number of registered vehicles and the charge size of their MAC systems, an estimate of CFC-12 consumption for the MAC sector was determined as shown in Table 4.11. The total number of vehicles that are equipped with CFC MACs in 2003 is about 108,000 units.

Table 4.11 Service Information of CFC MACs Installed in Vehicles in Vietnam

Vehicle Type	No. of Vehicles with CFC MACs	Charge Size (kg)/service	Avg. No. of Service per year	CFC-12 Consumption (kg/year)
Cars with less than 9 passengers	68,591	0.4	1	27,436
Buses (more than 10 passengers)	35,244	0.6	1	21,146
Buses (more than 46 passengers)	4,448	1.25	4	22,240
Trucks	-	0	-	-
Others	-	0	-	-
Total	108,283			70,823

The survey conducted during the preparation of this Plan indicated that there were about 150 MAC service shops located in the following cities and provinces: Quang Ninh, Hai Phong, Nam Dinh, Ha Nam, Ninh Binh, Hanoi, Phu Tho, Son Tay, Bac Ninh, Bac Giang, Lang Son, Thanh Hoa, Nghe An, Hue, Da Nang, Quy Nhon, Nha Trang, Ninh Thuan, Phan Thiet, and Ho Chi Minh. Each of the 150 MAC service shops provided information on the number of their service technicians and the estimated level of CFC-12 consumption during 2001 – 2003. The result of the survey is shown in Table 4.11.

Table 4.11 CFC-12 Consumption in the MAC Sector as Provided by Service Shops

No.	Province	No. of Service Shops	CFC-12 Consumption (kg/year)			No. of Technicians
			2001	2002	2003	
1	Quang Ninh, Hai Phong	9	7,685	10,555	12,127	24
2	Nam Dinh, Ha Nam, Ninh Binh	4	1,020	1,090	1,150	7
3	Hanoi	48	10,235	11,075	12,014	181
4	Bac Ninh, Lang Son, Bac Giang	4	750	780	805	8
5	Phu Tho, Son Tay	5	2,200	1,920	1,550	12
6	Thanh Hoa, Nghe An	7	5,660	6,610	7,110	25
7	Hue, Da Nang, Quy Nhon	9	760	860	3,620	28
8	Nha Trang, Ninh Thuan, Phan Thiet	6	1,800	2,000	4,800	26
9	Ho Chi Minh	41	21,115	22,177	25,701	159
10	Dong Nai, Can Tho	8	3,508	3,623	3,623	24
11	Ben Tre, Binh Phuoc, Vung Tau, Gia Lai	9	1,992	2,772	4,572	25
	Total	150	56,725	63,462	77,072	519

The estimates of CFC-12 consumption in 2003 based on the number of registered vehicles and information provided by service shops are slightly different. For the purpose of this National CFC and Halon Phase-out Plan, a lower figure of 70.82 MT will be used as a total CFC-12 consumption in the MAC servicing sector. The figures provided by the MAC service shops are considered less accurate as the consumption reported by MAC service shops may include the amount of CFC-12 that they resold to other service shops.

The survey results also reveal that service shops are starting to experience HFC-134a MAC systems equipped in relatively new vehicles being filled with CFC-12. The incident of reverse retrofit may become more prevalent when a larger number of new vehicles equipped with HFC-134a MACs become older. As older model vehicles tend to be repaired by smaller service shops where proper equipment for repairing HFC-134a MAC system is not common. The CFC-12 consumption as reported by MAC service shops (Table 4.11) shows an increasing trend during the last three years even though the car manufacturers in Vietnam have already stop equipping new vehicles with CFC MAC systems in late 2000.

Thus far, the only activities financed by the Multilateral Fund in the MAC servicing sector is the CFC-12 MAC recovery and recycling project which is part of the Refrigerant Management Plan. Under this project, a total of eight MAC CFC-12 recovery and recycling machines were distributed to four service shops in Hanoi and another four service shops in Ho Chi Minh City. This project has already been completed in the second half of 2003. The ODP phase-out impact as per the project proposal is 5.8 MT of CFC-12 per year. The total funding provided by the Multilateral Fund to support this activity is US\$ 50,500.

5. FIRE PROTECTION SECTOR

Halon 1301 and Halon 2402 are the only two Annex A, Group II chemicals that are used for the fire protection industry in Vietnam. Vietnam did not import any halon 1211. Vietnam has already enforced strict control on the import of halons. New installations of halon fire extinguishing systems have been banned since 1995. The residual demand of halons is for refilling of the existing fire extinguishing systems in the country. Import of halons is still allowed but only for servicing existing fire protection systems. To import halons, enterprises must obtain an approval from MONRE. The statistical import data of halons from 1995 – 2003 is shown in Table 4.12.

Table 4.12 Import Data of Halons from 1995 – 2003 (ODP tons)

Chemical	1995	1996	1997	1998	1999	2000	2001	2002	2003
Halon 1301	10	10	30	42	40	15	0	34	0
Halon 2402	12	13.2	36	36	36	18	0	63.6	0

It appears that Vietnam was not in compliance with the freeze control of the Montreal Protocol pertaining to halon consumption in 2002. However, it was confirmed that halon 2402 imported in 2002 was from recycled sources. As consumption of recycled halon is not considered as consumption by the Montreal Protocol, Vietnam, therefore, was in compliance with the freeze control in 2002. Vietnam's industry reported its difficulty to find the supply of halon-1301. While the total quantity of halon-1301 of 34 ODP tons was approved by MONRE in 2002, enterprises were not able to find suppliers of this chemical. This has resulted in difficulties for the relevant industry to maintain their fire protection system.

It is also important to note that while the import data for 2000 shows that only 15 ODP tons of halon 1301 and 18 ODP tons of halon 2402 were imported, the actual consumption as reported by Vietnam under the context of the progress report of the implementation of country program shows that 40 ODP tons of halon 1301 and 36 ODP tons of halon 2402 were consumed. The difference between the actual consumption and import was met by drawing additional quantities of halons from the existing stock within the country.

Based on the survey conducted by UNIDO, halon-1301 and halon-2402 are installed mainly in fire extinguishing system on oil tankers and offshore oil platforms. Total installations of halon fire extinguishing systems by industry are shown in Table 4.13.

Table 4.13 Halon Installation by Industry (ODP kg)

Industry	Halon-1301	Halon-2402
Oil tankers	116,320	133,086
Petroleum Facilities and Offshore Installations	17,550	3,510
Civil Aviation	34,650	9,210
Others	25,000	3,000
Total	193,520	148,806

The total halon installation in Vietnam is, therefore, more than 340 ODP tons. More than 80% of all halon fire protection systems in Vietnam is owned by Vietsopetro, the largest state-owned petroleum industry. The total demand of halons in Vietnam for the past five years was about 76 ODP tons and part of that demand was met by recycled halon.

The findings of the Multilateral Fund supported technical assistance activity to prepare a national halon bank management program conclude that there is an urgent need to establish a central halon banking facility in Vietnam as most halon applications are still required. The halon usage in Vietnam is considered to be essential use even by non-Article 5 countries.

CHAPTER 5 NATIONAL CFC AND HALON PHASE-OUT PLAN

1. INTRODUCTION

The total import of Annex A, Group I chemicals in Vietnam in 2003 was 243.20 ODP tons. These included 19.60 ODP tons of CFC-11, 223.06 ODP tons of CFC-12, and 0.54 ODP tons of CFC-115. Of these quantities, the study conducted under the preparation of this National CFC and Halon Phase-out Plan could identify actual consumption by the end users only up to 219.84 ODP tons. The detailed consumption breakdown by chemical and by application is summarized in Table 2.2.

The review of all ODS phase-out activities approved by the Multilateral Fund to date reveals that expected CFC phase-out impact of all approved activities has already been realized. Without further intervention by the Multilateral Fund and the Government of Vietnam, the demand for CFCs is expected to reduce only slightly due to the attrition of existing CFC domestic and commercial refrigerators, and MACs. This is based on the assumption that no reverse retrofit will be made to new non-CFC equipment⁶.

Under this scenario, the total demand of CFCs in Vietnam in 2007 will reduce to 198.14 ODP tons. The total reduction of 21.7 ODP tons from the 2003 level is the result of the reduction in the demand of CFCs by 0.1 ODP tons in the chiller sector and 21.60 ODP tons in the refrigeration sector. In accordance with the 85% reduction target of the Montreal Protocol, the maximum allowable consumption of Annex A, Group I chemicals in 2007 is only 75 ODP tons.

It is important that additional activities must be undertaken to assist Vietnam to meet its obligations in 2007 and 2010. Without further action by the Government of Vietnam or the Multilateral Fund, Vietnam will not be able to meet its 85% and 100% reduction targets in 2007 and 2010. As the residual consumption of CFCs in Vietnam is in the service sector where phase-out is normally taking longer time to achieve than other investment activities, hence it is critical that additional activities must be undertaken immediately.

With regard to Annex A, Group II chemicals, the Ozone Office of MONRE and the Customs Bureau indicated that no halon was imported in 2003. The import of these chemicals (halon-1301 and halon-2402) in 2002 was significant. According to the study financed by the Multilateral Fund and implemented by UNIDO, there are a total stock of 19.35 MT of halon-1301 and 24.8 MT of halon-2402 currently installed in the existing fire protection systems. As these systems require maintenance and refill, the demand of Annex A, Group II chemicals is expected to remain beyond 2010.

⁶ However, the CFC-12 consumption data as reported by MAC service shops (Table 4.11) suggested that reverse retrofit, at least in the MAC sector, becomes increasingly common.

To ensure Vietnam's full compliance with the Montreal Protocol obligations pertinent to Annex A, Group II chemicals, it is important that an effective halon management system and recovery and recycling capability must be put in place as soon as possible. This would enable Vietnam to meet its halon demand through recycled halons, which are not controlled substances under the Montreal Protocol.

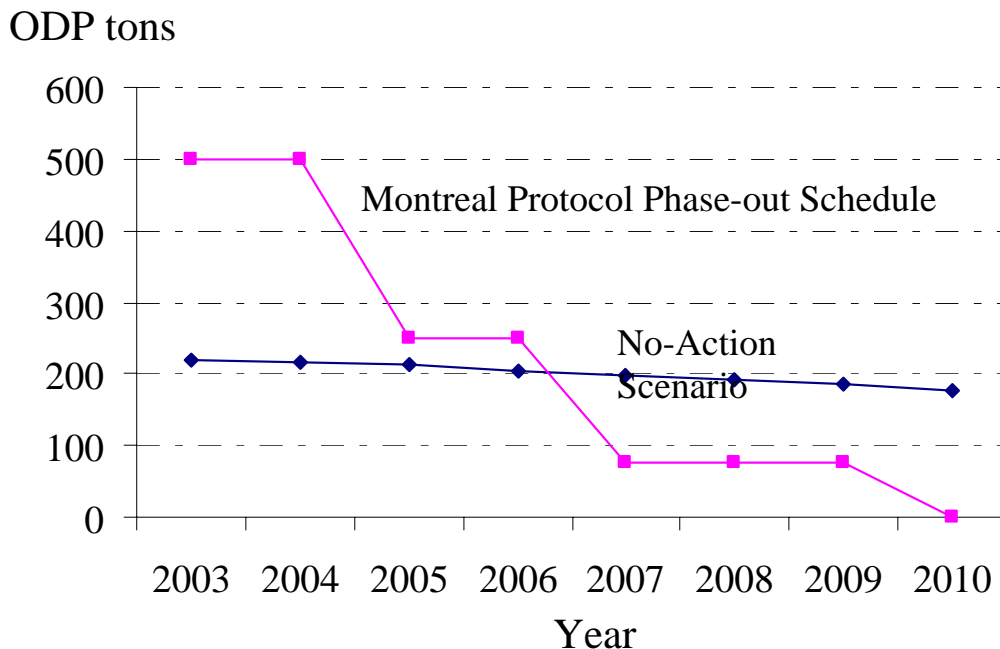


Figure 5.1 Reduction Scenario of CFC Demand in Vietnam without Further MLF Intervention

2. PROPOSED POLICIES AND STRATEGIES

The Government of Vietnam will impose ban on the use of CFCs in the manufacturing sector by the end of 2006, and to establish an infrastructure, incentive and disincentive systems, to eliminate the use of CFCs in the service sector and to preempt reverse-conversion of non-CFC equipment. To ensure a level-playing field, the Government of Vietnam will prohibit any imports of CFC equipment by the end of 2006. Moreover, to ensure full compliance with Montreal Protocol obligations, Vietnam will strengthen its ODS import/export control through the introduction of import licensing and quota systems.

According to the results of the survey described in Chapter 4 of this document, the total use of Annex A, Group I chemicals in enterprises in the manufacturing sector is 46.05 ODP tons. Of this quantity, the total of 12.30 ODP tons of CFC-11 is used for the production of rigid and flexible polyurethane foam. In addition, 10 ODP tons of CFC-12 is being used by the one remaining manufacturer of CFC domestic refrigerators in Vietnam. Small service shops also consume 23.75 ODP tons of CFC-12 for production of new CFC commercial refrigerators and freezers.

The Government of Vietnam is seeking funding from the Multilateral Fund to support conversion at all eligible enterprises. For enterprises owned by foreign companies whose countries agree not to seek any funding to support investment projects in their countries, costs of conversion, if any, will be borne by the enterprises.

If there are additional CFC consuming enterprises identified during the implementation of the National CFC and Halon Phase-out Plan, conversion costs in part or in full may be financed by the funds already provided to this Plan. However, these companies will receive lower funding priority than those enterprises identified in this document. In any event, the Government of Vietnam will not request any additional financial support from the Multilateral Fund beyond what will be approved for this Plan.

The National CFC and Halon Phase-out Plan proposes to give high priority to the implementation of investment activities in order to assist CFC consuming enterprises to meet the complete CFC phase-out deadline for the manufacturing sector by the end of 2006.

With the whole manufacturing sector becoming CFC-free, the total quantity of Annex A, Group I chemicals to be imported from 2006 onwards will be for meeting the demand in the service sector. Excluding the demand of CFC in the manufacturing sector, the remaining requirement for CFCs to meet the demand in the service sector in 2007 is expected to be 152 ODP tons, which still exceed the maximum allowable consumption of 75 ODP tons in 2007. Hence to meet the 85% reduction target in 2007, an additional CFC phase-out in the service sector of another 77 ODP tons is required.

It is the strategy of the Government of Vietnam to achieve this critical reduction in the service sector by strengthening capacity of service technicians in handling CFC- and non-CFC equipment, and by informing the public of the future scarcity of CFC supply and cost-effective options for eliminating their dependence on these chemicals.

To strengthen capacity of service technicians in both refrigeration and MAC sectors, the Government of Vietnam is proposing to extend the scope of the training being implemented as part of the Refrigerant Management Plan to cover all service technicians in Vietnam. In addition, to assist all service shops to have access to proper equipment and tools for handling CFC- and non-CFC equipment, financial assistance should be rendered to them. This National CFC and Halon Phase-out Plan, therefore, includes a funding request to support part of the cost of this equipment provision program.

The National CFC and Halon Phase-out Plan also proposes activities to enhance awareness of the public pertaining to the need to phase out ODSs. These activities include public awareness activities to be carried out by the Government, a MAC inspection program, and a technical assistance activity to develop a national strategy for phasing out the use of MDI products.

For Annex A, Group II chemicals, the Government of Vietnam has already banned new installations of halon-based fire protection systems since 1995. This regulatory measure

has effectively preempted the build-up of the demand of halons in Vietnam. However, for the airline industry which has experienced a significant growth in the past five to ten years, new installations of fire protection systems in the new aircrafts are still relying on halon as this is the only option commercially available in the international market. Therefore, Vietnam will certainly require the supply for halon for at least the next 20 – 30 years.

Given the baseline halon consumption of Vietnam is low, the rapid growth in the airline industry, and the demand of halon for servicing existing fire protection systems in oil and gas industry, the Government of Vietnam is proposing to establish a halon databank and recovery and recycling facilities within Vietnam. This would allow Vietnam to be able to fulfill its halon requirement through recycled halons supplied by the sources within the country and by other international sources.

No measure for phasing out Annex B chemical is proposed by this National CFC and Halon Phase-out Plan as no Annex B chemicals, except CTC, were imported to Vietnam during the past years. The level of import of CTC is very low. The use of this chemical is limited to laboratory applications where non-CTC alternative standards are not available. Therefore, import of CTC at the quantity within the maximum level allowed by the Montreal Protocol will be allowed until 2010.

3. IMPACT OF APPROVED PROJECTS AND NEWLY PROPOSED ACTIVITIES

Impact of various investment, technical assistance, and regulatory activities proposed under the National CFC and Halon Phase-out Plan is shown in Tables 5.1 to 5.3. In 2003, Vietnam imported 243.20 ODP tons of Annex A, Group I chemicals. However, the actual amount consumed by end-consumers is slightly lower than the imported amount. This difference may represent the remaining stocks of CFCs at the end of 2003. It may also reflect the possibility that the survey conducted under this National CFC and Halon Phase-out Plan did not cover all users in Vietnam. However, the difference is less than 10% of the total imported quantity. For the purpose of the development of the National CFC and Halon Phase-out Plan, the consumption figure based on identifiable consumption from the survey was employed.

3.1 AEROSOL SECTOR

At present, there is no consumption of CFCs in the aerosol sector. While the last investment project in the aerosol sector was not completed at the time of preparation of this document, it was reported that the actual consumption at the enterprises covered by this investment project had already stopped using CFCs in 2003. Therefore, the impact of this investment project has already been captured in 2003. The survey confirmed that no any other aerosol enterprise in Vietnam uses CFCs anymore. As the last investment project is a terminal umbrella project for the aerosol sector and no aerosol enterprises using CFCs were found during the survey, no additional funding request is included in the National CFC and Halon Phase-out Plan.

Vietnam consumes a significant amount of MDI products containing CFCs. There is no local MDI production facility in Vietnam. As per the Montreal Protocol's definition, CFC contained in imported MDI products is not considered as a controlled substance by the importing country. While the use of CFC MDI products does not affect ability of Vietnam to meet their obligation of the Montreal Protocol, it is still important for Vietnam to have a comprehensive strategy to switch to non-CFC MDI products and implement this strategy early. This is to ensure that patients depending on CFC MDI products would have sufficient time to adapt to new products. Hence, development of a CFC MDI phase-out strategy will be included in the proposed National CFC and Halon Phase-out Plan.

3.2 SOLVENT SECTOR

The statistical data from the Customs Bureau and information from major solvent suppliers in Vietnam confirmed that there was no import of CFC-113 and 1,1,1-TCA for the past several years. The industrial survey also confirmed that no enterprises in Vietnam use these chemicals in their cleaning process. Therefore, the Plan will not include any intervention for the solvent sector. With regard to CTC, it was identified that CTC is still being used for laboratory applications. However, the annual demand of this chemical is very low (about 200 kg per year). As CTC used in these applications is mainly required by international standards and since no alternative testing procedures are available, the CTC demand is not expected to drop in the near future. The National CFC and Halon Phase-out Plan, therefore, proposes that import of this chemical at the current level be allowed until 2009. If no non-CTC alternative international standards are available in 2010, Vietnam will follow the established Montreal Protocol procedures to seek exemption for this use within the context of the CTC global exempted use regime.

3.3 FOAM SECTOR

The total consumption of CFC-11 in the foam sector in 2003 was 12.30 ODP tons. This amount was consumed by 6 foam enterprises. One of them was established before July 1995 and its consumption was 10 ODP tons. The funding request for this sector is made on the basis of the eligible incremental costs of this enterprise. With the requested funds, the Government of Vietnam will ensure that the remaining CFC-11 consumption in this sector will be phased out completely by the end of 2006 at the latest, by prohibiting the use of CFCs in the manufacturing of new products. In addition, the supply of CFCs will be restricted as the Government of Vietnam will attach a condition prohibiting sales of CFCs to the manufacturing sector as part of the import quota of CFC importers. With these measures, it is expected that a total consumption of reduction of 12.30 ODP tons from the foam sector will be realized from 2007 onwards.

3.4 DOMESTIC AND COMMERCIAL REFRIGERATION MANUFACTURING SECTOR

With the ban on the use of CFCs in the manufacturing sector by 2006 and the supply restriction as mentioned above, this would result in the consumption reduction of another 10 ODP tons of CFC-12 in the domestic refrigerator manufacturing sector. It was

reported that 23.70 ODP tons of CFC-12 is used for manufacturing new CFC commercial refrigerators by a large number of small service shops. Complete phase-out of the use of CFC-12 in the production of commercial refrigerators will be achieved only when all small service shops producing these units have received new service equipment. Because of a large number of small service shops, it is expected that to achieve 100% coverage of all service shops, it would take about two years after the commence of the Plan.

3.5 REFRIGERATION SERVICING SECTOR

In addition to the consumption reduction to be achieved from the proposed investment intervention, additional consumption reduction could also be realized through natural attrition of CFC containing equipment assuming that no new non-CFC based equipment is retrofitted to CFC.

3.5.1 CHILLER SECTOR

As the life expectancy of building chillers is about 25 years old, by the end of 2004 two CFC-12 chillers installed at Hanoi Textile in 1979 would be retired. The annual demand of 100 kg of CFC-12 for servicing these two units will, therefore, be eliminated. By the end of 2007, five CFC-11 chillers installed at Nha Trang Textile in 1982 would be retired. An additional CFC-11 consumption reduction of 200 kg would be achieved.

After 2007, there will be only 4 CFC chillers still in operation in Vietnam. The demand for CFC for servicing these chillers will remain after 2010. The annual requirement of CFC-11 for servicing these four remaining CFC-11 chillers is about 400 kg for the next five years after 2010. The total CFC-11 requirement for the period 2010 – 2015 is about 2.06 MT. However, CFC-11 installed in five CFC-11 chillers at Nha Trang Textile, which will be retired at the end of 2007 is about 3 MT. Therefore, when dismantling CFC-11 chillers at Nha Trang Textile, CFC-11 should be properly recovered from these dismantled units. This amount of CFC-11 could be used for servicing the remaining chillers until the end of their useful life.

The economic impact of CFC phase-out in the chiller sector is, therefore, expected to be very limited. With the technical assistance provided by the earliest project financed by the Multilateral Fund through the French bilateral cooperation, no additional intervention is required.

3.5.2 DOMESTIC AND COMMERCIAL REFRIGERATION SERVICING SECTOR

It is estimated that there were about 3.5 million units of CFC domestic refrigerators in 2001 in Vietnam. It is reasonable to assume that the average age of these 3.5 million units is 10 years old in 2001. It was reported that Vietnam households normally keep their domestic refrigerators for about 20 years or more. Assuming that the existing CFC domestic refrigerators will be retired on a linear basis for the next ten years after 2001, the total CFC-12 requirement for servicing these domestic refrigerators will continuously decline from 2001 onwards. However, the demand for CFC-12 will not completely

phase-out by 2010 as currently there are still more than 100,000 units of CFC domestic refrigerators being put into the market by one remaining domestic refrigerator manufacture in Vietnam.

With the proposed policy to prohibit the production of CFC domestic refrigerators by the end of 2006, CFC demand for servicing domestic refrigerators will remain until the end of 2025. After 2009, Vietnam will have to rely on the existing stocks of CFC-12 before 2009 or from recycled sources.

Additional CFC consumption reduction will also be achieved through the retirement of existing CFC commercial refrigerators and freezers. It is expected that the retirement of these refrigerators and freezers will contribute to a total CFC consumption reduction of 41.60 MT in 2010.

To achieve additional CFC consumption reduction in order to meet Montreal Protocol obligations, it is proposed that all service technicians be trained on proper handling of CFC-12 and HFC-134a refrigeration and air-conditioning systems. In addition, this National CFC and Halon Phase-out Plan also proposes that each service shop should be provided with at least one set of proper service tool kits to ensure that no new non-CFC equipment be retrofitted to use with CFC-12.

3.6 FIRE PROTECTION SECTOR

For Annex A, Group II chemicals, Vietnam will ensure its full compliance with Montreal Protocol obligations by establishing an effective halon management system. The future demand of halons will be met by the surplus halons from dismantled fire protection systems in Vietnam and by recycled halons. This National CFC and Halon Phase-out Plan proposes that the Vietnam fire protection industry should be allowed to continue its import of virgin halons when the supply of recycled halons from domestic and international sources is not sufficient. It is expected that the demand for halons will remain at 76 ODP tons until 2015.

The phase-out scenario based on the strategy described above is shown in Tables 5.1 – 5.3, and Figure 5.2.

Table 5.1 CFC Phase-out by On-going and Newly Proposed Activities (MT)

Annex A Group I	2003	2004	2005	2006	2007	2008	2009	2010
CFC-11 (Demand)	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9
<i>Impact of On-going Phaseout Activities</i>								
Chiller Replacement/Retirement			-	-	-	0.2	0.2	0.6
<i>Impact of New Investment Activities</i>								
Investment Activities in the Foam Sector				-	12.3	12.3	12.3	12.3
CFC-11 Consumption Schedule	12.9	12.9	12.9	12.9	0.6	0.4	0.4	0
CFC-12 (Demand)	206.4	206.4	206.4	206.4	206.4	206.4	206.4	206.4
<i>Impact of On-going Phaseout Activities</i>								
Chiller Replacement/Retirement			0.1	0.1	0.1	0.1	0.1	0.1
<i>Impact of New Phase-out Activities</i>								
Ban on the production of CFC domestic refrigerators				-	10	10	10	10
Ban on the production of CFC commercial refrigerators				10	23.7	23.7	23.7	23.7
Retirement of CFC-12 Domestic & Commercial Refrigerators		3.96	7.88	14.76	21.60	28.30	35.10	41.60
Certified refrigeration service technicians & Provision of Service Tools (Retrofit)			12	24	36	48	60	60
Certified MAC service technicians (No topping-up) & Provision of Service Tools (Retrofit)		5	13	35	47	60	71	71
CFC-12 Consumption Schedule	206.40	197.44	173.42	122.54	68.00	36.30	6.50	-
CFC-115 (Demand)	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
<i>Impact of On-going Phaseout Activities</i>								
Retirement of the industrial refrigeration systems					-	-	-	0.9
CFC-115 Consumption Schedule	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0

Table 5.2 CFC Phase-out Schedule Based on the Proposed Plan (ODP tons)

Annex A Group I	2004	2005	2006	2007	2008	2009	2010
Phaseout Schedule for Vietnam	210.88	186.86	135.98	69.14	37.24	7.44	-
Interim Reduction Targets for Vietnam	500	250	250	75	75	75	-

Table 5.3 Halon Phase-out Schedule Based on the Proposed Plan (ODP tons)

Annex A Group II	2003	2004	2005	2006	2007	2008	2009	2010
Phaseout Schedule for Vietnam		37.06	18.53	18.53	18.53	18.53	18.53	-
Interim Reduction Targets for Vietnam		37.06	18.53	18.53	18.53	18.53	18.53	-

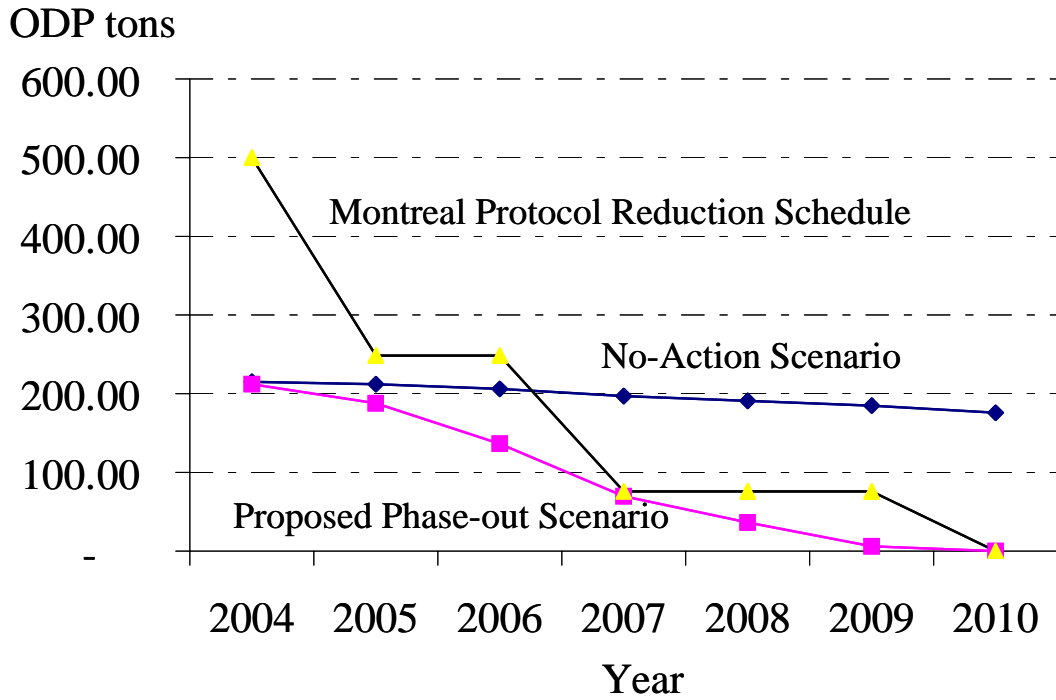


Figure 5.2 Proposed Phase-out Scenario for Annex A Group I Chemicals

CHAPTER 6 ACTION PLAN

1. AEROSOL SECTOR

1.1 INVESTMENT COMPONENT

It has been confirmed that no additional aerosol manufacturers are using CFCs in their production. Since Vietnam has already received funding for a terminal umbrella project for the aerosol sector, no additional funding for this sector will be requested.

The Government of Vietnam will ensure that the remaining on-going projects in this sector will be completed as scheduled and the phase-out of CFC consumption in this sector will be permanent.

1.2 TECHNICAL ASSISTANCE COMPONENT

With regard to MDIs, it is proposed that a MDI phase-out strategy be developed. The strategy will focus on how to reduce the growth of CFC MDIs dependence by an early introduction of alternatives. The objective of the proposed strategy is to promote the use of non-CFC alternatives and to formulate a proper transition plan taking into account the phase-out plan of major CFC MDI producers in both developed and developing countries.

The proposed MDI strategy will include, *inter alia*, information dissemination programs targeting medical doctors and the management of hospitals in order to raise their awareness pertaining to the need to phase out the use of CFC MDIs. The strategy will look into how to stop the growth of CFC MDI dependence and give momentum to the introduction into the market of the non-CFC based MDIs. This work is considered to be crucial as the number of asthma patients in Vietnam is increasing.

To develop a plan for phasing out CFC MDIs, the Ministry of Health through its Drug Administration and the Treatment Department, in close cooperation with MONRE, will contract a consulting firm to undertake preparation of a strategy. The pharmaceutical industry, doctors, relevant government agencies, and relevant stakeholders, will be invited to participate in the strategy development process. The preparation process will include stakeholder consultation workshops, development of a transition plan including information dissemination strategies, recommendations to promote the use of non-CFC alternative MDIs. It is proposed that financial support of US\$ 49,500 be provided by the Multilateral Fund to support this activity.

Table 6.1 Technical Assistance Component for MDIs

Activity/Description	US\$
Workshops	20,000
Consultant Fees	13,000
Information Dissemination Materials for Health Care Industry	12,000
Sub-total	45,000
Contingency of 10%	4,500
Total	49,500

1.3 REGULATORY COMPONENT

As the Government of Vietnam will prohibit the use of CFC in the manufacturing sector by the end of 2006, this will cover the use of CFC in the production of all non-medical aerosol products. This will include products that use CFC as propellants or as an ingredient. When approving applications for import licenses and quotas for CFCs a condition prohibiting the sale and use of CFCs for the production of aerosol products will be imposed on all importers.

2. SOLVENT SECTOR

Since there is no reported use of 1,1,1-TCA in Vietnam, no investment or technical assistance activity is included in the proposed Plan. It was reported that there is still a small use of CTC for laboratory testing purposes. Since for this type of applications the use of CTC is normally required by the international standards, phase-out of this consumption depends on the availability of new international standards. Therefore, continuing use of CTC only for these applications would be allowed.

2.1 REGULATORY COMPONENT

MONRE, in close cooperation with the Ministry of Trade, Customs Bureau, and other relevant ministries, will not allow any importers to import 1,1,1-TCA from January 2005 onwards. For CTC, an import quota will be issued on an annual basis. The annual import quota will be issued in accordance with the Montreal Protocol requirements. As the baseline of CTC consumption for Vietnam is 1.16 MT (or 1.28 ODP tons), the annual import quota for 2005 – 2009 will not exceed 15% of this baseline quantity (175 kg or 0.19 ODP tons), and zero in 2010. In addition, CTC importers will be required to provide a list of end-users and their applications to MONRE when applying for an annual import permit for CTC.

3. FOAM SECTOR

3.1 INVESTMENT COMPONENT

As described in Chapter 4, there are six foam enterprises that are still using CFC-11 as a blowing agent and none of them have received any assistance from the Multilateral Fund. All six enterprises are 100% owned by Vietnamese and their products are for the domestic market. However, five out of the six enterprises were established after July 1995. According to the existing decision of the Executive Committee on the eligibility of enterprises, the funding request is proposed for only one enterprise that was established before July 1995. Information of all six remaining enterprises that are still using CFC-11, is summarized in Table 6.1.

Table 6.1 CFC-11 Consumption in Remaining Foam Enterprises

Sub-sector	Established before July 1995		Established after July 1995	
	No. of Enterprises	ODP tons	No. of Enterprises	ODP tons
Rigid Polyurethane Foam Insulation Panels	1	10		
Flexible PU Foam			5	2.3
Total	1	10	5	2.3

Thus far, Vietnam has not had any investment project in the foam sector approved by the Multilateral Fund. However, there was one refrigeration manufacturing investment project (Phasing out of ODS at the Searefco and Searee industrial refrigeration plants of Seaprodex Co.), which included elimination of the use of CFC-11 in the manufacturing of insulation foam for industrial refrigeration equipment. The project was approved as a refrigeration manufacturing project, not a foam project.

Vietnam is proposing to phase out the remaining consumption of 12.3 ODP tons of CFC-11 in the foam sector by converting all the remaining foam enterprises that have already been identified in Annex III. All conversions must be completed by the end of 2006. While there are six remaining foam enterprises still using CFC-11 as a blowing agent, the funding request is being made on the basis of the eligible incremental costs of one enterprise established prior to July 1995.

This enterprise is Insulation Panel Co. located 39A/3 Kha Van Can Street, Thu Duc District, Ho Chi Minh. The company was established in 1989. Main products manufactured by this enterprise are insulation panels for cold storage, and off-site spray applications for walls, pipes and tanks. Insulation panels manufactured from this enterprise use CFC-11 as a foam blowing agent. The size of insulation panels made by this enterprise varies from 6 – 12 m. in length, 50 – 150 mm. in thickness, and 1.2 m. in width. These insulation panels have an average foam density of 40 – 45 kg/cu. m. Before 2000, the enterprise produced insulation panels by mixing its chemical system

with an electric stirrer and pouring the chemical mix into the panels. The enterprise purchased a new Cannon C-60 foam injection machine in 2000.

The company also produces spray foam for walls, pipes and tanks. This spray foam has an average foam density of 35 – 38 kg/cu. m. In 2003, the total production of insulation panels was 16, 514 m² and 49,200 m² of spray foam with an average thickness of 3 – 15 cm. In addition, the enterprise also produces pour-in-place packaging foam.

Before 2001, the enterprise purchased premixed polyol from Huntsman and BASF. However, due to the corporate policy of these two international suppliers not to offer CFC-11 premixed polyol, the enterprise started mixing polyol with CFC-11 in house in 2001. The total CFC-11 consumption of this enterprise was 10 MT in 2003. The baseline equipment of the Insulation Panel Co. is listed below.

Table 6.2 Baseline Equipment of Insulation Panel Co.

Enterprise	Product	Baseline Equipment	Model	Maximum Output
Insulation Panel Co.	Insulation Panel	Low Pressure Injection Machine	Cannon C-60	60 kg/min.
	Spray foam	Spray Foam Machine	Lifeng LF - 7M-30P (Taiwan)	12 l/min or 15 kg/min
		Spray Foam Machine	Gusmer FF-1600 (USA)	5.6 l/min or 7 kg/min

The enterprise proposes to replace CFC-11 with HCFC-141b as a foam blowing agent. To maintain the same quality of the foam products, the baseline low pressure injection machine (Cannon C-60) will be replaced with a high pressure injection machine with equivalent production capacity. The two baseline spray foam machines will be retrofitted for use with HCFC-141b, by changing seals, hoses and gaskets to material compatible with HCFC-141b. The estimated conversion costs at this enterprise is shown in Table 6.3.

Table 6.3 Standard Cost of Foam Injection Machines

Equipment	Maximum Output	Standard Cost (US \$)
High pressure injection machine (1)	60 kg/min	90,000
Spray foam machine (2)	retrofit	10,000

While the total incremental capital cost of conversion at Insulation Panel Co. is US\$100,000 and no similar foam projects have been approved for Vietnam, the funding request of up to the established cost-effectiveness threshold applicable to rigid polyurethane foam of US\$ 7.83/kg ODP will be made. Therefore, the proposed funding level for Insulation Panel Co., based on the cost-effectiveness of US\$ 7.83/kg ODP and

the total ODP phase-out impact of 8.9 ODP tons after deducting the ODP value of HCFC-141b, is US\$ 69,687.

The Ozone Office of MORE will provide assistance to help this foam enterprise prepare its proposal including a disposal plan for its baseline equipment. If it is found later that there are more foam enterprises that need to convert their production processes, costs of conversion at those additional enterprises will be covered by the funds approved for this National CFC and Halon Phase-out Plan or borne by the enterprises.

3.2 REGULATORY COMPONENT

MONRE in close cooperation with the Ministry of Industry and other government agencies, will prohibit the use of CFC-11 in foam production after 2006. A condition prohibiting the sales of CFC-11 for use as a blowing agent will be attached to the import licenses. All CFC-11 importers will be required to provide a list of end-users.

4. DOMESTIC AND COMMERCIAL REFRIGERATION MANUFACTURING SECTOR

The only domestic refrigerator manufacturer in Vietnam that is still producing CFC domestic refrigerators, is Daewoo – Hanel in Hanoi. Since the enterprise has already confirmed that it would be able to switch to HFC-134a domestic refrigerator production in short time and without additional costs or support from the Multilateral Fund. No funding request for this enterprise will be made.

To assist a large number of small commercial refrigerator manufacturers to convert to non-CFC production technology, funding will be provided as part of CFC phase-out in the service practice. The detailed financial assistance and technical assistance to this target group is described in the following section.

4.1 REGULATORY MEASURE

The use of CFC-12 in the manufacturing sector will be prohibited by 2006. MONRE will inform Daewoo – Hanel of this decision in advance and will enforce this regulation by visiting this enterprise immediately after 1 January 2007.

As large commercial and industrial refrigeration systems are mainly used in the fishery industry, to prevent additional build-up of CFC equipment in this industry the Ministry of Fisheries has not endorsed any requests for a business license from any new enterprises that wish to use CFC equipment in their operations for the last ten years. The Ministry of Planning and Investment that is responsible for issuing business licenses, thus far, has taken the recommendations of the Ministry of Fisheries into account when reviewing the applications for business licenses, and has not issued any business licenses to those enterprises.

5. DOMESTIC AND COMMERCIAL REFRIGERATION SERVICING SECTOR

An average lifetime of domestic refrigerators is about 20 years. CFC domestic refrigerators are still being offered to the local market by Daewoo – Hanel. Daewoo – Hanel has started manufacturing 160,000 domestic refrigerators since 1995. Production of CFC domestic refrigerators has been about 70% of the total production since then. It is, therefore, a priority for the Government of Vietnam to cease the production of CFC domestic refrigerators. The Government of Vietnam proposes to ban the production of CFC domestic refrigerators by the end of 2006 when all CFC consumption for the manufacturing purposes will be banned. Under this circumstance, the last CFC domestic refrigerator units produced in 2006 are expected to be out of service by 2026.

Based on the survey results, about 63 MT of CFC-12 was used for servicing CFC domestic refrigerators in 2003. Assuming that the existing stock of CFC domestic refrigerators in 2000, when the survey was done for the preparation of the Refrigerant Management Plan, except those manufactured by Daewoo – Hanel, has an average age of 10 years and the number of these units will decrease at a constant rate with a total depletion by 2010, the CFC demand for servicing domestic refrigerators, mainly those manufactured by Daewoo-Hanel, will decrease to about 22 by 2010. With no supply of CFC-12 after 2009, it is estimated that about 120,000 units of CFC domestic refrigerators and freezers may have to be retired before their expected life.

The above scenario is based on the assumption that there is no reverse retrofit of HFC-134a domestic refrigerators to CFC-12. With the growing economy, the demand for domestic refrigerators has been increasing continuously in the past several years. Based on the estimate made in the Refrigerant Management Plan, the domestic refrigerator market is expected to grow at a 5% rate per annum. Without proper training of service technicians and without proper equipment to handle HFC-134a domestic refrigerators, the possibility and the potential growth of reverse retrofit increases.

Based on the survey results, about 16.5 MT of CFC-12 was used for servicing CFC commercial refrigerators in 2003. An average lifetime of commercial refrigerators is about 2 years as most of them are produced with rebuilt compressors. As reported in the Vietnam Refrigerant Management Plan that in 2000 there were about 50,000 units of CFC commercial refrigerators installed in Vietnam. The recent survey confirmed that about 50,000 units of rebuilt compressors are produced by 10 larger compressor enterprises. Based on this information, it is estimated that about 50% of the rebuilt compressors is used for servicing CFC commercial refrigerators and another 50% is used for manufacturing new CFC commercial refrigerators.

To preempt an increasing stock of commercial refrigerators and freezers, it is a priority for the Government of Vietnam to stop the use of CFC-12 in the production of commercial refrigerators. Commercial refrigerators are manufactured by a large number of service shops that offer new commercial refrigerators and also provide service for these refrigerators. Therefore, the Government of Vietnam intends to restrict the supply of CFC-12 to this sector. In addition, it is important that all service shops are equipped

with proper tools and equipment to repair and to build commercial refrigerators and freezers. To reach out to the large number of refrigeration service shops, the Government of Vietnam will work closely with the 10 larger manufacturers of rebuilt compressors and through their 60 distributors.

Most service shops repair both domestic and commercial refrigerators as technology and servicing procedures are quite similar. Therefore, it is proposed that implementation of the CFC phase-out strategy in the domestic refrigeration servicing sector should also cover the commercial refrigeration sector as the target group is the same.

Without a proper program to train service technicians on how to properly repair HFC-134a domestic refrigerators and commercial refrigerators, it is likely that a large percentage of this growing stock of HFC-134a units will be charged with CFC-12. Therefore, there is a need to establish a reeducation program for service technicians. Moreover, to ensure that there will be no more demand of CFC-12 from 2010 onwards, the reeducation program should also equip service technicians with the needed skill to carry out retrofits of CFC-12 refrigeration equipment to HFC-134a.

No additional request is made for servicing of cold storage and large industrial refrigeration sector. Service shops in this sector are much more organized and have access to new technology. In addition, these shops have already been covered by the activities previously supported by the Multilateral Fund.

5.1 REFRIGERATION SERVICING TRAINING PROGRAM

The Multilateral Fund approved US\$ 200,000 to support the train-the-trainer program in the refrigeration servicing sector, which was part of Vietnam's Refrigerant Management Plan implemented through UNEP. Funds provided by the Multilateral Fund were allocated to support one five-day workshop for training the trainers, and 34 workshops for training service technicians. In addition, the funding provided by the Multilateral Fund also covered provision of 3 sets of training equipment.

Under this activity, a total of 30 trainers and about 1,000 service technicians have been trained. The local agency in charge of this activity is the General Department of Vocational Training under the Ministry of Labor, Invalids and Social Affairs.

While no additional funding will be requested to support training of additional trainers, it is important that a number of training equipment should be increased. The training has been carried out by three training centers of the General Department of Vocational Training in Hanoi, Quy Nhon, and Ho Chi Minh. Each training center is provided with one set of basic training equipment. Based on the experience of previous training sessions, the limited number of training equipment has restrained the capacity of these training centers to provide more hand-on training to service technicians.

Based on the result of the recent survey, there are 1,274 service technicians in the Northern part of Vietnam, 623 in the Central part, and 1,518 in the Southern part of the

country. Therefore, it is proposed that at least 20 more training centers be added. The training courses and curriculum developed by UNEP should also be integrated to the current training curriculum of all training centers and institutes under the General Department of Vocational Training. As the total number of 1,000 service technicians have been trained and certified as part of the Refrigerant Management Plan, there still are more than 2,000 service technicians to be trained.

With the three training centers that are beneficiaries of the Refrigerant Management Plan and another 20 centers to be supported under the National CFC and Halon Phase-out Plan, this would allow the General Department of Vocational Training to train the remaining 2,000 service technicians within the next two years (2006 and 2007). The proposed expansion of training facilities will also enable the General Department of Vocational Training to offer more hand-on training to service technicians. Trainers who have already been trained by the previously MLF supported train-the-trainer program will train additional trainers for the twenty newly proposed training centers.

Each training center will organize at least six training sessions in order to train about 100 service technicians within the two year period. To ensure that each service technician has sufficient access to training equipment, each training session should not have more than 15 trainees. Each training center will be provided with two sets of basic training equipment. The list of basic training equipment and its cost are included in Annex IV. After 2007, training equipment will be used for training new service technicians.

The training course developed as part of the Refrigerant Management Plan includes the use of recovery equipment, procedures for proper decommissioning of old CFC units, leak reduction, good refrigeration practice, and retrofits. Training materials developed for this course will be used for training more service technicians.

The funding requirement to extend the training network and to complete training for all existing service technicians is summarized below.

Table 6.4 Training for Service Technicians in the Refrigeration Servicing Sector

Description	US \$
Production of Training Materials (2,000 sets x US\$ 20)	40,000
Cost of management and logistics (20 x US\$ 2,000)	40,000
Basic Equipment for 20 Training Centers (2 set each plus one each for the three already established)	193,500
Sub-Total	273,500
Contingency 10%	27,350
Total	300,850

It will take about 6 months to set up the above infrastructure.

5.2 PROVISION OF PROPER SERVICE TOOL KITS FOR THE REFRIGERATION SERVICING SECTOR

The evaluation of the service technician training program under the Refrigerant Management Plan highlighted that a large number of service technicians (about 70%) were able to make very little use of the knowledge learned from this training as their service shops do not have the required equipment. It was, therefore, recommended that financial subsidy to assist small service shops to acquire proper equipment items for servicing CFC-12 and HFC-134a refrigeration and air-conditioning systems should be provided.

It is proposed that each service shop, that has at least one of its service technicians completing the required training from the General Department of Vocational Training, should be entitled to receive financial assistance from the Multilateral Fund to purchase a set of service equipment. The list of service equipment items and their standard costs are included in Annex IV. This will enable service technicians of these shops to carry out their service based on the procedures and good practices taught by the training centers, and to be able to handle HFC-134a based refrigeration systems. This is essential for preempting widespread practice of reverse retrofit from HFC-134a to CFC-12. This same equipment can also be used by small enterprises to produce commercial refrigerators and freezers from second-hand compressors.

There are about 700 service shops in larger provinces in Vietnam. The standard cost for a set of service equipment is US\$ 2,500. Therefore, the total cost for equipping all 700 service shops with proper tools is US\$ 1,750,000.

To assist all service shops to acquire the new set of equipment, the Government of Vietnam is requesting that US\$1,050,000 or 60%⁷ of this cost be financed by the Multilateral Fund.

6. MAC SERVICING SECTOR

Before Vietnam's economy was opened up in early 1990s, there were a small number of cars imported to Vietnam. Most vehicles were military vehicles without air-conditioning systems. Since early 1990s a number of imported cars has grown continuously. Most of them were installed with CFC MACs. However, after 1999 or 2000 vehicles with new HFC-134a MACs have been introduced to Vietnam. These included passenger cars and buses.

In 2001, it was estimated that vehicles with CFC MACs constituted about 60% of the total vehicle population. Given the significant increase in the volume of imported cars and locally assembled vehicles in Vietnam, it is estimated that in 2003 vehicles equipped with CFC MACs represent about 50% of the total population (108,000 vehicles).

⁷ Based on the Multilateral Fund's support provided to previously approved National CFC Phase-out Plans for a similar activity, the subsidy level of 60% of the standard cost is proposed for this Plan.

The average age of vehicles in Vietnam is about 8 to 10 years given that the import of vehicles just started in early 1990s. As countries with less advanced economic system tend to keep their vehicles longer, it is common that vehicles will be kept in operation more than 20 years. While the life expectancy of CFC MAC systems is much less than 20 years, the demand of CFC for servicing these older vehicles will not subside as when MAC systems break down, they will likely be replaced with either new or second-hand CFC MAC systems. Therefore, it is expected that the demand for CFC in the MAC servicing sector in Vietnam will remain at about 71 MT even after 2010 if no other intervention is made by the Government. This demand could in fact grow even higher than 71 MT when vehicles are getting older.

As mentioned previously, service shops are starting to experience HFC-134a MAC systems equipped in relatively new vehicles being tampered or filled with CFC-12. This incident could become more prevalent in the near future if it is gone unchecked. One of the major causes of this practice is that smaller service shops do not have proper equipment for repairing HFC-134a MAC systems. Therefore, there is an urgent need to provide service shops with technical know-how and proper equipment to handle HFC-134a MAC systems.

To address CFC phase-out in the MAC servicing sector, the proposed strategy must address vehicle owners, service shops, and supply of CFC-12.

6.1 MAC INSPECTION PROGRAM

The Vietnam Register requires that all vehicles in Vietnam undergo inspection at the Vietnam Register's inspection stations on an annual basis. There are 80 inspection stations across the country with 14 stations in Hanoi and 13 in Ho Chi Minh. The current vehicle inspection procedures focus on emission control and safety.

As a strategy to raise awareness of the CFC issue and its phase-out, the Government of Vietnam is proposing to add MAC inspection into its existing vehicle inspection procedures. The purpose of this inspection is to inform vehicle owners of what type of refrigerant is being filled in their MAC systems. This would allow vehicle owners to make an informed decision next time they need to have their MAC systems repaired. The public awareness program to inform the public of service shops that have their service technicians properly trained on how to repair CFC and HFC MAC systems will be carried out by the Project Management Unit to be established as part of this National CFC and Halon Phase-out Plan.

To increase technical capacity of the existing vehicle inspection network, it is proposed that a manual describing procedures for determining the type of refrigerant in MAC systems be developed. All 80 inspection stations will be invited to send their technicians for half-day training. It is proposed that the program should start with inspection stations in Hanoi and Ho Chi Minh only. At the conclusions of the training, each

participant from these inspection stations will be provided with a refrigerant identifier, which can identify CFC-12, HFC-134a, hydrocarbons, and moisture content.

After the first year of implementation of this program, experience gained from inspection stations in these two major cities will be used for revising the inspection procedures. Technicians who actually carry out MAC inspection at the inspection stations in Hanoi and Ho Chi Minh, will organize four additional half-day training for the remaining 53 inspection stations. After completing the training, each of these inspection stations will receive a similar refrigerant identifier.

After the first year of the implementation of this program in Hanoi and Ho Chi Minh, the Government of Vietnam will consider whether additional intervention in form of regulations is required to ensure sustainable phase-out of CFC in this sector. If it is required, the Government of Vietnam will consider not renewing vehicle registrations of vehicles whose HFC-134a MAC systems are tampered with CFC refrigerant.

Table 6.5 MAC Inspection

Description	US \$
Development of a standard inspection manual	10,000
Production of information brochure explaining the MAC inspection program	10,000
Training of 80 technicians from all inspection stations (6 sessions)	14,000
Refrigerant identifiers for 80 stations	120,000
Sub-total	154,000
Contingency 10%	15,400
Total	169,400

The training of inspection stations and implementation of MAC inspection in Hanoi and Ho Chi Minh, will be carried out during the first year of the program (in 2005). The review process will be undertaken in July 2006.

6.2 TRAIN-THE-TRAINER PROGRAM

As this component has already been carried out as part of the implementation of the Refrigerant Management Plan, no additional funding will be requested. As pointed in the earlier section that basic training equipment provided by the Multilateral Fund as part of the Refrigerant Management Plan to the three centers established under that Plan may not be adequate, hence there is an urgent need to equip more training centers with technical capacity and proper equipment in order to train a much higher number of service technicians than what was estimated in 2001.

However, no additional funding will be requested for this component. It is proposed, however, that the training centers to be covered by this National CFC and Halon Phase-

out Plan should have flexibility on how to utilize the proposed funds under the refrigeration servicing sector section. While it is proposing that each training center should have at least two sets of basic training equipment, the final decision should be made by training centers whether they would like to obtain two sets of refrigeration training equipment or one each for refrigeration servicing and MAC servicing equipment.

6.3 PROVISION OF PROPER SERVICE TOOL KITS FOR THE MAC SERVICING SECTOR

All service technicians attending the refrigeration and MAC training programs of any training centers of the General Department of Vocational Training will receive certificates for the General Department of Vocational Training. Each MAC service shop that has at least one certified service technician will be entitled to receive financial assistance from the Multilateral Fund to purchase a set of service equipment. The list of service equipment items and their standard costs are included in Annex IV.

This will enable service technicians of these MAC service shops to carry out their service based on the procedures and good practices established by the General Department of Vocational Training.

There are about 150 MAC service shops in larger provinces in Vietnam. The standard cost of a set of service equipment is similar to the one for servicing refrigeration systems, US\$ 2,500. Therefore, the total cost for equipping all 150 MAC service shops with proper tools is US \$375,000.

To assist MAC service shops to obtain this new set of equipment, which is essential for servicing CFC-12 and HFC-134a MAC systems, the Government of Vietnam is requesting that US \$225,000 or 60% of this cost be financed by the Multilateral Fund.

7. FIRE PROTECTION SECTOR

To eliminate the demand of halon-1301 and halon 2402 in Vietnam, it is important that an activity to assist the Vietnam industry to avoid venting of installed halons, to undertake recovery and recycling of halon-1301 and halon-2402 from existing facilities, and to have these recycled halons available for critical uses in the future, be implemented as soon as possible. It is proposed that this activity should consist of two components: technical assistance, and establishment of a recovery and recycling facility.

7.1 TECHNICAL ASSISTANCE

The proposed technical assistance component is designed to provide better understanding of the current state of technology pertaining to alternatives and substitutes of halons. Moreover, this technical assistance component will aim at strengthening technical capacity of the fire protection industry in evaluating efficacy and safety use of the wide range of alternatives. To achieve the above objectives, the technical assistance component will cover the following:

- Training on standards and technical information pertaining to recycled halons and non-halon alternatives;
- Training and information campaign on the issues related to the Montreal Protocol and its associated halon phase-out schedules, and technical information on non-halon alternatives. The targeted groups are the fire protection industry, halon equipment owners and relevant authorities; and
- Technical assistance to fire equipment companies, service shops, and main critical users and key industries in Vietnam on how to avoid venting of halons, and technical knowledge critical to the design of new non-halon alternative fire protection systems.

The estimates for undertaking this proposed technical assistance component are shown in Table 6.6.

Table 6.6 Cost Estimate for Implementation of Technical Assistance Component for the Halon Sector

Cost Item	US \$
Technical standards and information	3,000
Halon fire protection workshops (2 sessions)	10,000
Technical assistance program and training of service technicians	6,000*
Technical assistance to critical users through consultancy service	10,000**
	29,000

*In addition to a general training provided to the entire industry by the two proposed workshops, it is necessary to provide specific and direct assistance on a company by company basis.

**Larger companies might need a consultant to visit their installations in order to assist them to develop a detailed phase-out plan, instead of leaving this task solely to the suppliers.

Vietsopetro will be appointed as an executing agency for this project component. Vietsopetro will work closely with the Project Management Unit to be established under this National CFC and Halon Phase-out Plan and the National Ozone Office.

The Vietnam Register whose mandate includes approval, certification, and inspection of motor vehicles, trains and railway systems, marine transportation, and offshore installation, will collaborate with the National Ozone Office and the Project Management Unit to ensure that the design, installation and maintenance of non-halon alternative fire protection systems are carried out in accordance with international standards.

7.2 ESTABLISHMENT OF RECOVERY AND RECYCLING FACILITY

In order to address all critical halon uses, the National CFC and Halon Phase-out Plan is proposing to include a halon management system be established in Vietnam. The halon management system will consist of two components: physical recovery and recycling facility, and electronic halon databank.

To assist the industry depending on the halon fire protection industry to cope with the phase-out of halons, a recovery and recycling facility will be established. This facility is important to assist the industry to avoid venting halons from its existing installations. Vietsopetro, which is the largest state-owned petroleum industry in Vietnam and owns more than 80% of the total halon-based fire protection systems, will take full responsibility in operating this facility.

Vietnam, due to its close historical cooperation with Russia, fire protection systems for the petroleum industry and on-board ships are mainly equipped with halon-2402. Since Russia is the only country in the world that produced halon-2402 and halon-2402 is still in great demand in Russia for servicing its existing fire protection systems, Vietnam, therefore, needs to set up a halon bank for halon-2402 in order to avoid any disruption to its petroleum industry. The halon recycling equipment to be acquired will be consistent with international standards and practice.

Recovered halons will be stored and reused within the country. Due to the possible declining demand of halons for servicing, there might be surplus of halons in the near future. The surplus halons would be made available to other countries in the region.

The amount of recovered halons available in the country will be recorded in the electronic halon databank. In addition, the halon databank will also maintain information pertaining to demand of each facility in Vietnam that still requires halons for its fire protection systems. The objective of this halon databank is to provide the Government of Vietnam with better information for determining and sourcing future supply of halons and to ensure that this demand will not cause Vietnam to be in non-compliance with the Montreal Protocol obligations. The halon databank should have a link to other halon banks in the international market. This would allow the Project Management Unit, the National Ozone Office, and Vietsopetro, to provide advice to the industry where and at which quantity of virgin and recycled halons could be imported.

It is proposed that to ensure sufficient supply of halons a small reserve of halon-2402 will be set up at Vietsopetro. Based on the relevant safety regulations in Vietnam and increasing difficulty in getting reliable supply of halon-2402, a reserve of 40 – 50 MT of halon 2402 (twice the quantity installed in the fire protection system) is required. In this regard, the funding request for establishment of a recovery and recycling facility will include costs of four 5,000 liter tanks for setting up this reserve. With regard to halon-1301, Vietnam will rely solely on recycled halons from international halon banks. Owners of halon-1301 fire protection systems will benefit from the halon databank to be developed under this project.

An estimate cost for establishment and operation of the recovery and recycling facility is shown in Table 6.7.

Table 6.7 Cost Estimate for Establishment and Operation of the Recovery and Recycling Facility in Vietnam

Cost Item	US \$
Halon recovery and recycling equipment including vacuum pump	26,000
Portable gas chromatograph	5,000
Storage tanks for internal storage, domestic transportation, and shipping to other halon banks in the region.	5,000*
Halon lead detector	5,000
Training	3,500
Development of Halon databank	10,000
Shipping costs (equipment)	5,000
Sub-total	59,500
Contingency (10%)	5,950
Total	65,450**

*Shipping tanks must meet the requirements of other halon banks. Costs of storage tanks are relatively high due to specific German requirements for such shipping tanks.

**The requested funding for the halon recovering equipment for countries with low halon consumption exceeds the template cost of US\$25,000. Based on recent quotation obtained, it cannot be done within the US\$ 25,000 and the figure needs to be adjusted to reflect the 2003 price.

7.3 REGULATORY MEASURE

All importers of halons will be required to provide MONRE with certificates proving that imported halons are indeed recycled halons.

8. 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 be included in this proposed national plan. These are:

- Project Management Unit; and
- Capacity Building for the Customs Bureau.

The capacity building activity for the Customs Bureau will build on the previous activity that has already been financed by the Multilateral Fund.

8.1 PROJECT MANAGEMENT UNIT

The National CFC and Halon Phase-out Plan entails CFC and halon phase-out activities in the manufacturing sector, training of a large number of small- and medium-scale service shops, and implementation of the halon phase-out project. In total, this overall plan will involve CFC and halon phase-out activities in more than 950 private enterprises and government entities, in addition to a series of activities to establish a policy and regulatory framework to support sustainable CFC and halon 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, database of CFC users, halon databank, public awareness activities, and other activities. Implementation of this plan requires a project management unit with full-time staff.

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

8.1.1 REGULATIONS

The Project Management Unit will assist the National Ozone Office to undertake the following:

- Collaboration with the Ministry of Trade, Ministry of Industry, and the Customs Bureau, to establish and implement the import/control system for ODS;
- Collaboration with the National Ozone Office to assist the Government of Vietnam to issue a ban on CFC use in the manufacturing of all new products (for example, foam, domestic and commercial refrigerators) by the end of 2006;
- Providing assistance to the National Ozone Office to review annual ODS import/export license applications to ensure that the list of end-users are provided by importers/exporters, and to ensure that no CFC supply will be offered to applications where the bans have already been issued by the Government;
- Assisting the National Ozone Office to develop and publish the annual import quotas for CFCs and halons for the period 2005 – 2010;
- Collaboration with the Vietnam Register to include MAC inspection as part of the existing vehicle inspection program by starting with the two larger cities (Ho Chi Minh and Hanoi) first;
- Assisting the Vietnam Register to review experience gained from the MAC inspection program in Hanoi and Ho Chi Minh with the objective of expanding this requirement to all 80 existing inspection stations throughout the country;
- Assisting the National Ozone Office and the Vietnam Register to review the need for including MAC inspection as part of the conditions for renewal of vehicle registrations; and
- Assisting the Vietnam Register to review and adopt standards for new non-halon fire protection systems.

8.1.2 PROJECT IMPLEMENTATION

The Project Management Unit will undertake the following activities in close cooperation or under supervision of the National Ozone Office:

- Preparation of a standard implementation procedure for eligible enterprises that would like to seek funding from the resources provided by the Multilateral Fund;
- Assisting eligible CFC and halon consuming enterprises to prepare proposals to obtain financial support from the funds provided by the Multilateral Fund to phase out their use of these chemicals;

- Arranging technical support, on a need basis, for enterprises to identify appropriate non-ODS technology;
- Review and approve proposals submitted by eligible enterprises;
- Coordination of the establishment of the networks of training centers of the General Department of Vocational Training for the refrigeration and MAC servicing sectors;
- Facilitation of the selection of qualified suppliers to supply tools and equipment for MAC and refrigeration service shops;
- Develop and maintain, in collaboration with the General Department of Vocational Training, a database of refrigeration and MAC certified technicians including names and addresses of service shops that already have their technicians trained;
- Assisting the Vietnam Register to train their inspection stations to identify various refrigerant types in the MAC systems;
- Organizing training for the six regional offices of the Ministry of Trade that are responsible for issuing ODS import quotas on the issues related to the ozone layer depletion, the obligations of the Montreal Protocol, and experience of other countries in the region pertaining to implementation of their import control systems;
- Maintain and update, in close cooperation with Vietsopetro, the halon databank and communicate with the local users and other international halon banks on the issues related to availability of recycled halons;
- Provide advice and recommendation on the allocation of annual import quotas of all Annex A chemicals to the National Ozone Office of MONRE and the Ministry of Trade; and
- Preparation of Annual Work Programs of the overall implementation of the National CFC and Halon Phase-out Plan and other reports as required by the ExCom.

8.1.3 PUBLIC AWARENESS

The Project Management Unit will undertake the following tasks under supervision of the National Ozone Office:

- 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 and halon phase-out in Vietnam;
- Conduct, in close cooperation with the National Ozone Office and the Ministry of Trade, public awareness activities to inform the public of availability of non-CFC products and the environmental and economic impact of ozone layer depletion via newsletters, news articles, seminars, radio spots;
- Organize a promotional program to encourage the public to have their refrigeration and MAC systems repaired by technicians certified by the General Department of Vocational Training; and

- Undertake the public outreach programs for the refrigeration and MAC servicing sectors to ensure that all service shops are equipped with proper tools for servicing CFC-1 2 and HFC-134a refrigeration and MAC systems.

8.1.4 MONITORING

The Project Management Unit will assist the National Ozone Office to carry out the following tasks:

- Functioning of the industry advisory group for the refrigeration sector in order to ensure maximum outreach to existing CFC refrigeration and MAC service shops;
- Development of 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 and halons with the Customs Bureau on a quarterly basis;
- Report of any incidents of illegal import of CFCs and halons;
- Carry out safety and technical audits of all relevant activities undertaken under this plan.

To support operations of the Project Management Unit, the financial support described in Table 6.8 will be made as part of the overall Multilateral Fund support of the National CFC and Halon Phase-out Project. In addition, a special account will be set up to allow financial support from the Multilateral Fund to be channeled directly to the Project Management Unit.

Table 6.8 Project Management Unit (2005 – 2009)

Description	US \$
Regulatory and Policy Support	None*
Project Implementation (including experts' fees)**	200,000***
Public Awareness	200,000
Monitoring Activities	60,000
Sub-total	460,000
Contingency (10%)	46,000
Total	506,000

*As this component has already been financed by the Multilateral Fund as part of the Refrigerant Management Plan, no additional funding is, therefore, requested.

**Part of this allocation will be used for organizing training workshops for the six regional offices of the Ministry of Trade in order to strengthen their capacity in establishing and monitoring the import quota and other import control measures.

***About US\$ 75,000 of the total funding request for this component will be allocated for the full-time staff of the Project Management Unit for 2005 – 2009. The Project Management Unit will be manned by three senior technical staffs and two administrative staffs. Another US\$ 100,000 will be used for hiring consultants to undertake the coordination role for the distribution of service tools to more than 850 small service shops throughout the country. The balance of US\$ 25,000 will be allocated for experts in the foam sector and other experts to undertake safety and technical audits for all Multilateral Fund financed activities in Vietnam.

8.2 CUSTOMS TRAINING PROGRAM

At present, the legal basis for controlling of ODS imports and exports is a Circular Letter issued by the Government. This Circular Letter has a similar legal power as any other legal acts under the Vietnamese legal framework. The Circular Letter contains the list of ODSs subject to import and export control. ODSs covered by this Letter include CFC-11, -12, -113, -114, -115, halon-1211, halon-1301, and halon-2402. Methyl bromide is controlled by a separate legislation designed specifically to deal with all pesticides.

The Circular Letter also specifies the procedure for issuing import/export permits. Applications for permits should be made to the Ministry of Industry and Ministry of Fisheries, and the National Ozone Office of MONRE. The National Ozone Office is empowered by the Government to be responsible for setting up an annual import/export quota for these controlled substances.

The Circular Letter also requires importers and users of ODSs to report the imported quantity and consumption to the National Ozone Office on a mandatory basis. To ensure effective enforcement of this ODS import/export control system, staff of relevant agencies must be familiar with the Montreal Protocol and other ODS related issues. The Multilateral Fund has already provided financial assistance to strengthen capacity of the National Ozone Office through the Vietnam Institutional Strengthening Project.

Other two major agencies involved in the enforcement of the import/export control system are the General Department of Customs and the Market Management Office under the Ministry of Trade. To strengthen capacity of these two agencies, the Multilateral Fund has already approved funding of US \$100,000, as part of a bilateral contribution of the Government of Poland, to support the implementation of a Customs training program in Vietnam.

There are approximately 5,000 customs officers and 4,000 market management inspectors in the country. The Customs training program jointly implemented by the Government of Poland and UNEP estimated that by training a total of 200 customs officers and 100 market inspectors, the licensing system could be initiated and effectively enforced.

The objective of the Customs training program is to enable customs officers and market inspectors to become familiar with the ODS import/export licensing system and other regulations related to the phase-out of ODS and their respective role in enforcing these regulations. Customs officers and market inspectors are trained on how to identify the substances controlled by the Montreal Protocol and mixtures containing such substances; to identify imported products that may contain ODS, especially refrigerators, freezers and other refrigeration equipment using CFCs; and to record imports and exports of ODS and ODS-containing products and report to the National Ozone Office. The Customs training program financed by the Multilateral Fund also include provision of 20 refrigerant identifiers to major customs entry points in the country.

The Customs training module developed by this project will be integrated to the regular customs training program. Therefore, the Customs training program is designed to provide training to about 80 trainers from the General Department of Customs and the Market Management Office. Training of these 80 customs trainers was completed in May 2002. These trainers will provide subsequent training to other customs officers and market inspectors. Thus far, additional 225 customs officers have been trained by local trainers.

Since the customs training module developed by this project will be integrated to the regular curriculum of the customs training program, it is expected that all 5,000 customs officers will be trained within the next five to six years. For the market inspectors, training of 100 inspectors will be sufficient for the implementation and enforcement of the ODS import/control system as there are only 62 provinces and main cities in Vietnam.

The on-going Customs training program financed by the Multilateral Fund is very comprehensive and should be sufficient in strengthening capacity of the General Department of Customs and Market Management Office in order to effectively implement the ODS import/export control system. Therefore, no additional funding will be requested for this component under this National CFC and Halon Phase-out Plan. In case additional assistance is identified in the future, it will be addressed by the customs modernization project being developed by the Department of Customs. Funding to cover these additional activities will be obtained from other sources.

CHAPTER 7

JUSTIFICATION FOR SELECTION OF ALTERNATIVE TECHNOLOGY

1. FOAM

The presently available ODS phaseout 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, 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 offered in the applicable regional area as a premixed system and would require an on-site premixer. 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 blends are, however, not available in Thailand or neighboring countries. On-site blending would significantly increase the one-time project costs. In addition, 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, except that of local availability. 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 thermoware. 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 sprayfoam 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 sprayfoam applications. It is also less energy efficient, and expensive compared to most other technologies.

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.

The following technologies have been considered for the *integral skin foam* conversion:

Accepted ODS phaseout technologies for integral skin molded 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 HFC's 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. GOVERNMENT'S STATEMENT ON THE USE OF HCFCs AS INTERIM SOLUTIONS

Vietnam is fully aware of the ExCom requirements pertaining to the use of HCFC. The National Ozone Unit will review the use of HCFC during the implementation of this

National CFC and Halon Phase-out plan. Vietnam has a preference for non-ODS substances and will enforce the general policy when possible.

3. FIRE PROTECTION SECTOR

The approach to eliminate the use of halon as presented in this proposed National CFC and Halon Phase-out Plan takes into account findings of the Monitoring and Evaluation report on the evaluation of halon projects funded by the Multilateral Fund, the Halon Technical Options Committee (HTOC) report, UNEP information on Halon phase-out and recommendations of the Parties to the Montreal Protocol.

Identification and selection of substitutes will be based on the HTOC report, which provides an overview of all available substitutes and alternatives to both halon 1301 and halon 2402 and for fire extinguishing systems.

For fire extinguishing systems, which are the major concerns in Vietnam, HFC-227 and inert gases, are the most likely substitutes. However, new halon like substitutes are now being promoted by some international fire equipment companies and could be considered by the users in Vietnam.

CHAPTER 8
COSTS OF NATIONAL CFC AND HALON PHASE-OUT PLAN

Activities	No. of Enterprises	ODP tons	Total Costs US \$	Requested Amount US\$
Technical Assistance Component for the MDI Sector			49,500	49,500
CFC-11 phase-out in the foam sector	1	12	100,000	69,687
Establishment of additional training centers (20 training centers)	20		300,850	300,850
Provision of service tool kits for the refrigeration servicing sector	700	136	1,750,000	1,050,000
Establishment of MAC inspection centers	80		169,400	169,400
Provision of service tool kits for the MAC servicing sector	150	71	375,000	225,000
Technical Assistance Component for the Halon Sector			29,000	29,000
Establishment of the Halon Recovery and Recycling Facility	1	76	65,450	65,450
Project Management Unit	1		506,000	506,000
Total	953	295	3,345,200	2,464,887

CHAPTER 9

NATIONAL CFC AND HALON PHASE-OUT POLICIES AND SCHEDULE FOR VIETNAM

The Government of Vietnam will announce import schedules for Annex A chemicals for 2005 – 2010 within 12 months after funding for this National CFC and Halon Phase-out Plan has been approved by the Executive Committee. No import licenses will be given to new importers. The proposed annual quota will be distributed among existing importers. The revised list of importers of Annex A chemicals will be developed within 12 months after funding has been approved as well.

Table 9.1 Import Quota for Annex A and B Chemicals (ODP tons)*

	2005	2006	2007	2008	2009	2010
Annex A, Group I	190.00	140.00	70.00	40.00	10.00	0.0
Annex A, Group II	18.00	18.00	18.00	18.00	18.00	0.0
Annex B, Group I	0.0	0.0	0.0	0.0	0.0	0.0
Annex B, Group II	0.19	0.19	0.19	0.19	0.19	0.0
Annex B, Group III	0.0	0.0	0.0	0.0	0.0	0.0

*Import quota of controlled substances as defined by the Montreal Protocol, excluding recycled chemicals.

Upon approval of the National CFC and Halon Phase-out Plan by the Executive Committee of the Multilateral Fund, the Ministry of Trade will include all Annex A and B chemicals into its list of goods subject to import/export control as per the Government's Decision 46, which allows the Ministry of Trade to impose import/export control on any goods controlled by international treaties.

The existing six regional offices of the Ministry of Trade that are in charge of issuing import/export quotas for goods subject to control under Decision 46 will be responsible for issuing the import quota to existing importers. The maximum import quotas for all Annex A and B chemicals will be established in close consultation with MONRE. The aggregate amount of imports of Annex A and B chemicals will remain within the annual targets presented in Table 9.1.

MONRE will coordinate the implementation this quota system with the Ministry of Trade and the Customs Department. The Customs Department will ensure that only importers with proper import permits and quotas will be allowed to import ODSs to Vietnam. Importers will be required to submit their list of end-users when applying for import/export permits and quotas. In addition, the Customs Department will maintain all import/export records and report to MONRE and the Ministry of Trade. This information will then be audited on an annual basis.

As a Party to the Montreal Protocol, Vietnam has an obligation to establish an import control system to monitor the trade of ozone depleting substances by 1 January 2000⁸. Thus far, the licensing system has not been in place. However, the Government of Vietnam intends to establish this system as soon as possible. With this import control system, Vietnam will be able to manage and monitor its ODS phase-out in accordance with all the phase-out requirements of the Montreal Protocol. Vietnam will also be able to provide accurate consumption data to the Ozone Secretariat.

To ensure that all manufacturers stop using CFC in their manufacturing process by the end of 2006, the Ministry of Industry will announce the ban of the use of CFC and other Annex A and B chemicals for producing new products in 2005 or early 2006. This ban is intended for getting the one remaining domestic refrigerator manufacturer and other small commercial refrigerators to convert to non-CFC technologies. This measure is considered important for Vietnam to ensure that other manufacturers that have already converted to non-CFC production technologies, would not revert to CFCs.

In addition, to ensure that CFC phase-out undertaken by local manufacturers will not be undermined by imported goods from other countries, it is proposed that the Ministry of Trade also bans imports of CFC refrigerators, display cabinets, freezers, and water coolers by the end of 2006.

The regulatory measures proposed above are critical in helping Vietnam avoid unnecessary build-up of CFC equipment. As CFC producers around the world including Argentina, China, India, Mexico, and Venezuela, are shutting down their production, it is anticipated that the supply of CFCs will reduce or disappear in the near future. Currently, China is also proposing to completely phase out its CFC production by the end of 2007.

Without the above measures, more CFC equipment will be offered to Vietnamese consumers. However, in the next few years this CFC equipment may have to be retired prematurely as there is no CFC to service this equipment. This would cause significant financial burden to Vietnamese consumers.

It is important to note that ban on the use of CFC in the manufacturing sector and ban on the imports of CFC equipment are common features in CFC phase-out strategies of a number of countries. For example, European Union already put in place regulations banning imports of equipment containing CFCs. Countries in this region include India, Thailand, Malaysia, and the Philippines, have already banned the use of CFCs for producing new products. In addition, Thailand and the Philippines also ban the import of CFC refrigerators.

⁸ Article 4B: "Each Party shall, by 1 January 2000 or within three months of the date of entry into force of this Article for it, whichever is the later, establish and implement a system for licensing the import and export of new, used, recycled and reclaimed controlled substances in Annexes A, B, C and E.

CHAPTER 10
PROJECT IMPLEMENTATION MILESTONES AND PROJECT FINANCING

1. PROJECT IMPLEMENTATION MILESTONES

Table 10.1 Project Implementation Milestones

Funding Tranche	Performance Milestone	Released Funds (US\$)
1 st Tranche (2004)	The National CFC and Halon Phase-out Plan is approved by the Executive Committee.	1,232,500
2 nd Tranche (2007)	Import/Export Control is functional; Ban on the use of CFC in the manufacturing sector; Meeting the consumption reduction targets in 2005.	1,232,387

2. PROJECT IMPLEMENTATION SCHEDULE

Table 10.2 Project Implementation Schedule

Task	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
Aerosol Sector																								
Technical Assistance for MDI Sector																								
(i) Selection of Consultant		X	X																					
(ii) Consultation Process			X	X	X	X																		
(iii) Development of MDI Strategy						X	X																	
Foam Sector																								
Investment Activity in the Foam Sector																								
(i) Project Appraisal	X	X																						
(ii) Contract Signed		X																						
(iii) Equipment Delivered			X	X																				
(iv) Test and Trials				X																				
(v) Disposal of Baseline Equipment				X																				
(vi) Activity Completed				X																				
Refrigeration Service Sector																								
(i) Expansion of Training Network																								
- Selection of Training Centers	X																							
- Development of Equipment Specifications	X	X																						
- Equipment Procurement and Delivery			X	X																				
(ii) Certification of Service Technicians					X	X	X	X	X	X	X													
(iii) Procurement and Distribution of Service Tools					X	X	X	X	X	X	X	X	X											
Mobile Air-Conditioning Service Sector																								
MAC Inspection																								
(i) Development of a Standard Inspection Manual																								
- Selection of Consultants		X	X																					
- Preparation of Inspection Manual			X																					
(ii) Pilot Phase of MAC Inspection																								

- Development of Equipment Specifications			X																	
- Equipment Procurement and Delivery				X	X															
- MAC Inspection					X	X	X	X												
(iii) Training for Vehicle Inspection Technicians								X												
(iv) Procurement and Distribution of Equipment								X	X											
Provision of Service Tools																				
(v) Certification of Service Technicians					X	X	X	X	X	X	X	X								
(vi) Procurement and Distribution of Service Tools					X	X	X	X	X	X	X	X	X	X						
Fire Protection Sector																				
Technical Assistance for Fire Protection Sector																				
(i) Appointment of Experts			X	X																
(ii) Halon Fire Protection Workshops				X	X															
(iii) Technical Assistance to Specific Enterprises					X	X	X	X												
Halon Recovery and Recycling Facility																				
(i) Project Appraisal		X	X																	
(ii) Contract Signed				X																
(iii) Procurement and Delivery of Equipment				X	X	X														
(iv) Technical Training for R&R Operators						X														
(v) Development of Halon Databank				X	X	X														
Project Management Unit																				
(i) Selection and Appointment of PMU Personnel	X	X																		
(ii) Implementation Assistance			X	X	X	X	X	X	X	X	X	X	X							
(iii) Public Awareness Activities			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
(iv) Regulatory Support			X	X	X	X														
(v) Monitoring			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

3. FINANCIAL PLAN

Table 10.3 Cash-flow for the National CFC and Halon Phase-out Plan

Activity	Total Request (US\$)	2004	2005	2006	2007	2008	2009
Technical Assistance for MDI Sector	49,500	49,500					
Investment Project - Foam	69,687	69,687					
Strengthening of Additional Training Centers	300,850	300,850					
Provision of Service Tools for Refrigeration Service Sector	1,050,000		300,000	550,000	200,000		
Strengthening of MAC Inspection Centers	169,400	34,000	40,500	94,900			
Provision of Service Tools for MAC Service Sector	225,000			100,000	125,000		
Technical Assistance for Fire Protection Sector	29,000	29,000					
Establishment of Halon Recovery and Recycling Facility	65,450		65,450				
Project Management Unit	506,000	100,000	100,000	100,000	100,000	100,000	6,000
Total	2,464,887	583,037	505,950	844,900	425,000	100,000	6,000

ANNEX I
LIST OF IMPORTERS

Name of Importers	Type of Business	City
Thuan Thanh Electrical and Refrigeration	Trader	Hanoi
Hoa Sang Electrical, Refrigeration and Trade	Trader	Ho Chi Minh
Kim Phong Hung	Trader	Ho Chi Minh
Kim Thanh Long	Trader	Ho Chi Minh
Lao Import and Export	Trader	Hanoi
Hong Phuc Mechanical, Electrical and Refrigeration	Trader	Hanoi
Hoa Khoa Trade and Service	Trader	Hanoi
Kim Nguu Trade and Service	Trader	Hanoi
Refrigeration Stock Colder	Trader	Hanoi
Doanh Tin International	Trader	Ho Chi Minh
Quang Nam Import and Export	Trader	Quang Nam
Kim Kan Trading	Trader	Ho Chi Minh
Medical Technical Equipment	Trader	Ho Chi Minh
Medical Equipment	Trader	Ho Chi Minh
Chemical Company	Trader	Hanoi
Hung Tri Trading	Trader	Ho Chi Minh
Trong Tin Manufacture and Trading	Trader	Ho Chi Minh

ANNEX II
LIST OF APPROVED INVESTMENT PROJECTS

	Approved Date	Approved Funding	ODP Phase-out (ODP Ton)	Completion Date
Aerosol Sector				
Conversion to hydrocarbon aerosol propellant technology at Saigon Cosmetics Company	Jul-95	238,430	80	Aug-98
Conversion to CFC-free hydrocarbon aerosol propellant technology at Daso Company	Nov-95	110,340	27	Dec-99
Conversion to hydrocarbon aerosol propellant technology at Cosmetics Producing and Trading (CP & T)	Nov-95	285,120	85	May-02
Phase-out of CFC-12 in the manufacture of perfumes by conversion to hydrocarbon propellants at Nam Do Corporation	Jul-00	49,720	11.3	Aug-03
Teminal umbrella project for the aerosol sector to phase out ODS consumption in the manufacture of aerosol and perfumes by conversion to hydrocarbon propellant (Dong A and Thorakao Cosmetics)	Jul-02	125,400	28.5	Apr-05

ANNEX III
LIST OF ENTERPRISES USING CFC IN THE FOAM SECTOR

No.	Company	Year of Establishment	Foam Type	Baseline Equipment	Model	CFC-11 Consumption (MT)
1	Insulation Panel Co.	1989	Rigid PU	Low pressure injection machines	USA: Canon C60	10
					Taiwan: Lifeng LF-7M-30P	
					USA: Gusmer HF-600	
2	Hong Ha	2002	Flex PU		Custom made in Vietnam	0.3
3	Tuan Anh	2003	Flex PU		China	0.1
4	Viet Thang Foam Rubber Enterprise	2000	Flex PU		China	0.8
5	Anh Minh Foam Rubber Enterprise	1999	Flex PU		Taiwan	0.8
6	Thong Nhat Foam Rubber Enterprise	2003	Flex PU		China	0.3
Total						12.3

**ANNEX IV
STANDARD COSTS**

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

Recovery and Recycling Equipment

- Recovery and recycling machine \$ 2,000

MAC and Refrigeration Servicing Equipment for Training Centers:

- Vacuum pump for HFC-134a \$ 800
- Manifold and gauges \$ 300
- Hoses \$ 100
- Portable leak detector \$ 500
- HFC-134a Refrigerant charging cylinder \$ 800
- Recovery and recycling machine \$ 2,000
- Total \$ 4,500

MAC and Refrigeration Servicing Equipment for Servicing Shops

- Vacuum pump for HFC-134a \$ 800
- Manifold and gauges \$ 300
- Hoses \$ 100
- Portable leak detector \$ 500
- HFC-134a Refrigerant charging cylinder \$ 800
- Total \$ 2,500

Equipment for Vehicle Inspection Stations

- Refrigerant Identifier \$ 1,500

ANNEX V
ENVIRONMENTAL ASSESSMENT

All project components proposed under the National CFC and Halon Phase-out Plan will employ alternative technologies that are recommended by UNEP Technical Options Committees for the relevant sectors. All applicable government environmental, health and safety regulations will be conformed with.

All project components proposed under the Plan will enable existing enterprises to convert to non-ODS alternatives. Therefore, no job loss or any adverse social impact is envisaged.