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EXECUTIVE COMMITTEE OF  
THE MULTILATERAL FUND FOR THE  
IMPLEMENTATION OF THE MONTREAL PROTOCOL  
Forty-first Meeting  
Montreal, 17 - 19 December 2003

**PROJECT PROPOSAL: VENEZUELA**

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

Phase-out

- National CFC phase-out plan (first tranche)

UNIDO

**PROJECT EVALUATION SHEET  
VENEZUELA**

SECTOR: Phase-out ODS use in sector (2002): 1,552.8 ODP tonnes

Sub-sector cost-effectiveness thresholds: Rigid Foam US \$7.83/kg  
Commercial Refrigeration US \$15.21/kg

**Project Titles:**

(a) National CFC phase-out plan (first tranche)

Project Data	Multiple
	National Plan
Enterprise consumption (ODP tonnes)	1,999
Project impact (ODP tonnes)	1,999*
Project duration (months)	84**
Initial amount requested (US \$)	1,194,900
Final project cost (US \$):	
Incremental capital cost (a)	
Contingency cost (b)	
Incremental operating cost (c)	
Total project cost (a+b+c)	7,805,884
Local ownership (%)	
Export component (%)	
<b>Amount requested for first tranche (US \$)</b>	1,194,900
Cost effectiveness (US \$/kg.)	3.83
Counterpart funding confirmed?	
National coordinating agency	FONDOIN
Implementing agency	UNIDO

<b>Secretariat's Recommendations</b>	
Amount recommended (US \$)	
Project impact (ODP tonnes)	
Cost effectiveness (US \$/kg)	
Implementing agency support cost (US \$)	
Total cost to Multilateral Fund (US \$)	

\* Total impact of the national phase-out plan. The impact of the first tranche is 312 ODP tonnes.

\*\* Duration of the plan. Duration of the first tranche is 12 months.

## PROJECT DESCRIPTION

### Sector background

#### CFC (Annex A Group I) Consumption and Phase-out Profile

According to Decision 35/37 Venezuela has selected Option 2 as Starting Point amounting to:	2,235.9 ODP tonnes
- Maximum remaining consumption of CFCs eligible for funding as at 41 <sup>st</sup> Meeting (per Decision 35/57, proviso B)	2,044.8 ODP tonnes
- Impact of all CFC projects submitted for funding at the 41 <sup>st</sup> Meeting	2,013.5 ODP tonnes
- Maximum consumption of CFCs remaining from the starting point consumption following possible approval of projects submitted to the 41 <sup>st</sup> Meeting	31.3 ODP tonnes

1. UNIDO has submitted on behalf of the Government of Venezuela a national CFC phase-out plan for consideration at the 41<sup>st</sup> Meeting. According to UNIDO, the objective of the plan is to phase out a total of 2,013.0 ODP tonnes at the cost of US \$7.8 million in the foam sector, commercial refrigeration manufacturing and refrigeration servicing sub-sectors within the period 2003-2010. However, in 2002, the Government of Venezuela reported a total CFC consumption of 1,552.8 ODP tonnes. The breakdown of the proposed activities and their costs are as follows:

### **Cost summary**

Sub-sector/activity	Consumption to be phased out (ODP tonnes)	Estimated Cost US \$	Cost-effectiveness US \$/kg
<b>I. Investment component</b>			
(a) Foam sector phase-out programme	456,744	19.0	24.04
(b) Refrigeration manufacturing sector phase-out programme	765,340	29.5	25.94
<i>Sub-total investment</i>	<i>1,222,084</i>	<i>48.5</i>	<i>25.20</i>
<b>II. Non-investment component</b>			
(a) National recovery and recycling project	4,519,900		
(b) National project for training service technicians	317,900		
(c) Incentive programme for retrofitting and replacement	1,000,000		
(d) Technical support component	400,000		
(e) Project management	346,000		
<i>Sub-total non-investment</i>	<i>6,583,800</i>	<i>1,965.0</i>	<i>3.35</i>
<b>Total (investment + non-investment)</b>	<b>7,805,884</b>	<b>2,013.5</b>	<b>3.88</b>

Foam sector

2. In addition to two on-going umbrella projects for about 40 small and medium enterprises to phase out a total of 198 ODP tonnes, it is reported that 23 small-scale enterprises 9 of which have stopped production were identified in a recent intensive survey for additional support. The remaining 14 enterprises have annual CFC-11 consumption ranging from 300 kg to 4.5 tonnes, with a total consumption of 19.1 ODP tonnes of CFC-11. The country reported a sector consumption of CFC-11 of 10 ODP tonnes in 2002. Eight of the enterprises have low pressure dispensers while the other six do hand mixing. The cost of replacement of the existing low pressure dispensers with high pressure ones and provision of similar machines to those using hand mixing amounting to US \$388,300 is the major component of the cost of the projects for the small-scale foam producers. The total requested funding as originally calculated amounted to US \$456,744 with cost-effectiveness of US \$24.04/kg against the sub-sector cost-effectiveness threshold of US \$7.83/kg.

Refrigeration sectorCommercial refrigeration manufacturing

3. There is currently an on-going project to phase-out 32.3 ODP tonnes in this sub-sector. A survey has further identified 13 enterprises with CFC-11 consumption ranging from 0.5 ODP tonne to 8 ODP tonnes and an average of 0.4 ODP tonnes of CFC-12 for a total consumption of 32.6 ODP tonnes of CFC. Another 7 enterprises with total consumption of 2 ODP tonnes also identified in the survey were considered ineligible for funding. The government reported a total of 1.08 ODP tonnes of CFC in this sub-sector in 2002. Using a similar approach as in the case of the foam sector projects, US \$616,000 and US \$149,340 were calculated as the incremental capital cost and incremental operating cost respectively with a total funding request of US \$765,340 and cost-effectiveness of US \$25.94/kg.

Refrigeration servicing

4. The following CFC-12 consumption estimates based on assumptions of unit refrigerant charge and frequency of charge form the basis for calculating the funding being requested in the refrigeration servicing sector.

<b>Type of unit</b>	<b>Stock in the market</b>	<b>Units serviced</b>	<b>CFC tonnes</b>
Passenger cars	955,000	859,500	1,117
Trucks/Vans	60,893	27,402	19
Buses	6,000	4,200	34
Transportation refrigeration	29,400	14,700	59
Supermarket equipment	233	233	9
Industrial equipment			50
Commercial equipment	12,500,000	312,500	266
Domestic refrigerators and freezers	4,892,620	1,223,155	428
<b>CFC-12 Total</b>			<b>1,981</b>
<b>CFC-11 for flushing</b>			<b>76</b>

5. A survey was carried out in 2001 among 908 service workshops representing 36% of the estimated 2,500 workshops in the country. On the basis of the information obtained on the service workshops as well as information collected on educational institutions in the country a recovery and recycling and a training programme have been proposed for a total cost of US \$6,583,800. The main elements of the programme are a supplementary recovery and recycling project, incentive programme, technical and management supports.

#### Supplementary recovery and recycling project

6. Fifteen additional recycling centres described as supplementary to the on-going national recovery and reclamation of refrigerant project approved for UNDP at a cost of US \$931,622 at the 22<sup>nd</sup> Meeting in May 1997, are proposed for implementation by UNIDO. UNDP's on-going programme consists of a network of 471 refrigerant recovery machines, related components and eight fully-equipped regional consolidated refrigerant centres. Eight of the newly proposed 15 recycling centres would be provided by upgrading the existing 8 regional centres funded under the UNDP programme. The supplementary national recovery and recycling project is estimated to cost US \$4.52 million.

#### Incentive programme

7. A financial assistance programme to encourage owners of big installations to replace or retrofit their existing CFC-based installations is also proposed in the plan. The beneficiaries of the programme, estimated to cost US \$1 million, would be supermarket chains and the dairy industry. No details of the programme were provided. It is stated that the details of the programme including eligibility of end-users to receive funding and equipment will be defined during the implementation of the phase-out plan.

#### Technical support component

8. A technical support component at the cost of US \$400,000 is also foreseen as part of the refrigeration sector phase-out plan. The purpose of this component includes establishment of a training, certification and licensing programme for refrigeration system production equipment operators and technicians.

#### Management component

9. While the Ozone Unit (FONDOIN) is expected to have the overall responsibility for national coordination of the programme management structures involving agencies and institutions at the national and regional levels are proposed for the management of the implementation of refrigeration sector and for the service sector activities. The cost of the management component is estimated to be US \$350,000, or for 2 of the total cost of the plan.

## SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

### COMMENTS

#### Eligible CFC consumption

10. UNIDO was requested, consistent with the rules of the Fund, to use Venezuela's actual consumption as a basis for calculating the eligible cost of the national plan. In this regard the maximum eligible CFC consumption that would be considered under the plan would be 1,552.8 ODP tonnes as reported by Venezuela for 2002 instead of 2,013.5 ODP tonnes used in the phase-out plan. UNIDO indicated its view that the consumption in 2002 was not representative of CFC use in Venezuela because of a long strike which had a serious impact on industrial activity. The Secretariat noted that the strike commenced in December 2002.

#### Recovery and recycling project and issues of double counting and duplication of approved activities

11. With regard to the projects proposed in the plan UNIDO's attention was drawn to the considerable amount of investment that has been made to phase out CFCs in the country. In the refrigeration sector in particular, the Executive Committee has approved almost US \$12.5 million for Venezuela for conversion to non CFC-refrigerants of several refrigeration manufacturing plants (domestic, commercial and MAC units) and for chiller retrofits in addition to about US \$2.4 million for activities related to the phase-out of CFCs in the refrigeration servicing sector. In several instances adequate capacity has been put in place to meet the phase-out needs of the country. The Secretariat provided UNIDO with a detailed list of all the activities that have been approved in the refrigeration sector demonstrating how any new approvals could lead to double counting.

12. For instance, in the refrigeration servicing sector (national recovery and recycling project) where UNIDO intends to allocate US \$4,519,900 (56% of the total cost of the proposed plan), a national programme for recovery, recycling and reclamation of refrigerants in the refrigeration and air conditioning sector was approved by the Executive Committee at its 22<sup>nd</sup> Meeting in May 1977 for implementation by UNDP and the Government of Canada at a total cost of US \$1.5 million. The project approved at the 22<sup>nd</sup> Meeting proposed the recovery, processing and recycling of at least 172 tonnes of CFC-12 per year with a corresponding reduction in the production of CFC-12. This figure was considered to be a conservative estimate with the potential for greater amounts to be recovered and processed.

13. Based on a survey carried out in 1996 (under the coordination of FONDOIN), it was found that 942 recovery machines, 10 regional refrigerant centres located in cities with major CFC consumption, and a reclamation plant, would be needed in the country. Accordingly, the project proposal included the establishment of a recovery/recycling network comprising 471 recovery machines and related components and eight regional consolidated refrigerant centres equipped with high-volume refrigerant transfer units, refrigerant identification kits and storage cylinders. The procurement of another 471 recovery machines (50 per cent of the total), was to be provided from other funding sources outside of the Multilateral Fund. The Secretariat

noted that of the total 942 recycling machines to be provided from the project, only 115 have been distributed among service technicians. In the Venezuela CFC phase-out plan presented by UNIDO an additional 2,500 recycling machines (costing US \$700 to US \$1,000 per unit) and 15 large recycling machines (US \$8,000 each) are being requested. UNIDO was advised that under the circumstances described above the request for the supplementary national recovery and recycling project constitutes double counting and does not appear to be eligible for funding. UNIDO indicated in its response that the number of additional recovery and recycling equipment was determined to be necessary to cover the whole service sub-sector.

14. The Secretariat also noted that the Executive Committee decided to approve the overall project proposal (recovery and recycling network and reclamation project) at the 22<sup>nd</sup> Meeting, taking into account, *inter alia*, the assurance, based on the success of past recycling projects in Venezuela, that the project could be successfully implemented and the understanding that the project was intended to provide regional capacity for refrigerant reclamation (Decision 22/52).

15. Furthermore, according to the completion report submitted by the Government of Canada regarding the reclamation centre, “the project was very successful in achieving its objective. A reclamation centre was created in Caracas and became operational in September 1998. Technicians from Canada spent two and a half weeks in Caracas, training local equipment operators. The training was extended to accommodate technicians assisting the INGERSICA staff with an off-site CFC-12 recovery project. This off-site project recovered over 8,000 kg of CFC-12. Since then, Venezuela has been able to establish a comprehensive recovery and recycling programme for refrigerants”. UNIDO emphasised that the proposed (additional or supplementary) recovery and recycling equipment is necessary to further ensure the total phase-out of CFC use in the refrigeration servicing sector.

#### Commercial refrigeration manufacturing

16. With regard to the funding requested for the project in commercial refrigeration manufacturing the Secretariat noted that it was reported in the national phase out plan proposal that the average annual production of commercial refrigerators for the last 15 years has been 80,000 units, whereas according to the approved projects for Venezuela in the commercial refrigeration sector the total annual production of commercial refrigerators converted with assistance from the Fund was estimated at 114,085 units, or 30% more than the average production reported in the national phase-out plan. The funding level approved for these projects is directly related to the annual production levels through payment of incremental operating cost. Thus, since the production levels of commercial refrigerators converted with assistance from the Fund that have been funded by the Multilateral Fund for conversion to non-CFC refrigerants were already higher than the current production levels as reported in the phase-out plan, and also in view of the fact that the country has reported a CFC consumption in the refrigeration manufacturing sub-sector of only 1.08 ODP tonnes, the eligibility of additional funding in the commercial refrigeration sector is questionable. UNIDO indicated in its response that relevant information had been analyzed and results of this analysis would be communicated to the Secretariat thereafter. At the time of writing this document, no additional information was received in the Secretariat.

Foam sector

17. UNIDO submitted to the Executive Committee at the 36<sup>th</sup> Meeting a “strategy plan of CFC-11 phase-out from the foam sector of Venezuela”. 50 small and medium scale enterprises (SMEs) with a total CFC-11 consumption of 226.5 ODP tonnes were identified and listed in the strategy plan. Two umbrella projects were foreseen under the plan with a third submitted as a terminal umbrella project. However, the Government of Venezuela decided to submit only one umbrella project for 21 SMEs to the 38<sup>th</sup> Meeting which was approved at US \$851,432 to phase out 149 ODP tonnes of CFC-11. The remaining terminal umbrella project was to be included in future national CFC phase-out plan which has been submitted to the 41<sup>st</sup> Meeting.

18. The Secretariat made a comparison of enterprise baseline data provided by UNIDO in the foam sector plan as submitted at the 36<sup>th</sup> Meeting and the national phase-out plan. All the enterprises except three stated in paragraph 2 above to have been identified in “a recent intensive survey” had been identified and included in the list of enterprises in the strategy plan submitted to the 36<sup>th</sup> Meeting. A review of the baseline data in the national CFC phase-out plan and the foam sector strategy plan showed significant inconsistencies that would impact the cost of the projects in the national phase-out plan.

19. The analysis shows, also, either inconsistent or imprecise descriptions of baseline equipment in the national CFC phase-out plan. Since the Gusmer and Glascraft high pressure sprayfoam dispensers as well as the Decker dispensers require minimum retrofit the amount requested for the foam sector in the national CFC phase-out plan does not seem to be eligible. UNIDO provided additional information on the cost of foam equipment. Discussion on the data discrepancies and eligibility of incremental costs is ongoing between UNIDO and the Secretariat.

20. The Secretariat requested additional information to support the claim for eligibility of the requested US \$1 million lump sum for the conversion incentive programme. UNIDO indicated that a detailed proposal for the incentive programme would be prepared encompassing supermarkets, dairy industry, transportation refrigeration and chillers. This additional information is still pending.

21. All the issues raised above are still under discussion. The outcomes of the discussion will be communicated to the Sub-Committee on Project Review.

**RECOMMENDATIONS**

22. Pending

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**PROJECT COVER SHEET**

<b>COUNTRY</b>	:	Venezuela	
<b>IMPLEMENTING AGENCY</b>	:	UNIDO	
<b>PROJECT TITLE</b>	:	National CFC phase-out plan	
<b>PROJECT IN CURRENT BUSINESS PLAN</b>	:	Yes	
<b>SECTOR</b>	:	Multi sector	
<b>ODS USE IN ALL SECTORS (2001) :</b>	:	2,546 ODP tonnes	
<b>PROJECT IMPACT</b>	:	1,999 ODP tonnes	
<b>PROJECT DURATION</b>	:	2003 - 2010	
<b>PROJECT COST</b>	:	USD 7,805,884	
<b>LOCAL OWNERSHIP</b>	:	100%	
<b>EXPORT COMPONENT</b>	:	Nil	
<b>REQUESTED GRANT</b>	:	USD 7,805,884	
<b>COST-EFFECTIVENESS</b>	:	USD 3.90 per kg ODP	
<b>IMPLEMENTING AGENCY SUPPORT COST</b>	:	USD 585,441	
<b>TOTAL COST OF PROJECT TO MULTILATERAL FUND</b>	:	USD 8,391,325	
<b>FINANCING ARRANGEMENT</b>	:	<u>Project cost</u>	<u>Grant with support cost</u>
2003 tranche	:	USD 1,194,900	USD 1,284,518
2004 tranche	:	USD 1,109,300	USD 1,192,498
2005 tranche	:	USD 1,586,784	USD 1,705,793
2006 tranche	:	USD 1,249,000	USD 1,342,675
2007 tranche	:	USD 2,665,900	USD 2,865,843
<b>STATUS OF COUNTERPART FUNDING</b>	:	N/A	
<b>PROJECT MONITORING MILESTONES INCLUDED</b>	:	Yes	
<b>NATIONAL COORDINATING AGENCY</b>	:	FONDOIN	

**PROJECT SUMMARY**

The present national CFC phase-out plan aims at phasing-out all the remaining consumption of Annex A, Group I CFCs in Venezuela over the period of 2003 – 2010. A series of investment, non-investment, and technical support activities are proposed to achieve this target in the foam and refrigeration sectors. The present CFC Phase-out Plan will enable the Government of Venezuela to totally phase-out the CFC consumption by January 01, 2010 except the CFC usage chiller servicing. Considering this multi-faceted approach it is crucial that flexibility be given to the Government of Venezuela to adapt or modify its strategies during implementation of this plan as the need arises.

The Government of Venezuela requests about US\$ 7.8 million as the total funding from the Multilateral Fund for the total elimination of all Annex A Group 1 substances (CFCs) in the country. The funding will be paid out in installments as specified in the Agreement attached. Being a performance based Agreement, future payments will be conditioned to meeting the performance targets and conditions specified in the Agreement.

The approval of this project will result in the elimination of CFCs consumption in the refrigeration sector of Venezuela and will substantially contribute to the ability of the country to meet its Montreal Protocol obligations.

Prepared by: UNIDO  
 Reviewed by: P Appleyard

Date: 4 September 2003  
 Date: 4 September 2003

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## 1. General information

The present project proposal consists of a national CFC phase-out plan. The proposal aims at reduction of the consumption of Annex A, Group I substances, CFCs in Venezuela in compliance with the Montreal Protocol obligation. The plan has duration of 7 years.

Ratification status of Venezuela is as below,

Vienna Convention, -----	Accession on 1 September 1988
Montreal Protocol, -----	Ratified on 6 February 1989
London Amendments, -----	Ratified on 29 July 1993
Copenhagen Amendment, ----	Ratified on 10 December 1997
Montreal Amendment, -----	Ratified on 13 May 2002
Beijing Amendment, -----	Under study

## 2. Impact

### 2.1 Basic data on the country consumption of CFCs

Venezuela has a CFC production factory, Productos Halogenados Venezuela (Produven). Table 1 shows production and consumption of CFCs from 1995 to 2002.

Table 1. Consumption and Production of Annex A Group I substances in Venezuela, in ODP tones

Year	1995	1996	1997	1998	1999	2000	2001	2002
Max allowed consumption	-	-	-	-	3,321.6	3,321.6	3,321.6	3,321.6
Consumption	3,220	3,050	3,704	3,213	2,188	2,703	2,546	1,441
Production	4,285	4,412	5,662	3,652	3,010	2,281	2,721	1,637

Venezuela's baseline average consumption of Annex A – Group I substances for the period from 1995 to 1997 amounted to 3,321.6 ODS tonnes. The country has always been in compliance with the Montreal Protocol control measures for the CFC consumption from 1999.

Relevant data for Multilateral Fund assistant scheme are given below.

Baseline consumption, -----	3,321.6 ODP tonnes,
Starting point established by Decision 35/57, -----	2,235.9 ODP tonnes,
Consumption funded since the starting point, -----	191.1 ODP tonnes,
Remaining eligible consumption not funded as of submission of the proposal, ---	2,044.8 ODP tonnes

### 2.2 Assessment of the consumption reduction schedule

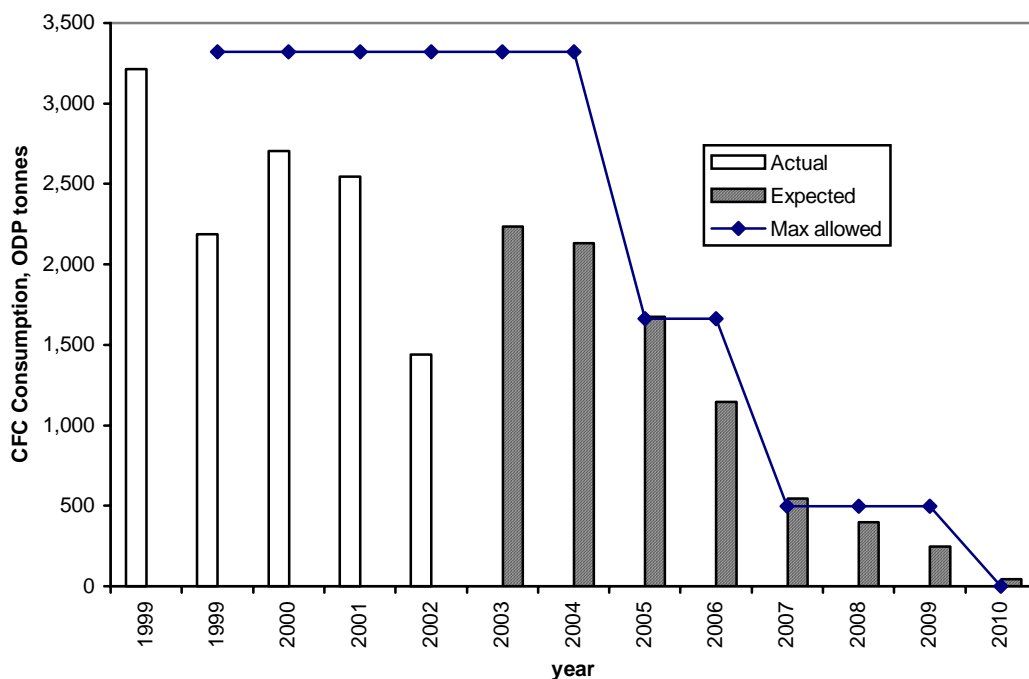
In 2002, there was a long strike and industrial activity was reduced to the greater extent. Therefore, the CFC consumption is not representing the normal market situation. In the present project proposal, the CFC consumption in 2001 is considered as the remaining CFC consumption. As a part of this consumption will be phased out through completion of on-going projects, the target consumption or the project impact of the present national phase out plan is 1,999 ODP tonnes.

The projection of the CFC consumption trend as the result of the implementation of the present phase out plan and that of on-going MFMP projects is given in Table 2 and illustrated in Fig. 1. The consumption of CFC in the chiller sector for servicing will remain, as no counter measure is considered at the moment. It is expected that Venezuela will achieve the 50% reduction target in 2005, 85% reduction in 2007 and zero consumption after 2010 except the CFC usage for maintenance of chillers.

Table 2. CFC Consumption reduction schedule, in ODP tonnes

Year	2003	2004	2005	2006	2007	2008	2009	2010
1. Max allowable total consumption of CFC	3,322	3,322	1,661	1,661	498	498	498	0
2. Reduction from ongoing projects as per business plan	312 172 UNDP 140 UNIDO	56 24 UNDP 32 UNIDO	136 UNIDO	0	0	0	0	0
3. New reduction under the present plan	0	50	319	530	600	150	150	200
4. Total annual reduction of CFC	312	106	455	530	600	150	150	200
5. Expected total consumption of CFC	2,234	2,128	1,673	1,144	544	394	244	44
NB: New reduction as per business plan 2003 - 2005	0	0	384	300	300			

Fig. 1. CFC Consumption reduction schedule in Venezuela



### 3. Data collection and validation

#### 3.1 Methodology for data collection

##### Data of CFC consumption

CFC Consumption data are reported to the Montreal Protocol Secretariat according to the definition of the Montreal Protocol; i.e., Consumption = Production + Import – Export.

##### Data of foam sector

CFCs 11 and 12 have been used in Venezuela to produce PS rigid foams and PU rigid and flexible foams for insulation of display cabinets, construction of cold rooms, panel production for the insulation industry, seats for automotive industry, as well as in the domestic and commercial refrigeration industry, production of freezers, chillers, and spray foaming activities.

Many producers in Venezuela in the above mentioned foam sub-sectors do not consume directly CFC-11. Most of them buy mixtures of polyols plus CFCs from the system house formulators and distributors of the main chemical components. CFCs are locally available mainly from PRODUVEN (the only CFC producer in Venezuela); however, some CFCs are imported through the system houses and other companies also available on the market for some factories.

A specialized group of national experts established under the coordination of FONDOIN, for the relevant independent sources of baseline information and data identified and contacted (PRODUVEN, local system houses, distributors of imported chemicals, etc.); the updated list of remaining enterprises reviewed in light of the eligibility criteria; all pre-selected enterprises have been visited to collect the necessary information and data.

The pre-selected enterprises were requested to fill in a questionnaire to provide the following information:

- a) Name and address
- b) Date of establishment
- c) Ownership status
- d) Mixture of CFC11-polyol consumption for the last three years
- e) Providers of the mixture CFC11-polyol
- f) Foam machine, manufacturer, year of purchase, capacity
- g) Products and production
- h) Use of substitute: HCFC141b

Based on the questionnaire, a preliminary list was prepared and consulted with the system houses to complete the information. After that the final list was completed and the enterprises were organized and regrouped in two umbrella projects, leaving apart the enterprises with consumptions lower than 4 ODP tons to be included in a terminal project.

### Data of refrigeration sector

In 2001, UNIDO contracted with the University of Carabobo for the collection of information required for preparation of the refrigeration service sub-sector phase out plan, including:

- District wide distribution of service workshops
- Estimation of total number of workshops
- Current service practices
- Potential service providers
- Market situation of CFCs
- CFCs commercial supply routes
- CFCs and alternatives trends
- Pricing and taxation of CFCs
- Trade agreement with neighboring countries
- Industrial statistics of production and import of refrigeration and air-conditioning equipment
- Technical institutions and vocational training centers
- Industrial associations
- Governmental Agencies relevant to ODS issues
- Amount of CFCs in installed units

In the Carabobo University study, the 908 service workshop were directly contacted to gather information of the situation of the relevant sector in the year 2000. The result of the extensive survey was summarized in a report with the database of all service shops investigated. In addition to this survey, a regional consulting firm, Ubajay S.A., Argentina, was assigned in the first half of 2003 to conduct additional survey in order to update the situation of the sector.

During the above survey exercise, Official bodies, Associations, Entrepreneurial Chambers related to the refrigeration sector, refrigerants distributors and importers of refrigeration equipment including second hand goods and other stakeholders were consulted. Discussion was also made with the CFCs producer, Produven, and refrigerant distributors to obtain precise data about sales, stocks, and trends of refrigeration/air conditioning equipment, reefer containers, refrigerated fishing vessels, and other equipment as well as refrigerants price information. Information of CFCs end users such as supermarkets chains and industrial refrigeration systems was also obtained. Further service workshops in the informal sector were investigated, which carry out 20 –25 % of total refrigeration service jobs in Venezuela.

In order to determine the amount of refrigeration and air conditioning equipment existing in the country, and the quantity of refrigerants used, the following organizations were consulted among others:

Servicio Autónomo de Transporte y Tránsito Terrestre del Ministerio de Infraestructura  
(Autonomous Service of Terrestrial Transport and Transit- Infrastructure Ministry),  
SARPA (Fishing Vessels Association),  
Asociación Nacional de Supermercados y Afines  
(National Association of Supermarkets and Cognates),  
Fábrica de contenedores refrigerados (Factory of Refrigerated Containers),  
Customs Office,  
Bus Companies,  
Cámara Automotriz de Venezuela (CAVENEZ).

The usage of CFC at service workshops determined through direct survey was doubly checked based on the obtained industrial statistics of production and import of appliances and automobiles which use CFCs.

### 3.2 Sector distribution of the remaining eligible CFC consumption

The distribution of the consumption of CFCs in Venezuela is given below.

**Table 3. Distribution of CFC consumption, ODP tonnes**

Sector	1999	2000	2001
Aerosol	18	31	8
Foam	147	338	418
Refrigeration manufacturing	26	46	29
Refrigeration service	1,668	2,253	2,065
Chiller, service use	20	20	20
Solvent	36	16	8
Miscellaneous	273	-	-
<b>TOTAL</b>	<b>2,188</b>	<b>2,704</b>	<b>2,548</b>

The implementation of MFMP projects in the foam and refrigeration manufacturing sectors has been progressed. There are several newly approved MFMP projects in these sectors. It is expected that there will be little consumption of CFCs in these two sub-sectors by year 2005 - 2006. The refrigeration service sub-sector is a dominant user sector of CFC in Venezuela. There are about 290 chillers working with CFC-11 and CFC-12, which need 20 ODP tones of CFCs for annual maintenance. There is only limited amount of CFC consumption in the aerosol and solvent sectors in 2001.

## 4. Strategy and plan of implementation

### 4.1 General strategy of reduction of CFC consumption

#### Annual reduction of CFC consumption

The CFC consumption in Venezuela is expected to be reduced by 312 ODP tonnes through the completion of on-going projects under the Multilateral Fund for 2003. In 2004 additional 56 MT will be reduced through completion of on-going projects as projected in the 2003 – 2005 rolling business plans of implementing agencies. Further 136 MT will be phased out in 2005 through completion on-going projects.

New activities were planned in the 2003 – 2005 rolling business plan by UNIDO. Based on the scenario in this business plan, totally 984 ODP MT will be reduced in Venezuela by 2007. However, according to the analysis made after the intensive investigation of the remaining CFC consumption along with the extensive survey of the remaining user sectors, it is expected that the CFC consumption in 2007 would exceed the maximum amount allowed for

the country, if only the activities in the business plan would be executed. Therefore, the activities necessary to achieve the compliance target particularly in 2007 are proposed in the present phase out strategy.

In the present proposal, the total CFC consumption will be phased out in the foam sector by 2005 and that in the refrigeration-manufacturing sector by 2006. In the refrigeration service-sector, a certain amount of CFC usage is expected to be reduced by implementation of technicians training program, which is proposed in this strategy, since intentional or non-intentional leakage of CFC refrigerants from equipment will be reduced during service or maintenance work as well as during operation of the equipment due to better service practices.

It is aimed to gradually reduce the CFC consumption in the service sector from 2005 till 2010 by introducing the national recovery and recycling scheme. Thereby, service workshops will be able to rely on recovered or recycled refrigerants for their service job to greater extent<sup>1</sup>.

There is relatively small amount of CFC usage (16 ODP tones in 2001) in aerosol and solvent sectors and 20 MT for chiller maintenance. The former usage may be managed to be phased out by implementation of the technical support component in the present proposal, whereas the latter usage will continue as no measure is considered at the moment.

It is worth mentioning that the quite big amount of consumption reduction is planned in 2006 and 2007 in order to achieve the 85% reduction target in 2007. These are critical target for the present strategy.

#### Management of the supply and demand of CFC

The local manufacturer, PRODUVEN supply CFCs to the local market. A apart of the local demand was also satisfied by imports through seven major importers. The ratio of sources of CFCs in Venezuela in 2000 was,

-  
Domestic production at PRODUVEN, 64%  
Import from Mexico, 17%  
Import from Netherlands, 10 %  
Import from Spain, 4 %  
Import from Germany, 3%  
Import from Belgium, 2 %

Table 4 shows the comparison between the local CFC demand expected in the present strategy and the local production.

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<sup>1</sup> A certain amount of spontaneous reduction would also be expected in the refrigeration service sector due to the replacement of CFC appliances and MAC with non-CFC units. However, the amount of spontaneous reduction is uncertain.



Table 4. Production and consumption of CFCs, Venezuela, in ODP tonnes

Year	1995	1996	1997	1998	1999	2000	2001	2002
Max allowed consumption	-	-	-	-	3,321.6	3,321.6	3,321.6	3,321.6
Consumption	3,220	3,050	3,704	3,213	2,188	2,703	2,546	1,441
Production	4,285	4,412	5,662	3,652	3,010	2,281	2,721	1,637
year	2003	2004	2005	2006	2007	2008	2009	2010
Max allowed consumption	3,322	3,322	1,661	1,661	498	498	498	0
Expected consumption,	2,234	2,128	1,673	1,144	544	394	244	44
Max allowed production*	5,265	5,265	2,872	2,872	1,197	1,197	1,197	0

\* Max allowed production is determined as an average of production for 1995 – 1997 (base level) plus 10% of this base level to satisfy basic domestic needs for 1999 - 2004, 50% of base level plus 10% of base level for 2005 and 2006, and 15% of the base level plus 10% of the base level.

CFC Production phase-out strategy is yet in place, and there is only the Montreal Protocol control measures for CFC production in Venezuela. According to the production control measures, the demand under this national CFC phase out plan will be satisfied by local production

#### Policy instruments

#### **Legislation on CFC control**

Additionally, Venezuela has the following National regulations dealing with the protection of the Environment, which are also related to the protection of the ozone layer:

- The Penal Law of the Environment published on January 3<sup>rd</sup> 1992, in its Art 47 considers criminal offences, different actions that may produce damages to the environment as well as violations of international agreements or national regulations protecting the ozone layer.
- The Customs Duty Code, Decree 989, published the 9<sup>th</sup> of February, 1996 that contains the classification of CFC as controlled substances (Note 10), requiring special permits for imports or exports.
- The Decree 3220 from January 13<sup>th</sup>, 1999 containing all the regulations regarding how to reduce the consumption of substances that produce damages to the ozone layer, which includes limits for the production and imports of ODS in Venezuela.

Preliminary plan for the Amendment of Decree 3220 relative to ODS control in Venezuela is given below.

#### **Background**

1. Decree 3220 was published in the Gaceta Oficial in January 1999. During the following year, the new Constitution was issued, later on, in 2001 the Amendment of Montreal Protocol was ratified and the law on Dangerous Substances, Materials and Waste was promulgated. These three laws make reference

to aspects related to the ozone layer protection, ozone depleting substances and control measures beyond what is established in Decree 3220. From there, the necessity to adequate it to the new juridical frame.

2. On the other hand, Decree 3220 presents imprecision and weaknesses in the licenses system which have facilitated customs crimes and has hindered following the products entering the country, especially in non rechargeable cylinders, forbidden by such decree, as well as second hand refrigeration equipments, also forbidden by the mentioned decree.

Conclusion: The Decree modification cannot be postponed, since it is the main measure to adjust administrative and corrective proceedings applicable to the violations of dispositions in force.

Fondoin expects that this Modification of Decree 3220 be issued before the end of year 2003.

- The Customs Law from June 17<sup>th</sup> 1999, which describes the administrative procedures dealing with imports, including those related to CFC. The Art. 109 gives special consideration to the smuggling of controlled substances which includes the case of CFC.
- The new Constitution of Venezuela from March 24<sup>th</sup> of year 2000, in the Art. 127 establishes that is a fundamental obligation of the Government the protection of the environment including the ozone layer.

#### Regulations regarding the imports of CFC

In a review of the legislation, were found the following aspects concerning CFC import procedures:

- The import and export of CFC are controlled through licenses of the Ministry of Environment, the customs procedures are very general and there is not a particular one applied specifically to CFC;
- The imports of equipment containing CFC are regulated under Article 25 of Decree 3220, which establishes a prohibition starting January 1<sup>st</sup>, 2000;
- The Customs Duty Code classifies the CFC according to Table 4.

**Table 4. Customs Duty Code of CFC**

TYPE of CFC	DUTY CODE NUMBER
R11	2903.4590 or 2903.4910
R12	2903.4200
R113	2903.4300
R114 and R115	2903.4400

According to this classification the CFC are considered pertaining to Rule 10 (Note 10), applied to substances requiring Import Permit from the Ministry of Environment and regulated under the Decree 3220 from 13 January 1999.

- The Decree 3220 establishes that beginning on 1 January 1999 until 31 December 2004. the production, imports and exports of CFC should not exceed the values indicated in the following Table 5.

**Table 6. Yearly quotas for Imports, Export and Consumption**

CFC	Imports in Kg	Production in Kg	Consumption in Kg
R-11	15,720	1,114,772	525,652
R-12	119,275	3,672,122	2,667,253
R-113	120,187	0	120,087
R-114	27,955	0	27,956
R-115	19,795	0	8,987

– Additionally this Decree establishes that these values of Table 6, should be reduced be 50% beginning on 01-01-2005, by 80% beginning on 01-01-2007 and finally reaching 100% at the beginning on 01-01-2010. (Zero Level).

The current Import Procedure which is represented in Figure 11, was validated by The Chief of Duty Division of the National Custom Offices (see Appendix 3). The step by step current procedure is also presented in this Appendix 3. It is important to point out that the import should be carried out through two official channels:

- The Ministry of the Environment for the Registration of the Import Company and for the Application of the Half-Yearly Import Permit. (License).
- The Customs Office at the entry point where the import is taking place.

#### **Recommendations about licenses and control of imports**

With the intention to facilitate import control of CFC and to reduce the risk of illicit import the following actions are recommended:

- To develop a National Standard in accordance with International Standards (ISO, ASA etc.) for the storage of refrigerant, specifying the kind of containers, their capacity in Kg, Type of valve that should use and required labels and color for identification;
- To amend the Decree 3220, Article 17, to incorporate the technical specifications of the National Standard for Refrigerant Storage as recommended before, in order to have a more strict control on the containers used for the imports and marketing of CFC;
- To change the optional character of the Customs Duty Classification Letter (Oficio de Clasificación Arancelaria), to a compulsory one, for all the inspection procedures of CFC imports, in order to identify the kind of refrigerant within the containers and the correct application of standardized valves, color, labels and capacity for the CFC;
- To keep a precise accounting system of the imports of CFC through a database with national updated information from all entry ports of the country, using the information provided by the Customs Duty Liquidation Office of all the imports made during each semester by each importer in order to control the CFC import permits;
- To establish a coordinating link between the Ministry of Environment and the Seniat for a better control of the amounts of CFC included in the import licenses and the physical amount of the import;
- To conduct a training of the customs officers about the import license system, the international regulations, CFC, identification, illegal CFC trade and the ozone problem;
- To strength the import license system to include not only the CFC, but all used or new equipment designed to work with CFC.

### Steps to be taken to gradually curtail CFC demand

CFC Production phase-out strategy, a project aiming at the phase-out of CFC production in Venezuela is being prepared with the assistance of IBRD. Along with the control of CFC production under the Agreements made with CFC producing Article 5 countries (China, India, DPR Korea, Argentina and Mexico) the Venezuela program would result in adequate reduction of supply of CFCs in the country. Possible reduction of CFC production in non-Article 5 countries in Europe would further create a circumstance where the present CFC consumption phase out plan would be effectively executed, since production phase out would result in short of virgin CFC availability, encouraging user industries to convert to alternative technologies and to consider the responsible use of refrigerants including recovery exercise.

Completion of on-going projects supported by the Multilateral Fund will reduce the consumption of CFCs in foam and refrigeration manufacturing sectors according to the 2003 – 2005 rolling business plans approved at the 39<sup>th</sup> ExCom. This will be followed by the new activities proposed in the foam and refrigeration manufacturing sector. Totally about 600 ODP tonnes will be phased out.

Customs training project is being implemented with the assistance of UNEP. The progress of this project provides preferable circumstance where the CFC phase out strategy in the service sub-sector is going to be effectively executed. A recovery and supplementary recycling program proposed in this strategy would give rise to dependence on recycled refrigerant by service workshops for their job, and would contribute to reduce the amount of production and imports of CFCs. As a result of these activities, about 2,000 ODP tonnes of the CFC demand currently required in the refrigeration service sub-sector will be phased out.

At the late stage of the present plan, an incentive program will be introduced to encourage retrofitting and replacement of existing relatively large equipment working with CFCs. It will phase out final CFC consumption for servicing these units. Chillers are not subject to the incentive program.

Except the usage of CFCs for servicing chillers, the CFC demand in the refrigeration sector and other sectors will be gradually reduced to zero consumption by 2010.

## **4.2 Foam sector implementation program**

### Current situation of the sector

Projects under MFMP are listed in Table 7. Many of projects were completed and relevant CFC consumption was phased out in the foam sector. There are six on-going foam projects, which will be completed by 2005 as indicated in the business plan for 2003 – 2005.

Table 7. MFMP Projects in the foam sector

SUB-SECTOR	PROJECT TITLE	IMPACT	STATUS	IA	
PSt/PE	Conversion of a CFC-12 polystyrene foam production facility to use hydrocarbons as blowing agent at Plásticos Molanca	259	completed	IBRD	
Rigid	Phasing out ODS at Decocar C.A.	16.2		UNIDO	
Rigid	Phasing out ODS at Veniber C.A.	21.6		UNIDO	
Rigid	Phasing out ODS at Daniven C.A.	18		UNIDO	
Rigid	Phasing out ODS at Industrias Todos C.A., Caracas	17.8		UNIDO	
Rigid	Phasing out CFC-11 with HCFC-141b at Tecnofrigo in the production of rigid PU panels	9		UNIDO	
Rigid	Phasing out CFC-11 with HCFC-141b at Liderfrio in the production of rigidpolyurethane panels	13.9		UNIDO	
Rigid (insulation refrigeration)	Phasing out CFC-11 with HCFC-141b in the production of rigid polyurethane panels at Fricava, C.A.	15.3		UNIDO	
Integral skin	Phasing out of CFC-11 by 100% water blown system in the production of moulded integral skin flexiblepolyurethane foam at Fanesi	11.4		UNIDO	
Rigid	Phasing out CFC-11 with HCFC-141b in the production of rigid polyurethane panels at Novemeca	16.2		UNIDO	
Rigid	Phasing out CFC-11 with HCFC-141b in the production of rigid polyurethane panels at Amerio Industrial, S.A.	11.8		UNIDO	
PSt/PE	Phasing out CFC-12 at Fandec C.A. (EPSR Foam)	45		ONG	UNIDO
Rigid	Phasing out CFC-11 with HCFC-141b at Friobox in the production of rigid P.U. panels	16.5		ONG	UNIDO
Rigid	Phasing out CFC-11 with HCFC-141b at Nevecor in the production of rigid P.U. panels	36.4	ONG	UNIDO	
Rigid	Phasing out CFC-11 by conversion to HCFC-141b as a blowing agent in the manufacture of rigid polyurethane foams (Umbrella No. 1) (Frimac, Frizer, El Control, Incumaca, Frive, Lungler, Profibra, Recovenca, Refriven, Requiven, Tefiven and Vanger)	62.8	ONG	UNIDO	
Integral skin	Phasing out CFC-11 by conversion to water system as a blowing agent in the manufacture of flexible polyurethane foams at Manufacturas Enveta, C.A. Cumana	32	ONG	UNIDO	
Rigid	Phasing out CFC-11 by conversion to HCFC-141b as a blowing agent in the manufacture of rigid polyurethane foams (umbrella project No. 2)	135.5	ONG	UNIDO	

However, a recent intensive survey identified about 20 small enterprises that use still CFC-11 for their foaming operation. These enterprises will be assisted by MFMP for phase-out of CFC use by converting their technology to non-CFC technologies. These enterprises are listed in Table 8.

Table 8 - Indicative list of remaining enterprises in the Foam (Mfg) Sector

	Name of the company	CFC-11	Location		Comments
1	Polimeros Ind.	2.6	La Victoria	Aragua	small
2	Fanabus	2.4	Carabobo	Valencia	small
3	Ebano	0.5	Barquisimeto	Lara	small
4	Ref, Rodriguez	0.5	Merida	Merida	small
5	Dureca	1.8	Los Teques	Miranda	small
6	Carroceria Andina	0.3	San Antonio	Tachira	small
7	Carroceria Urena	1	Tachira	Urena	small
8	Intercar	0.2	Tachira	Urena	small
9	Prointer	1.6	Yaracuy	Yaritagua	small
10	Alza Astilleros	0.8	Zulia	Maracaibo	small
11	Gamma Industrial	1.6	Zulia	Maracaibo	small
12	Aislantes Termicos	1	Aragua	La Victoria	small
13	Lavenca	0.3	D.F.	Caracas	small
14	R.S.M.	4.5	Barquisimeto	Lara	small
	<b>TOTAL</b>	<b>19.1</b>	<b>MT</b>		
		<b>14</b>	<b>Enterprises</b>		

**List of Non eligible enterprises in the Foam (Mfg) Sector**

	Name of the company		Location	Comments
15	CT Form		Barcelona	Stopped PU Production
16	Ind. Ter. Cavas			Stopped PU Production
17	Mercantil Speca			Stopped PU Production
18	Metal Nueva cadiz		Cumana	Stopped PU Production
19	Cerveceria Modelo		Maracaibo	Stopped PU Production
20	Wall Flex		Valencia	Stopped PU Production
21	Cofrio		Caracas	Stopped PU Production
22	Luvitec		Caracas	Stopped PU Production
23	Polifibras		Tachira	Stopped PU Production
	<b>Total</b>	<b>9</b>	<b>Enterprises</b>	

Phase-out plan

The CFCs phase-out at the remaining companies in Venezuela will be carried out individually, taking into consideration the possibility of forming groups of companies for some of the components (e.g. training, technology transfer, tests, etc.) of common interest to them.

**4.3 Refrigeration manufacturing sector implementation program**Current situation of the sub-sector**Domestic refrigeration**

MFMP Projects in the domestic refrigeration sector are given in Table 9.

**Table 9. MFMP Projects in the domestic refrigeration sub-sector**

Project title	Impact	Status	IA
Conversion of CFC-12 to compressor production facilities at Vecomesa, S.A. to manufacture HFC-134a compressors	0.7	Completed	UNDP
Elimination of CFC-11 and CFC-12 in the manufacture of domestic refrigerators at Grupo Frigilux, C.A.	46	Completed	UNDP
Elimination of CFC-11 and CFC-12 in the manufacture of domestic refrigerators at Coresmalt Valencia, C.A.	65.5	Completed	UNDP
Elimination of CFC-11 and CFC-12 in the manufacture of domestic refrigerators at Manufacturera de Aparatos Domésticos, S.A. (Madosa)	-	Cancelled	UNDP
Umbrella project for phasing out CFC-12 with HFC-134a and CFC-11 with HCFC-141b at 3 domestic refrigeration companies: Nordpol, Friocon and Tecobar	27	Completed	UNIDO

This sector includes manufacturers of household refrigerators, water coolers and freezers. The stagnation of the economy has caused a drastic reduction of sales and strong competition of low priced foreign products has caused the closure of many national manufacturers. ETERNA is still producing high quality refrigerators.

The total sales of refrigerators during year 2000 were estimated as 250,000; approximately 90% were imported, with brands such as L.G., Kelvinator, General Electric, Samsung, Whirlpool, Magic Queen, Kenmore, and Black and Decker.

The new equipment came with refrigerant R-134a. On the other hand all used refrigerators imported during year 2000 came with R-12. The total sales of second hand R-12 refrigerators reached 1-2% of total refrigerators sales.

The year 2001 National Census registered a total of 4,363,000 home refrigerators surveyed, excluding domestic refrigerators which are used in offices, pharmacies, etc. The amount of refrigerators not polled by the National Census is estimated to be 20%. Totally 5,250,000 domestic refrigerators are in operation for the whole country. The quantity of freezers represents a 4% of the total domestic refrigerators sales and the amount of water coolers represents a 6% of such total.

## Commercial refrigeration

This sector includes manufacturers of refrigerated showcases, bottle coolers, ice cream machines, ice machines and cold storage rooms. The national manufacturers supply almost 100% of the market, although most of parts or components used in their products are imported.

Commercial equipment manufacturers under the MFMP assistance for technology conversion are listed in Table 10.

**Table 10. Commercial equipment manufacturers under the Multilateral Fund assistance**

Project title	Impact	Status	IA
Elimination of CFCs 11 and 12 in the manufacture of commercial refrigeration equipment at Pinova, S.A.	25.1	completed	UNDP
Elimination of CFCs 11 and 12 in the manufacture of commercial refrigeration equipment at Industrias Nutal, C.A.	14.5		UNDP
Elimination of CFC-11 and CFC-12 in the manufacture of refrigerated display cases and bottle coolers at Neve Industrial, C.A.	7.5		UNDP
Elimination of CFC-11 and CFC-12 in the manufacture of bottle coolers, freezers and water coolers at Tecnocongeladores Venezolanos (Tecoven), C.A.	13.2		UNDP
Elimination of CFC-11 and CFC-12 in the manufacture of bottle coolers, freezers and water coolers at Hielomatic, C.A.	11.1		UNDP
Phasing out CFC-11 and CFC-12 with HCFC-141b and HFC-134a at Invitrel in the manufacture of commercial refrigeration equipment	46.4		UNIDO
Umbrella project for phasing out CFC-12 with HFC-134a and CFC-11 with HCFC-141b at 5 commercial refrigeration companies: Unidas, Inrefrisa, Cold Front, Refrivencia and Europa	30.9		UNIDO
Phasing out CFC-12 with HFC-134a and CFC-11 with HCFC-141b at 7 commercial refrigeration companies (Vikingo, Eterna, Indarelca, J.R. Refrigeración, Inelmem, Couttenye and Refrinaza)	32.3	On-going	UNIDO

According to the information extracted from conversion projects implemented in the Commercial Refrigeration Sector by UNDP/FONDOIN on one hand, and to data obtained from TECOVEN y NEVE INDUSTRIAL on the other, average annual production for the last 15 years has been approx. 80,000 units. Units are distributed according to the following percentage (approx.), bottle Cooler, 32%, commercial freezers, 61%, show case, 5%, others, 2%. Life span is established in 15 years. 25% of these units need Re12 annual re-charging. Each repair job needs 0.850 Kg. of CFC-12.

In addition to manufacturers listed above, this sub-sector comprises of a number of predominantly small enterprises, which are geographically scattered and are of with relatively little access to sophisticated technology and production practices.

Thirteen enterprises, engaged in manufacturing refrigeration equipment, were identified. The average total CFC consumption in the identified enterprises for years 1999/2001 is estimated to be about 43 MT/year. The eligibility of the surveyed enterprises was determined in accordance with the relevant Executive Committee decisions.



**Table 11 - Indicative list of remaining enterprises in the Commercial Refrigeration (Mfg) Sector**

	<b>Name</b>	<b>CFC-11</b>	<b>CFC-12</b>	<b>Total</b>	<b>Location</b>
1	Refrig. Duran	8.3	0.6	8.9	Barquisimeto
2	Refricentro	3.4	0.3	3.7	Araure
3	Metalcentro	1.6	0.3	1.9	Barquisimeto
4	Refriservice	2.4	0.5	2.9	Maracay
5	Frige Herven	0.5	0.3	0.8	Barquisimeto
6	Cafrica	0.8	0.3	1.1	Valencia
7	Deinbo	1.2	0.3	1.5	Caracas
8	Deincopa	1	0.3	1.3	Caracas
9	Frimetal	1	0.3	1.3	San Antonio
10	RSM	4.4	0.3	4.7	Yaritagua
11	Redupeca	1	0.7	1.7	S. Cristobal
12	Mercantil Sol y Aire	1.2	0.3	1.5	S. Cristobal
13	Siherna	1	0.3	1.3	S. Cristobal
	Sub-total	<b>27.8</b>	<b>4.8</b>		
	<b>SUM</b>			<b>32.6 MT</b>	

Based on the responses to the questionnaires, as well as the inputs received from plant visits, information of the baseline equipment in the enterprises was obtained. Small-sized enterprises mostly use locally made (or in some cases imported) foam machines. Some enterprises use manual mixing of chemicals. They have semi-automatic charging units, vacuum pumps and leak detectors suited for CFC-12.

While the owners/management of the enterprises surveyed, are more or less conversant with the need to eliminate CFCs under the Montreal Protocol, most enterprises do not have the financial or technical resources to undertake conversions at their own cost. Most of the small-sized enterprises have less than 10 employees. While the technicians have basic skills in refrigeration charging and evacuation, there is a lack of good housekeeping and related practices and lack of adequate knowledge or training on CFC-free technologies or applications. Most of the small-sized enterprises do not have well-equipped factories or workshops and lack organizational and infrastructure facilities.

### Transport refrigeration

According to the information provided by SETRA (Servicio Autónomo de Transporte y Tránsito Terrestre) (Autonomous Service of Terrestrial Transport and Transit) and to the data from CFCs Markets in Latin America (World Bank), there are approximately 42,000 refrigerated trucks in Venezuela. It is considered that 70% of them bear CFC-12, that is 29,400 trucks.

### Refrigerated containers (refer containers) sector

#### Mobile air conditioner (MAC)

Manufacturers of MAC parts and MAC assembly factory under the Multilateral Fund Assistance are listed in Table 12. Two projects were completed.

**Table 12. Manufacturers of MAC under the Multilateral Fund Assistance**

Project title	Impact	Status	IA
MAC factory conversion for fabrication of HFC-134a heat exchangers at FÉbrica de Aparatos de Aire Acondicionado, S.A. (Faaca)	0	Completed	IBRD
MAC factory conversion for fabrication of HFC-134a compressors and heat exchangers at Aire Acondicionado Integral, S.A. (Aaisa)	11	completed	IBRD

**Passenger cars:** 70% of total fleet bears A.C. In addition, Venezuela is a country with a permanent use of A.C. all year long. By the beginning of 1996, every new car sold in Venezuela bore air conditioning equipment working with R-134a. Some portion of second hand cars with R-12 MAC, older than 10 years, needs new compressors for replacements and more service jobs than new units. According to data provided by Service workshops and gases sale shops, it is estimated that 70% of the fleet is recharged annually with R-12. Considering that Venezuelan economy is depressed, it is estimated that by year 2010, the present fleet will still be in use.

**Trucks:** By December 2001, there were also 255,000 pick-ups. From this information, and by applying the same analysis as the one done for cars, we can assume that 80,000 vehicles have air conditioners with CFC-12.

**Buses;** According to information provided by SETRA (Servicio Autónomo de Transporte y Tránsito Terrestre), there are 24,466 buses for public transportation (8,938), executive transportation (5,576), tourism (6,408), schools (3,544). Taking into account that compressors imports during years 1998/2000 consisted of 22,600 CFC-12 compressors and only 6,080 HFC-134a compressors, it is estimated that a part of those buses fleets are equipped with CFC-12 air conditioners. The estimated number of buses with CFC-12 AC is 6,000.

There is a certain quantity of R-12 used for recharging air conditioners designed with R-134a technology called as "chimbo".

### **Industrial refrigeration and air conditioning**

All refrigeration equipment for big industrial applications is imported and usually works with ammonia or other non-controlled refrigerant. Brands in the market are different depending on the kind of application. A survey conducted showed the following list of brands with the Venezuelan representatives:

Grupo AG, selling Fes equipment.  
 Tecnonorte selling Grasso refrigeration systems.  
 Venesabor, selling Vilter equipment.  
 Mycom de Venezuela representing the Japanese company Mycom  
 Ateproyeca representing Frick. manufacturing company  
 York Venezuela selling York equipment.

The commercial and industrial air conditioning equipment on the market is mostly imported, some of the brands include names such as Carrier, Trane, York, Mc Quay for large capacity units; Tempco, Ruud, Rhem, Peake, Classic, Lennox, Airtemp for small or medium capacity units. As a whole the small and intermediate capacity group work with R-22 and these units are sold pre-charged with refrigerant.

National manufacturers are Frio Control, Gas Air and Infrisa in the chiller sectors and Climar, Ainca, Fecsa, Frio Productos, Friodan, Induclima, Friooven, Imperca, Inrefrisa, SuplyAir and Termoval .

The installed capacity of Chillers (with CFCs), checked until May 2003 is approximately 99 MT of refrigeration (Tr) which have 135 MT of CFCs associated with them, distributed as follows: 33 MT of R11, 101 MT of R-12 and 1,00 MT of CFC113 (in excellent preservation state). During year 2001, there were 20 MT of CFC-11 and CFC-12 used for chillers. Other ACs use HCFC-22 and HFC-134a.

The quantity of Chillers with CFCs is 292 units distributed as follows: health: 9%, hotels: 10%, industry: 11%, education: 2%, offices: 20%, commerce: 10%, banks: 8% and others: 30%.

Units are between 15 and 20 years of age, which implies the consequent operation leaks. Chillers maintenance is quite good and most of them are expected to be still working beyond year 2010. But the oldest equipment related to public organizations is expected to come in disuse by year 2005-2006. For the rest of users, due to the quality of maintenance, it is expected that chillers will continue to be in use beyond year 2010. Table 13 lists projects under MFMP related to replacement of chillers.

**Table 13. MFMP Projects related to chillers**

Project title	Impact	Status	IA
Replacement of CFC by HFC-134a as a refrigerant in central air conditioning units at Instituto Venezolano de los Seguros Sociales	-	Cancelled	IBRD
Replacement of CFC by HFC-134a as a refrigerant in central air conditioning units at Clínica Atias, Hospitalización y Servicios	4	Completed	IBRD
Replacement of CFC by HFC-134a as a refrigerant in central air conditioning units at Instituto de Prevencion Social del Médico	2	Completed	IBRD
Replacement of CFC by HFC-134a as a refrigerant in central air conditioning units at Congreso de la Republica	-	Completed But fund returned	IBRD

### Second-hand units

It should be noticed that the import of second hand refrigerators working with R-12 occurs in spite of the prohibition established in Article 25 of the Decree 3220 of 1999, on importing equipment containing R-12. According to a survey carried out by Fondoin in Maracaibo during June 2003, total sales of second hand R-12 refrigerators reached 3,000 - 4,000 units, 1.5 - 2.0 % of total sales of appliances.

### Phase out plan

As seen in Table 11, there are identified 13 eligible small and medium size enterprises that are manufacturing commercial refrigeration equipment. Some of them have facilities of foaming and refrigerant charging, and some have only refrigerant charging facility. They are still manufacturing products with CFC-11 and CFC-12. Alternative technology selected was HCFC-141b as foam blowing agent and HFC-134a as refrigerant. These substitutes are accepted and recommended by TEAP as alternatives to CFC-11 and CFC-12. Depending on the current baseline equipment, necessary equipment modification will be provided.

The investment component of the plan will focus on enabling the participant enterprises to eliminate CFCs from their production activities and would comprise of the following elements:

- Assessment of the technical requirements of conversion
- Determining the scope of international and local procurement
- Development of technical specifications and terms of reference for procurement
- Pre-qualification and short-listing of vendors
- International/local competitive bidding
- Techno-commercial evaluation of bids and vendor selection
- Procurement contracts
- Site preparation
- Customs clearance and delivery
- Installation and start-up
- Product and process trials
- Operator training
- Commissioning of CFC-free production
- Destruction of baseline equipment

The approach for implementing the investment component in the remaining eligible and not funded enterprises in the sector is executed as below:

This approach draws on previous implementation experience and has been designed based on the size, level of organization, location and customer base of enterprises concerned and also based on ease and convenience for execution and management. Given the generally small size of the remaining enterprises in the sector, with inadequate in-house technical capabilities, the need for adequate investments for plant and process changes, supported by investments on adequate technical assistance, trials and training, is critical.

CFC Phase-out in ineligible enterprises will not be funded under the sector phase-out plan and is expected to take place through the control, which the Government will have through policy and regulatory actions. Any unaccounted or unidentified eligible enterprises will be identified and accommodated within the resources approved for this sector phase-out plan.

#### *Foam Operations*

- a) Chemicals suitable for the selected HCFC-141b foam blowing technology will be required. These are available existing chemical suppliers.
- b) The use of new formulations will lead to a marginal change in mixing ratios and increased viscosity leading to reduced flow ability of the PU material. In case of rigid foam conversions, the HCFC-141b based foam will have an increased thermal conductivity in relation to that produced with CFC-11, which is being replaced. The existing manual mixing process or low-pressure foam dispensers will not be able to handle the new formulations without adversely affecting the cell structure and thereby the thermal conductivity of the foam. Hand mixing is also not recommended from occupational health and safety standpoints. Therefore, new high or medium-pressure foam dispensers as applicable, of equivalent effective capacity will be needed to replace the existing dispenser/hand-mixing process. They will provide a finer cell structure and help minimize the deterioration of thermal conductivity of the foam, and also minimize the occupational health and safety risks,
- c) The HCFC-141b based foam will have an increased molded density with respect to the CFC-11 based foam, resulting in increased requirement of chemicals.

### *Refrigerant Operation*

a) Compressors suitable and optimized for HFC-134a/R-404a will be required. These will be available from existing suppliers;

b) The chemical stability of HFC-134a/R-404a and of the synthetic lubricants compatible with HFC-134a/R-404a is highly sensitive to moisture and impurities in the system, as compared to that with CFC-12. The evacuation/charging process for HFC-134a/R-404a and polyolester lubricant will need to ensure the required level of cleanliness and dryness in the system. To ensure this the following is proposed:

- The vacuum pumps will need to be suitable for use with HFC134a/R-404a. Retrofitting of vacuum pumps has not proven feasible or cost-effective in the past due to several factors (unsatisfactory condition, inaccessible suppliers, unavailability of parts, production downtime, etc) therefore appropriate quantities of new vacuum pumps suitable for the conversion, consistent with the baseline capacities, will need to be provided.

- The existing refrigerant charging units/kits are not suitable for use with HFC-134a/R-404a and cannot be retrofitted, and will therefore be replaced with automatic charging units or portable semi-automatic charging units suitable for HFC-134a/R-404a duty.

c) The design/sizing of the refrigeration cycles need to be optimized to ensure the viability of the process and to maintain the product standards for performance and reliability, such as:

- Reengineering evaporators and condensers, so as to ensure the levels of cleanliness and contamination that can be tolerated with HFC-134a/R-404a (< 5 ppm)
- Lengthening of the capillaries or changing the thermostatic expansion valve models
- Use of filter-dryers with finer pores, suitable for use with HFC-134a/R-404a.

The existing leak detection is unsuitable for detecting HFC-134a/R-404a leakages; therefore suitable hand-held leak detectors will need to be provided.

The planned project duration is 30 months, and the CFC consumption in the sub-sector will be phased out by 2006.

#### **4.4 Refrigeration service sector implementation program**

##### Current situation of the sub-sector

Approved MFMP projects related to the refrigeration service sub-sector are listed in Tables 14 to 16.

**Table 14 . MFMP Projects related to MAC recovery and recycling (all projects completed)**

Project title	Description	Impact	IA	Grant
Pilot programme in recovery and recycling of CFC-12 in MAC	Programme developed by Fondoin and US-EPA including a market study, identification and selection of mechanical service centres, and procurement and assigning of recovery and recycling units, and preparation of workshop. Implemented through the Global MAC	0	UNDP	\$13,400
Pilot project for recovery and recycling of CFC-12 in MAC (Phase II)	Installation of recycling equipment at 40 service shops for automobiles and buses. This constitutes Phase II of the project approved at the 12th ExCom Meeting, and takes into account a technical assistance project in this sub-sector submitted by USA. An a	75	UNDP	\$220,000
Technical assistance and demonstration project in CFC recycling in MAC	Study market, selection of mechanical service centres which would participate, procurement of recovery-recycling units and follow-up, demonstration workshop, and assessment of results. NOTE: \$13,400 transferred from the pilot programme in recovery and rec	0	USA	\$115,000
Demonstration project in MAC	MAC recycling workshop, installation of recycling machines at several workshops, collect and analyze MAC sector data, and performance data on the installed recycling machines. The recycling machines will be provided through the Global MAC project under UN	25	USA	\$53,000
Demonstration project in the refrigeration sector	Cooperate with Fondoin in the implementation of Phase II of a pilot project to reduce CFC-12 used in MAC units. It includes recruiting bus repair shops to receive training and equipment, assisting UNDP with equipment procurement, conducting training works	0	USA	\$67,000

**Table 15. MFMP Projects related to recovery and recycling**

Project title	Description	Impact	Status	IA	Grant US\$
Implementation of a centralized reclamation plant for recovered refrigerants in the commercial refrigeration and air-conditioning sector	Implementation of a centralized reclamation plant for processing the recovered refrigerants, equipped to fully restore all the recovered refrigerant to the original purity specifications. It includes 2 recovery units for the recovery of larger industrial	0	completed	Canada	495,285
Pilot programme in recovery and recycling of CFC-12 in domestic refrigeration	To train 200 technicians of MADOSA, the principal manufacturer of domestic refrigerators in Venezuela (located in nine cities), in procedures for recovery and recycling of CFC-12, and in the use of recovery equipment. 50 recovery units will be procured.	8	completed	UNDP	100,000
Implementation of a recovery and reclamation of refrigerants  VEN/REF/22/TAS/58 approved in May 1997	Establishment of a national refrigerant recovery and recycling network comprising of 471 recovery machines and related components and 8 regional consolidated refrigerant centres equipped with high-volume refrigerant transfer units, refrigerant identification. One third of the equipment has been distributed. The Government has launched a new survey to identify new technicians interested in participating in the project. It is expected that remaining equipment will start to be distributed in 02.	172	On-going	UNDP	931,622

**Table 16. MFMP Training Projects related to service sector phase-out strategy**

Project title	Description	Status	IA	Grant
Technical assistance and training of servicing technicians in the refrigeration sector	Technical support for 2 national seminars on CFC usage in refrigeration systems and alternatives to CFC, held in Caracas and Valencia (Jun 1992). A training videotape was produced and will be used as a training aid for similar programmes in Latin America.	Completed	UNDP	\$30,000
Training of customs officers	Training programme for staff of the Centre for Fiscal Studies, the National School of Administration and Treasury and other national centres to enable them train customs officers on issues related to the destruction of the ozone layer and its impacts; int	On-going	UNEP	\$120,000

Five projects were executed for refrigerant recovery and recycling scheme in the MAC sector. Under these activities, demonstration exercises were given to the industry and 40 MAC service shops were provided with recycling equipment. The refrigerant reclamation facility was installed at a recycling center. Further, a project is being executed with the assistance of UNDP to establish national refrigerant recovery and recycling scheme. Under this project, 471 recovery machines are being distributed and eight regional consolidated refrigerant centers are established.

Preliminary training exercises were done in 1992 for upgrading the service practices of service technicians with the assistance of UNDP. Two hundreds technicians of Madosa were trained in 1996, though the company withdrew from the business.

Training of Customs officers programme was prepared by UNEP and approved in July 2001. Execution is progressing with a new completion time of 2003.

The concept of UNDP projects is based on the provision of recovery and reclamation services and equipment. However, the practice shows that the recycling process of CFC-12 is a very efficient approach and, therefore, considered by this proposal to supplement activities carried out in the past under the assistance of MFMP in order to achieve the total CFC consumption phase-out in the refrigeration service sub-sector. Previous projects and activities are not well coordinated. The present proposal should focus on maximum utilization of achievements given by a series of previous activities.

### Number of service workshops

For preparation of sound strategy for phasing out CFC in the service sector, the solid information relevant to the sector is essentially required. Therefore, the extensive survey was conducted as described in Chapter 3.1. Here is summarized the information collected through 908 service workshops in 25 cities of Venezuela during the month of March 2001 and additional survey done in the first half of 2003.

The businesses visited were classified in two groups :

- a) Vehicle Air Conditioning Service Workshops (527 ).
- b) Refrigeration Service Workshop (381).

The number of 908 service workshops represents approximately 36% of the whole country. The other 64% includes service workshops of geographical areas not covered in the survey, or workshops in the areas covered but that were not visited during the survey or workshops which do not have any registration or formal organization. Total quantity of services estimated is approximately 2,500 service workshops. Data collected includes name, technical qualifications and phone number of 558 non-qualified technicians and

1,081 qualified technicians; a total of 1,639 technicians working in the workshops visited. Consequently, estimated total quantity of technicians countrywide is 4,500 - 5,000.

### **Characteristics of service workshops**

On the average the service workshop is small, with 2 technicians, one of them with some kind of academic background (High School Degree, Vocational School Degree, College Graduate). They are usually with a minimum of service equipment: vacuum pump, manifold service valve with pressure gages, watt-meter, voltmeter and a set of general tools. Nationwide the number of vehicle air conditioning service workshops is the double that the number of general refrigeration service workshops. This is due to higher demand for repairs in the vehicle sector. Most of the businesses are managed by the owner who usually works as a technician as well.

More organized and larger workshops are usually related to other kind of business such as dealers for the sale of refrigeration or air conditioning equipment, stores specialized in the sale of refrigerants and refrigeration parts or in the case of Air Conditioning vehicle service, workshops providing a broader car repair service.

In relationship with the ODS problem, most of the service workshops are aware in a general sense that some refrigerants are damaging the ozone layer (87.94%), but they do not know which of them are more harmful and they do not know how to handle the problem at the level of their service practice.

Regarding the recovery of CFC, 115 service shops (13 %) out of 908 reported that they have been recovering R-12 and in some cases R-134A as well, and 31 shops (3.4%) of them had participated in a FONDOIN Course related to ODS and refrigeration service practices.

### **Service practice**

At most of the workshops, there are no standardized procedures available in handbooks or any written materials describing the service practices or proper methods of performing repairs and maintenance of equipment,. Each service or repair is treated according to the experience of the technicians and available tools or materials at the moment.

Regarding the methods used to control the correct amount of refrigerant charged into a system during a service, the pressure measurements (discharge and suction) was the most common one (95%), the electrical consumption of compressor measured with a Wattmeter was the second one (15%), and the use of weighing of refrigerant with a balance was applied in 8% of the cases, although in some service shops several methods were used.

In general, the refrigerant containers used at service workshops were not standardized in capacity, labeling or color with the exception of disposable HFC-134A containers. According to their needs or economical capability, each business buys the refrigerant in very broad type of containers, most of them adapted by themselves, which they take to recharge with refrigerant when it is necessary.

Some of the service shops used R-11 as cleaning substance, but in general purging or flushing with the same refrigerant was the most frequent method used to eliminate air and humidity of the system

### **CFC service usage by application**

Table 14 lists the refrigeration and air-conditioning equipment that exists in Venezuela, and the amount of CFC used for the service jobs for respective refrigeration and air-conditioning units, which has been determined through the analysis of the surveyed information and industrial data.



**Table 17. CFC Usage for servicing refrigeration and air-conditioning units in 2001**

Type of units		STOCK IN MARKET	freq. of service	Units for service	CFC/unit (kg)	Total (mt.)
Mobile air conditioners	Passenger car	955,000	0.9	859,500	1.3	1,117
	Truck, Van	60,893	0.45	27,402	0.7	19
	Bus	6,000	0.7	4,200	8	34
Transport refrigeration		29,400	0.5	14,700	4	59
Equipment at super markets chains		233	1	233	40	9
Industrial equipment		-	-	-	-	50
Commercial equipment		1,250,000	0.25	312,500	0.85	266
Domestic refrigerators and freezers		4,892,620	0.25	1,223,155	0.35	428
<b>R-12, Total</b>						<b>1,981</b>
<b>R-11, for flushing</b>						<b>76</b>
<b>Chiller, R-12</b>		292	1	292	70	14
<b>Chiller, R-11</b>						6

### CFC Supply and prices

The main supplier of CFC in Venezuela is Produven, who sells its products through two different channels: the refrigeration industrial sector, and the dealers which are the suppliers of refrigerant to the retail stores that sell refrigerants to service workshops and to small manufacturing companies. The others big suppliers are the importers of CFC, but they usually sell refrigerants to the retail stores providers of the service sector.

In the last two years because of the slow growth of the economy, the refrigeration industrial sector had a high decline in sales that have caused the closure of several industries. There are only two industrial customers of Produven: Climar a manufacturer of air conditioning equipment and Grupo Inmensa, which bought small amounts of R-12 in 2000. At the moment, the dealers of Produven that are marketing R-11, R-12 and R-114 are Comercial San Antonio and Indugas. There are others as Refrimaster, buying mainly R-22, although occasionally they also buy R-12 or R-11.

In relationship with the importers of CFC they are suppliers mostly for the refrigeration or air conditioning service sectors. At present time there are only three companies reporting officially imports: Interfrigo, Corporación Saira and Refriquim.

In the year 2000, out of the total of 1,268.130 MT of R-12 sales of Produven, 1,265.568 MT (more than 99%) were directed to the dealers sector, to small manufacturing companies of the refrigeration sector, and to service workshops through retailers. Additionally, all the imports of R-12 (estimated more than 1,100 MT during year 2000) were sold through retailers to the service sector.

A similar situation occurs with the case of R-11. Out of the total of 91.28 metric tons sold by Produven in year 2000, 96% (87.76 Tons) was directed to the dealers, which, in addition to the estimated 1.5 ton imported, have been marketed through retailers to the service workshop sector or small manufacturing companies.

This means that at the present time, most of the R-12 and R-11 consumption in the refrigeration and air conditioning field (1,281 metric tons for year 2000) have been used by the service sector and for that reason more attention should be given to the projects trying to improve or reduce the use of CFC at service workshops.

The sales of CFC at the retail level in Venezuela were studied using the data collected from the refrigeration stores during the national survey. They have the following characteristics: the standardized CFC containers are only used in the case of throw-out container as reported by the sampling study. In 63% of the cases, CFC stores used non standardized size containers and 65% used non standardized color containers. On the other hand 68% of the CFC stores recharge the containers.

The CFCs' imports price depends on the product origin, operation volume, type of packaging and importer. For example, in year 1999 there are CFC-12 values from U\$S/Kg 0.76 to U\$S/Kg 2.44.

Sale prices presented correspond to prices charged by Produven to manufacturers and/or distributors.

The latter provide small spare parts sellers, installers, mechanics and other final users (supermarkets, industries, etc.).

#### Phase out plan

The demand of CFC in the refrigeration service sector will spontaneously be reduced as the replacement of ODS equipment with non-ODS appliance or mobile air conditioners is going to take place.

However, the CFC consumption cannot be totally phased out immediately, since many of these CFC products are used for further years until the end of their lifetime, sometimes even for another ten years or more due to the economic situation of Argentina.

It is inevitable to take necessary measures for the reduction of the service use of CFC, in order for Venezuela to be in compliance with the 50% reduction obligation for the year 2005, followed by the 85% reduction obligation in 2007. Measures for service use reduction are further important. The SPP framework is, therefore, of essential importance for Venezuela's compliance with the Montreal Protocol. As Venezuela is a big country with about 2,500 workshops, the RMP implementation would need several years. It should be started as soon as possible, to enable the country to meet its obligation for the years 2007 and 2010.

The conditions and constraints for SPP in Venezuela are described below.

- The industry related to CFCs must be developed in a sustainable manner. The revised national program indicates that, by 2005, there will be no demand of CFCs for new equipment in refrigeration and foam sectors.
- Employment must be kept in all related industries, particularly in small and medium sized enterprises (SMEs), which play a major role in the refrigeration service sector. Even more employment may be created as a result of successful implementation.
- The requirements of CFC refrigerants for servicing and maintenance of existing CFC refrigeration and air-conditioning equipment must be satisfied and must be supplied by the National recovery and recycling project.

- The service sector in Venezuela is not well coordinated due to the number of SMEs involved.
- Availability of CFC may be limited in the near future.
- Legislation framework in Venezuela is to be fine tuned.

External constraints for the RMP include the availability of CFCs at low prices and the disposal of CFC. These issues are under the consideration of Task Forces of the Multilateral Fund.

Under the above circumstances, the present SPP must serve as a seed to initiate a sustainable national system for refrigerant recovery and recycling and the responsible use of CFC refrigerant in the refrigeration industry and the consumer sector.

Specific activities or actions, objectives and modalities of implementation in each project component are elaborated below.

### **Linkage with a project for recovery and reclamation of refrigerant**

It is essential to have a link with on-going project for recovery and reclamation under the assistance of UNDP.

### **National technicians training program**

One of the components of a CFC phase-out strategy in the refrigeration service sub-sector is a project for training service technicians in the good service practices in refrigeration and air conditioning, to avoid or reduce the intentional or unintentional release of refrigerant to the atmosphere and particularly about the proper use of controlled refrigerants, CFC-12 and CFC-11. In addition, this project should promote the recovery, recycling and reclaiming of refrigerants in order to reduce the CFC consumption.

The training provided should be specified in such a way that at the end of the courses each one of the technicians should be able to:

- Understand how the CFC refrigerants affect the ozone layer and what kind of effects for the damage of the ozone layer have concerning life on earth.
- Apply appropriate methods of repairs, maintenance and installation of refrigeration or air conditioning equipment.
- Use refrigerant detection equipment to identify early leaks of gases to the atmosphere.
- Apply proper methods of cleaning, charging and discharging refrigeration units to avoid or to reduce the release of ODS into the atmosphere.
- Use proper methods to assess the correct amount of refrigerant to be put into the refrigeration unit during service or repair.
- Use properly the equipment for the recovery or the recycling of refrigerant in the workshops.
- Recognize the ethical implications of using ODS for the future of the world.

The courses should be directed to workshop service technicians, working with refrigeration or air conditioning equipment and with two different levels according to their educational profile as follows:

- For technicians with any of the following educational background: High School Graduate, Community College Graduate (TSU) or INCE Graduate. They will be called qualified technicians.
- For technicians with very low academic education but with practical experiences.

The National Training Plan will be developed in two phases

- First Phase: To instruct at least 1,500 service technicians: 750 qualified technicians (TSU, High School or INCE graduates) and 750 practical technicians, about the instructional objectives as described in Part 2.1 of this report.
- Second Phase: To continue with the instruction of all technicians within a National Certification Program of Refrigeration Technicians and or Service workshops.

The conditions and specifications of this Technician Certification Program should be written by the Administration of the Program.

In Table 18 is shown the number of technicians in both categories, qualified and un-qualified included in the Data Base of Refrigeration and Air Conditioning Service Workshops of different cities in Venezuela.

The courses should be planned in all major cities of Venezuela including Caracas and neighboring suburbs: La Guaira, Los Teques and Charallave; Valencia and neighboring suburbs Puerto Cabello and Guacara; Maracaibo; Cabimas; Barcelona; Puerto La Cruz; Anaco; El Tigre; Ciudad Bolivar; Puerto Ordaz; San Felix; Coro; Punto Fijo; Maracay; La Victoria; Cagua; Barquisimeto; Merida; San Cristobal; Porlamar; Maturin and neighboring Caripito; Barinas; San Felipe and San Juan de Los Morros.

Table 18. Number of Technicians included in Data Base

City	Qualified technicians	Non qualified technicians
Barcelona	13	3
Barquisimeto	115	59
Bolivar	24	12
Cabimas	40	24
Cagua	13	2
Caracas	234	134
Coro	16	7
Guacara	8	5
Guarenas	12	8
Guatire	1	7
Guauama	12	16
Los Guayos	7	1
Los Tequs	15	13
Maracaibo	118	87
Maracay	107	12
Maturin	54	16
Puerto Cabello	17	8
Ounto Fijo	36	19
Puerto La Cruz	21	14
Puerto Ordaz	18	7
San ristobal	43	23
San Felix	15	4
San Joaquin	5	8
Valencia	99	66
Villa de Cura	3	1
TOTAL	1,056	556

Information was collected in all educational institutions from Venezuela in order to identify those with the capability to provide technical training to refrigeration technicians or in order to cooperate with their facilities in the training of customs officers.

The survey was conducted in Universities, Community Colleges (JUT) , Technical or Vocational Schools and Training Centers, both Public and private looking for those that includes courses in Refrigeration and Air Conditioning in their syllabus.

A total of 34 institutes with capability to participate in the training Program for the Refrigerant Management Plan were selected according to the courses of refrigeration which they offered, laboratory facilities, teaching personnel and geographical location. They have 76 campuses throughout the country which could be training centers for the RMP of Venezuela. In addition to these 76 campuses, there are 12 INCE centers with the capability of teaching refrigeration in different places of the country, reaching a total of 88 centers for training.

Fifty Nine percent of these institutes are public and 41% of them are private, they are located in all major states of the country, particularly in those with more population (54,5% of them are located in the Capital District of Caracas, Carabobo, Zulia and Anzoátegui), but on the other hand there are seven States (Trujillo, Portuguesa, Cojedes, Apure, Sucre, Amazonas and Delta Amacuro) without training centers.

The Instituto Nacional de Cooperación Educativa INCE, is an Institution fully dedicated to provide vocational courses including Refrigeration and Air Conditioning. It has 12 locations in different cities of Venezuela and 8 Mobile Training Units with facilities to teach refrigeration in remote areas or small towns.

A summary of the total 88 training centers indicating the location or city of each one is shown in Table 19. In the list the type of Institution is referred by indicating if it is public or private and the level is used to indicate if it is: a University, Community College (IUT), The National Vocational School INCE or Training Centers.

All these centers are currently teaching either Refrigeration or Air Conditioning or both courses, and all of them are interested in participating in the National Training Program for the Refrigerant Management Plan.

**Table 19. Summary Of Training Centers Of Venezuela**

STATE	LOCATIONS AND NUMBER OF CENTERS	Total number
Capital district	Caracas, 12; L Teques, 1; L Guaira, 1 Charallave, 1	15
Anzoáte	Barcelona, 5; Anaco, 2; P LaCruz, 1; E Tigre, Arag 2	11
Carabobo	Valencia, 6; P Cabello ,2; Guacara, 2; Yagua, 1	11
Julia	Maracaibo, 6; Cabimas, 5	11
Bolivar	C Bolivar, 1; P Ordaz, 3; San Felix, 2	6
Falcon	Coro, 3; P. Fijo, 3	6
Aragua	Maraea , 3; L Victoria, 1; Cagua, 1	5
Lara	Barquisiin,3; Carom, 1; Cabudare, 1	5
Merida	Merida, 3; Tovar,1	4
Tachira	S CristObal,3	3
N. Esparta	Porlamar, 3	3
Monagas	Maturin, 2; Caripito, 1	3
Barinas	Barinas, 3	3
Yaracu	S Felipe, 1	1
Ciuarico	San Juan,1	1
<b>TOTAL</b>		<b>88</b>

The instructor or the Administration of the courses, should develop or select the appropriate training materials for the courses in Spanish, which includes standard textbooks with the support of audiovisual materials such as computer assisted animations, technical films, transparency films, etc.

The suitability of using the publication ISBN 92-80741469-4 from the United Nations as a textbook of any of the courses should be evaluated, as well as any other training materials from other Spanish speaking countries for similar training.

Instructors for the training Program should demonstrate their technical skills and experience in training and that they should speak Spanish Language by registering at the Office with the responsibility for the

Administration of the Program using their curriculum vitae or resume.

In accord once with the required profile they should have:

- a) Academic Background appropriate for each level of training
- b) Experience as instructor in refrigeration.
- c) Practical experience in the area.
- d) Knowledge about the national and international regulations for protecting the ozone layer.

The training Program will be developed in two phases. The first phase financed by the MPMF for training about 1,500 technicians and the second phase for training the rest of the technicians as a part of a Certification Continuous Program to be developed in an early future and to be financed by national funds which include the cost of the certification

The cost of the first phase is estimated considering that the 1,500 technicians to be trained will be grouped into 10 participants courses for a total of 150 courses of 24 hours (three days courses) nation wide. The cost of each course is given in Chapter 5.

The duration of the first phase of the program (training 1,500 technicians) is estimated in one year, considering that the training will be executed by four instructors and that each instructor will teach one course of three days per week. The planned 150 courses of the first phase could be given in a period of 40 weeks, in addition it is necessary a period of 10 weeks for promotion and registration and 18 weeks for the preparation of training materials.

IMPACT: Taking into consideration that the service sector nowadays, has the largest proportion of consumption of CFC in Venezuela, the training will have big impact by reducing the intentional and unintentional release of refrigerant during service.

The qualitative assessment of the impact of the training in tons of ODS is not straight forward, though it could be computed by considering the repairs performed on vehicle Air Conditioning and the domestic refrigeration sectors in year 2000 that reached a value of 1.500.000 in almost 2000 service shops visited. Considering that 50% of these repairs were for equipment working with R-12, with an average of 0.4 Kg per charge and that only 25% of repairs required gas, the total consumption was 75 tons of ODS. This amounts represents only one third of the national consumption, of 225 tons that easily could be reduced by 50% by using good service practices. In this situation the estimated impact will be as high as 112 tons of ODS.

### **Supplementary national recovery and recycling project**

This component is supplementary project to the on-going project titled as "recovery and reclamation of refrigerant" being executed with the assistance of UNDP.

Establishment of recycling centers: Totally fifteen (15) recycling centers will be established at major cities, principally at the training centers. Eight centers established through the implementation of the on-going UNDP project will be upgraded if needed. Additional seven centers will be established. Each

recycling center will receive fundamental equipment required for refrigerant recycling. They also need a cylinder to keep un-recyclable refrigerants until further treatment will be done. Equipment to be provided is a recovery machine, a recycling machine, a recycling machine with function to remove non-condensable gas, several small recovery cylinders, vacuum pumps, a refrigerant identifier (infrared type), a storage cylinder, service tools (piercing valve, gauge manifold etc.), and a hand-held leak detector. Reclamation facility already installed in Venezuela will be effectively used in the scheme.

Service equipment and recovery machines: Essential service equipment for good servicing practice and refrigerant recovery will be provided to 1,500 selected service workshops in addition to 471 units already provided under the on-going project. It includes vacuum pumps, recovery machines, recovery bags, piercing valves and other service tools. In order to facilitate the reduction of use of CFC-11 for flushing refrigeration systems, flushing units with non-ODS flushing agents (alcohols, glycol, ethers etc.) are going to be provided to selected service workshops, where amount of CFC-11 usage is high. All recipients must be certified after the training planned in the present plan.

#### 4.5 Incentive program for retrofitting or replacement of industrial equipment

Incentive program for encouraging retrofitting or replacement of existing CFC based relatively big installation is planned. Target end-users of this scheme are as follows. Chiller conversion assistance is not considered, however.

There are some end users that, due to their technical knowledge and logistic possibilities perform by themselves the service of their own refrigeration and air conditioning equipment.

Supermarkets; According to data provided by Asociación Nacional de Supermercados y Afines (ANSA) (National Association of Supermarkets and Cognates) there are 42 supermarket chains with 233 stores in the whole country. According to the sample work carried out in Caracas (128 stores), average consumption of these stores is as shown in Table 20. Taking into account total quantity of stores (233), total quantity of CFC-12 used for maintenance jobs in the whole country is 10 MT/year.

**Table 20. Supermarkets CFC-12 Consumption.**

Supermarket Chain	Quantity of stores	Consumption CFC-12 Kg/year	Average Consumption CFC-12 Kg/year	Pondered Average Kg/year
CADA	49	3,297	67	40
Central Maiderense	41	1,297	32	
UNICASA	28	1,344	48	
Plaza	10	387	39	

Industries; Usually, industries utilize, for their refrigeration and air conditioning systems, ammonia or other non controlled refrigerants. However, there is equipment that uses CFC-12, whose service jobs are done by their own manpower.



Dairy products manufacturers; A survey was carried out in the main Venezuelan Dairy industries, whose data can be seen in Table 21.

**Table 21. Dairy industries CFC-12 consumption.**

Company	Consumption CFC-12 K/year.
PARMALAT	N/A
INLACA	480
LACTEOS LOS ANDES	960
UPACA	120
LACTEOS SANTA BARBARA	596
TOTAL	2,156

Total CFC-12 consumption in the Dairy industry is: 2.00 - 3.00 MT/year.

A part of financial assistance is included in the present strategy to encourage the conversion to non-CFC equipment in 2007. The detail of the program including eligibility of end-users of CFC equipment and effectiveness of funding will be defined during the implementation of the present strategy in 2004 – 2005. Through this activity, the final consumption of CFC in the service sub-sector will be phased out.

#### 4.6 Technical support component

Since the Sector Phase-out Plan will address the entire refrigeration sector, the industry as a whole will need to be supported through provision of a technical support component to ensure that phase-out actions and initiatives are not only technically sound but also sustainable, and consistent with the important priorities of the Government, which are to prevent industrial dislocation and obsolescence. The technical support component will assist the refrigeration sector as a whole, on the following:

- a) Establishment quality and performance standards for the CFC-free products and applications within the sector;
- b) Interaction with the user industry for providing technology assistance for sustainability of CFC-free refrigeration applications through technical workshops and meetings;
- c) Establishment of a training, certification and licensing program for refrigeration system production equipment operators and technicians for sustaining the CFC-free technologies.

This component includes possible supplementary activities for service technicians training program, which is being executed with the assistance of UNEP, by providing additional training for certified trainees.

This would also provide the Government of Venezuela with flexibility for project implementation, thereby the strategy is able to cope with specific situation occurring during the execution of the program.

#### 4.7 Timetable for implementation of the sector phase-out plan

Table shows the timeframe for the implementation of each activity in each project component. After these activities have been completed, the Project Completion Report will be prepared in 2010. Therefore, the total duration of the project is 7 years.

Table 22. Timetable for implementation of the SPP, Venezuela

Year	2003	2004	2005	2006	2007	2008	2009	2010
Reduction in foam sector				19				
Reduction in ref. manufacturing sector					29.5			
Reduction in service sector	0	50	319	500	600	150	150	200
<b>Approval</b>	*							
<b>Project management</b>								
Coordination group set up								
Training of national experts								
Awareness promotion								
Monitoring								
Reports	*	*	*	*	*	*	*	*
<b>Technical support component</b>								
<b>Foam sector program</b>								
<b>Refrigeration manufacturing sector</b>								
<b>Customs training, UNEP</b>								
<b>Technician training</b>								
<b>Recovery and recycling scheme</b>								
Equipment delivery to centres								
Training of centre staff								
Delivery of equipment to shops								
<b>Incentive program</b>								

## 5. Incremental costs

### 5.1 Foam sector

Incremental costs for the foaming sector plan is composed of equipment costs for modification of existing foaming machines depending on the baseline equipment of enterprises. Incremental operating cost for 24 months operation will be provided to assist enterprises included in the present SPP for conversion. The detail is elaborated in ANNEX I.

### 5.2 Refrigeration manufacturing sector

Incremental costs for the manufacturing sector plan is composed of equipment costs for modification of existing foaming machines and refrigerant charging units depending on the baseline equipment of enterprises. Incremental operating cost for 24 months operation will be provided to assist enterprises included in the present SPP for conversion. The detail is elaborated in ANNEX II.

### 5.3 Refrigeration service sector

Financial assistance required for each activity is summarized in Table 23 for the consideration by the Multilateral Fund. The grant is requested in five tranches from 2003 to 2007, so that an effective use of the allocated fund is ensured. The administration costs of the implementing agency are 7.5 % of the project cost.

Table 23. Costs of the CFC NPP, Venezuela

Project component and activity	Sub total	2003 tranche	2004 tranche	2005 tranche	2006 tranche	2007 tranche
PROJECT MANAGEMENT	346,000	74,000	69,000	69,000	64,000	70,000
TECHNICAL SUPPORT COMPONENT	400,000	0	0	0	200,000	200,000
FOAM SECTOR PROGRAM	456,744	353,000	35,300	68,444	0	0
REFRIGERATION MANUFACTURING SECTOR PROGRAM	765,340	443,500	0	321,840	0	0
NATIONAL PROJECT FOR TRAINING SERVICE TECHNICIANS	317,900	155,400	20,000	142,500	0	0
NATIONAL RECOVERY AND RECYCLING PROJECT	4,519,900	169,000	985,000	985,000	985,000	1,395,900
INCENTIVE PROGRAM FOR RETROFITTING AND REPLACEMENT	1,000,000	0	0	0	0	1,000,000
<b>TOTAL PROJECT COST</b>	<b>7,805,884</b>	<b>1,194,900</b>	<b>1,109,300</b>	<b>1,586,784</b>	<b>1,249,000</b>	<b>2,665,900</b>
IA Support cost	585,441	89,618	83,198	119,009	93,675	199,943
Total Grant by MFMP	8,391,325	1,284,518	1,192,498	1,705,793	1,342,675	2,865,843
Business plan 2003 - 2005		1,075,000	968,000	1,613,000	0	0

The cost breakdown of activities in the project components is given in Annex III.

## 6. Management

The overall management of the plan will be carried out by the Government of Venezuela with the assistance of UNIDO.

The Ozone Office will be responsible for monitoring the implementation of the phase-out plan. The Ozone Cell will be responsible for tracking the promulgation and enforcement of policy and legislation and will assist UNIDO with the preparation of annual implementation plans and progress report to the Executive Committee.

The implementation of the Phase-out Plan will need to be closely aligned and coordinated with the various policy, regulatory, fiscal, awareness and capacity-building actions the Government of Venezuela is taking to ensure that the implementation of the Phase-out Plan is consistent with the Government priorities.

The Phase-out Plan for the whole refrigeration sector will be managed by a dedicated team, consisting of a coordinator to be designated by the Government and supported by representatives and experts from the implementing/executing agency and the necessary support infrastructure. The policy and management support component of the phase-out plan will include the following activities for the duration of the plan:

- a) Management and co-ordination of the Plan implementation with the various Government policy actions pertaining to the refrigeration sector,
- b) Establishment of a policy development and enforcement program, covering various legislative, regulatory, incentive, disincentive and punitive actions to enable the Government to acquire exercise the required mandates in order to ensure compliance by the industry with the phase-out obligations
- c) Development and implementation of training, awareness and capacity-building activities for key government departments, legislators, decision-makers and other institutional stakeholders, to ensure a high-level commitment to the Plan objectives and obligations
- d) Awareness creation of the Phase-out Plan and the Government initiatives in the Sector among consumers and public, through workshops, media publicity and other information dissemination measures
- e) Preparation of annual implementation plans including determining the sequence of enterprise participation in planned sub-projects
- 1) Verification and certification of ODS phase-out in completed sub-projects within the Plan through plant visits and performance auditing
- g) Establishment and operation of a reporting system of usage of ODS/substitutes by users
- h) Reporting of implementation progress of the Plan for the annual performance-based disbursement
- i) Establishment and operation of a decentralized mechanism for monitoring and evaluation of Plan outputs, in association with provincial regulatory environmental bodies to ensure sustainability.

For implementation of service sector activities, the "Executive Teams" in the ten cities/regions of Venezuela will coordinate the project implementation in each region including following activities, -

- Reassessment and analysis of the sector after the approval of the SPP.
- Determination of the specification of equipment to be provided by the SPP.
- Selection of trainers for training of technicians (INTI with the help of UNIDO).
- Selection of service workshops to be trained.
- Awareness promotion.
- Development of licensing system (FONDOIN).
- Monitoring and report (FONDOIN – INTI – UNEP – UNIDO).

FONDOIN will be responsible for the national coordination of the whole program.

In terms of regional coordination, the executive teams in the Autonomous city of Caracas, Barquisimeto, Valencia, Maracaibo, Barcelona, and suburbs of Caracas will lead the project implementation for each region.

The executive team consists of representatives of the provincial governments (environmental departments and industry departments), customs offices, education and training institutions and industries.

The activities envisaged in the following are required for the coordination:

- A list of service workshops should be updated in terms of their CFC consumption, necessary equipment for recovery, their readiness to recover CFC, commitment to CFC phase out activity, capability and other factors relevant to the recovery and recycling scheme project.
- Possible institutes and/or enterprises for centers for training and recycling should be surveyed. The business criteria of refrigerant recycling center should be developed.
- Recipient service workshops of recovery machine should be determined.
- Un-recyclable refrigerants should be kept for further treatment at the proper site.

Further, local distribution of service equipment and refrigerant recovery and recycle machines, which will be procured through UNIDO bidding procedure and delivered to the country, should be executed.

### **Administration of technicians training program**

Fondoin as Head Office for the management of the Program should take all the administrative provisions required to organize the program and among these *provisions are* the organization of focal courses in major cities of Venezuela in agreement with the training institutions registered for the plan, the publicity through local media, registration of participants classified for both levels of the course (Academic or empirical), appointment of instructors, logistics (rooms, dates, hours, training materials, certificates, equipment for practices, audiovisual facilities, etc.).

The following information should be available to the administrators and instructors of the program:

- a) The *REPORT* about the training Institutions of Venezuela.
- b) The *REPORT* with information about Service Venezuela in the field of refrigeration and air conditioning.
- c) The *REPORT* about the recovery, recycling and refrigerants in Venezuela
- d) The textbook "Manual de Instrucción sobre enfriadores Refrigerantes" UN Publication ISBN 9280714694.

## **7. Monitoring and evaluation**

FONDOIN monitors the consumption data of all ODS. Inspections at reconverted companies are foreseen to ensure the non-uses of CFCs after project completion. The licensing System will be a tool to monitor and ensure compliance of control measures.

The Government has offered and intends continuing to offer continuity of activities and endorsement for the projects through the institutional support (National Ozone Unit) over the next years. This will guarantee the success of any activity approved for Venezuela.

After the establishment of the countrywide scheme of refrigerant recovery and recycling, the monitoring activity will be initiated to know whether the project is successfully implemented and the target CFC phase out is achieved.

Monitoring activity will be done by:

- (1) Establishing the system to ensure with the counterpart institute, that every recycling center and service workshop is encouraged or obliged to report data and give information to the recovery and recycling scheme. This may be enabled through forms to be filled by recycling centers and service workshops.
- (2) Setting up adequate office facilities including a computer system to collect and analyze the data.
- (3) Regular communication with the counterpart institute.
- (4) Occasional visits to workshops and recycling centers.
- (5) Regular communication with customs offices.

Following information will be collected from recycling centers and workshops.

#### CFC quantity

- Number of appliances subjected to refrigerant recovery and type of these appliances at every service workshop,
- Amount of recovered CFC refrigerants at every workshop,
- Amount of recovered CFC refrigerants sent to the recycling centers at every workshop,
- Amount of recovered CFC refrigerants stored at every workshop,
- Amount of recovered CFC refrigerants received from service workshops at every recycling center,
- Amount of recycled CFC refrigerants at recycling centers,
- Amount of recycled CFC refrigerants returned (sold) to workshops,
- Amount of recycled CFC refrigerants used in workshops and its application,
- Amount of CFC refrigerants, which can not be recycled and are subject to further treatment (e.g., sent to reclaiming plants, or decomposition plants abroad)
- Other data relevant for monitoring the scheme (amount of imported CFC refrigerants etc.).

#### Cost information

- Cost of recovery at every service workshop and parties who bear the cost,
- Cost of recycling at every recycling center and parties who bear the cost,
- Price of recycled CFC refrigerants,
- Other financial information relevant to monitoring the recovery and recycling scheme.

Data and information collected will be analyzed to check the adequate operations of the scheme.

## **8. Performance targets and disbursement schedule**

Table 24 gives an overview of the annual performance targets.

Table 24. Performance targets of the national CFC phase out plan, Venezuela

Year	Performance target				CFC Reduction (MT)
	Management	Foam sector	Refrigeration manufacturing sector	Refrigeration service sector	
2003	Project approval				-
2004	Establishment of operational mechanism for management and monitoring of the phase-out plan	Working agreement with enterprise in the sector	Working agreement with enterprise in the manufacturing sector	Training of national experts	50
	Coordination groups set up	Bidding of foaming equipment	Bidding of foaming equipment	linkage with on-going R&R	
	Start of awareness promotion			Selection of recycling centres	
	Monitor and evaluation			Bidding of recycling centre equipment	
				Training of centre staff	
				Selection of training institutes	
2005	Monitor and evaluation	Commissioning of foaming equipment	Provision of foaming and charging units to manufacturing enterprises	Bidding for service equipment for workshops (phase 1)	319
				Training of technicians (phase 1)	
2006	Monitor and evaluation		Commissioning of foaming equipment and charging units	Delivery of service equipment (phase 1)	530
	Workshops e.g., supplementary training			Bidding of service equipment (phase 2)	
				Training of technicians (phase 2)	
2007	Monitor and evaluation			Delivery of service equipment (phase 2)	600
	Workshops e.g., supplementary training			Selection of end-users or retrofitting and replacement	
2008	Monitor and evaluation			Execution of retrofitting and replacement	150
2009	Monitor and evaluation				150
2010	Monitor and evaluation				200

Upon approval of the phase-out plan by the MLF, the Government of Venezuela, through UNIDO, requests the Executive Committee to authorize disbursement of funding for 2004 in advance, the implementation plan for which, is as following:

- a) Establishment of operational mechanism for management and monitoring of the phase-out plan;
- b) Formulation of detailed terms of reference and work plans for various activities under the technical support and policy & management support components;
- c) Establishment of an operational mechanism for participation in the phase-out plan and for obtaining phase-out commitments from enterprises;
- d) Initiating CFC phase-out activities for the ... medium-sized enterprises through individual sub-projects;
- e) Selection of the small-sized enterprises for group projects;
- f) Two workshops under the technical support component for technology assistance to prospective participant enterprises in the sector;
- g) One workshop for public awareness and information dissemination under the policy and management support component.

Since the average duration for completion of a sub-project is expected to be about 24 months, the phase-out activities initiated in 2003 will not produce results until mid or end-2004, contributing to the reduction of consumption starting 2005. Therefore, the Government of Venezuela through UNIDO, will request the disbursement of the 2004 funding at the last Meeting of the Executive Committee in 2003, against satisfactory reporting of activities carried out in 2003. The funds for 2005 and 2006 will be transferred to UNIDO at the first meeting of the Executive Committee in these years, for the amounts listed in the table above, upon approval of the annual implementation plan and upon confirmation by the Government and UNIDO, that the agreed reduction targets and relevant performance milestones of the respective preceding years have been achieved.

The further detail must be agreed with the Executive Committee and stated in the Agreement.



**ANNEX I - Project cost break down of phase-out plan in foam sector**

**Group 1                      Enterprises with foaming base line equipment**

<b>Company name</b>	<b>CFC-11 consumption</b>	<b>Baseline equip.</b>
1 Polimeros Ind.	2.6	LPD
2 Fanabus	2.4	LPD
4 Ref, Rodriguez	0.5	LPD
5 Dureca	1.8	LPD
7 Carroceria Urena	1	LPD
9 Prointer	1.6	LPD
11 Gamma Industrial	1.6	LPD
14 R.S.M.	4.5	LPD

<b>No. of enterprises</b>	<b>8</b>	<b>16 MT CFCs</b>
3 Ebano	0.5	H M
6 Carroceria Andina	0.3	H M
8 Intercar	0.2	H M
10 Alza Astilleros	0.8	H M
12 Aislantes Termicos	1	H M
13 Lavenca	0.3	H M

<b>No. of enterprises</b>	<b>6</b>	<b>3.1 MT CFCs</b>
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**Total foaming sector                      19.1 MT CFCs**

**Summary of foaming enterprises and consumption (MT/yr.)**

Small size with LPD	8 Enterprises	16	MT CFCs
Small size with HM	6 Enterprises	3.1	MT CFCs
<b>Total</b>	<b>14 Enterprises</b>	<b>19.1</b>	<b>MT CFCs</b>

**ANNEX I - Project cost break down of phase-out plan in foam sector (*cont.*)**

**A. INCREMENTAL CAPITAL COSTS**

Investment component	Hand mixing base-line	Dispenser base-line	Sub-total
Foam dispenser	15,000	25,000	
Trials	2,000	2,000	
Technical assistance	1,500	1,500	
Training	1,000	1,000	
<b>Subtotal</b>	<b>19,500</b>	<b>29,500</b>	
<b>Number of enterprises</b>	<b>6</b>	<b>8</b>	
<b>Sub-total foaming (all enterprises)</b>	<b>117,000</b>	<b>236,000</b>	<b>353,000</b>
<b>Contingencies (10%)</b>			<b>35300</b>
<b>Grand total</b>			<b>388,300</b>

**B. INCREMENTAL OPERATING COSTS**

	Before conversion	After conversion	
Foam chemicals	136,429kg	143,250kg	
Rate	2.5US\$/kg	2.67US\$/kg	
Amount	341,071US\$	382,478US\$	
Net incremental Costs			41,406
(5%) savings due to more efficient operation			-2,070
Incremental Operating costs			39,336
One year (10%) discount factor (.91)	35,796		
Second year (10%) discount factor (.83)	32,649		
<b>Incremental operating costs for foaming operation in US\$)</b>			<b>68,444</b>

**C. TOTAL COSTS**

Incremental Capital Costs including contingencies	388,300
Incremental Operating Costs	68,444
<b>Grand Total incremental costs (US\$)</b>	<b>456,744</b>

**ANNEX II. Project cost break down of phase-out plan in the refrigeration manufacturing sector**

<b>Group 1</b>		<b>Enterprises with with base line equipment</b>			
<b>Medium size companies</b>		<b>consumption</b>			<b>Baseline equip.</b>
<b>Name</b>		<b>CFC-11</b>	<b>CFC-12</b>	<b>total</b>	
1Refrig. Duran		8.3	0.6	8.9	LPD & 1 CB &2 VP &1LD

<b>Group 2</b>		<b>Enterprises with base line equipment</b>			
<b>Small size companies</b>		<b>consumption</b>			<b>Baseline equip.</b>
2Refricentro		3.4	0.3	3.7	LPD & 1 CB &2 VP&1 LD
3Deinbo		1.2	0.3	1.5	LPD & 1 CB &2 VP & 1LD
4Deincopa		1	0.3	1.3	LPD & 1 CB &2 VP & 1LD
5Frimetal		1	0.3	1.3	LPD & 1 CB &2 VP &1 LD
6Metalcentro		1.6	0.3	1.9	HM & 1 CB &2 VP&1 LD
7Refriservice		2.4	0.5	2.9	HM & 1 CB &1 VP &1LD
8Frige Herven		0.5	0.3	0.8	HM & 1 CB &2 VP &1LD
9Cafrica		0.8	0.3	1.1	HM & 1 CB &1 VP &1LD
10RSM		4.4	0.3	4.7	HM & 1 CB &1 VP &1LD
11Redupeca		1	0.7	1.7	HM & 1 CB &1 VP &1LD
12Mercantil Sol y Aire		1.2	0.3	1.5	HM & 1 CB &1 VP &1LD
13Siherna		1	0.3	1.3	HM & 1 CB &1 VP &1LD
<b>Subtotal</b>		<b>27.8</b>	<b>4.8</b>	<b>32.6</b>	
Total (medium and small)		13enterprises			

VP= Vacuum pump 18 units  
 CB= Charging boards 13 units  
 LD= Leak detector 13 units

**Summary of existing enterprises and equipment**

With hand mixing equipment (HM)	8 companies
With low pressure machines (LPD)	5 companies
Without foaming operation (no baseline)	0 companies
Vacuum pump (VP)	<b>18 units</b>
Charging boards (CB)	<b>13 units</b>
Leak detector (LD)	<b>13 units</b>

**ANNEX II. Project cost break down of phase-out plan in the refrigeration manufacturing sector (cont.)**

<b>Group 3</b>		<b>Non-eligible enterprises (established after 1995)</b>	
<b>Company name</b>	<b>CFC consumption</b>	<b>Base line equipment</b>	
1 Vitrinas Aries	0.3	HM	& 1 CB &1 VP &1LD
2 Vitrinas Skayla	0.2	HM	& 1 CB &1 VP &1LD
3 Frio Joven de Venezuela	0.4	HM	& 1 CB &1 VP &1LD
4 Infrioca	0.3	HM	& 1 CB &1 VP &1LD
5 Inrein	0.2	HM	& 1 CB &1 VP &1LD
6 Maesca	0.1	HM	& 1 CB &1 VP &1LD
7 Refribar	0.5	HM	& 1 CB &1 VP &1LD
<b>Sub-total</b>	<b>2MT</b>		
	Hand Mixing (HM)	7	units
	Vacuum pump (VP)	7	units
	Charging boards (CB)	7	units
	Leak detector (LD)	7	units

**Summary of refrigeration enterprises**

<b>Eligible enterprises</b>	<b>Indicative number of enterprises</b>	
	<b>CFC's consumption (MT/yr.)</b>	
Medium-size		
with baseline equipment	1	8.9
Small-size		
with baseline equipment	12	23.7
<b>Total</b>	<b>13</b>	<b>32.6</b>
<b>Non eligible enterprises</b>	<b>7</b>	<b>2</b>
<b>Grand Total</b>	<b>20</b>	<b>34.6</b>

**ANNEX III - Project cost break down of phase-out plan in the commercial refrigeration sector**

**A. INCREMENTAL CAPITAL COSTS**

**Investment component**

	<b><u>Foaming operation</u></b>			<b>Subtotal</b>
	<b>No foaming base-line</b>	<b>Hand mixing base-line</b>	<b>Dispenser base-line</b>	
Foam dispenser	0	20,000	45,000	
Trials	0	2,000	2,000	
Technical assistance	0	1,500	1,500	
Training	0	1,000	1,000	
<b>Subtotal</b>	<b>0</b>	<b>24,500</b>	<b>49,500</b>	
<b>Number of enterprises</b>		<b>8</b>	<b>5</b>	
<b>Sub-total foaming (all enterprises)</b>		<b>196,000</b>	<b>247,500</b>	<b>443,500</b>

<b><u>Equipment</u></b>	<b><u>Refrigerant operation</u></b>		
	<b>Number of related items in all companies</b>		
Vacuum pumps	2,500	18	45,000
Charging units	2,000	13	26,000
Leak detectors	1,000	13	13,000
<b>Subtotal refrigeration equipment</b>			<b>84,000</b>
<b>Services</b>			
Trials	1,000		
Technical assistance	1,000		
Training	500		
<b>Subtotal</b>	<b>2,500</b>		
<b>Number of enterprises</b>	<b>13</b>		<b>32,500</b>
<b>Subtotal refrigeration equipment &amp; services (all enterprises)</b>			<b>116,500</b>
<b>Sub-total foaming &amp; refrigeration (all enterprises)</b>			<b>560,000</b>
<b>Contingencies (10%)</b>			<b>56,000</b>
<b>Grand Total</b>			<b>616,000</b>

**ANNEX III - Project cost break down of phase-out plan in the commercial refrigeration sector (cont.)**

**B. INCREMENTAL OPERATING COSTS**

**Foaming operation**

**Chemicals**

**Before conversion**

Unit	Quantity (kg)	Rate (US\$/kg)		Amount
kg	252,727	2.5	US\$	631,818

**After conversion**

Unit	Quantity (kg)	Rate (US\$/kg)		Amount
kg	265,364	2.67	US\$	708,521
	Net incremental cost (US\$/year)			76,703
(5%) Savings due to more efficient operation			(US\$/year)	3,835
	Incremental Operating Costs			US\$ 72,868
	First year (factor.91)			US\$ 66,310
	Second year (factor.83)			US\$ 60,480
<b>Incremental operating cost for foaming operation</b>			<b>US\$</b>	<b>126,790</b>

**B. INCREMENTAL OPERATING COSTS**

**Refrigerant operation**

Item	R-12 Refrigerant			
unit	kg			
Quantity				4,800
Price differential (pre and post conversion)			US\$	3
Modifying factor				0.9
Net incremental cost (US\$/year)	12,960			
First year (factor.91)			US\$	11,794
Second year (factor.83)			US\$	10,757
<b>Incremental operating cost for refrigerant operation</b>			<b>US\$</b>	<b>22,550</b>

**Incremental operating costs for foam operation** 126,790

**Incremental operating cost for refrigerant operation** 22,550

**Total I.O.C.** **149,340**

**C. TOTAL COSTS**

**Summary**

Investment component		
Incremental Capital Costs including contingencies		616,000
Incremental Operating Costs		149,340
<b>Total costs</b>		<b>765,340</b>

## Cost breakdown of project components of National CFC phase-out plan, Venezuela, in US\$

Items	Description	unit cost	Q'ty	Sub total	2003 tranche	2004 tranche	2005 tranche	2006 tranche	2007 tranche
<b>PROJECT MANAGEMENT</b>									
International consultant	Once per year for 2002 -2005	5,000	6	30,000	5,000	10,000	10,000	5,000	
Training of national experts		2,000	20	40,000	40,000				
Awareness promotion		3,000	12	36,000	9,000	9,000	9,000	9,000	
Coordination, monitoring, report				240,000	20,000	50,000	50,000	50,000	70,000
	Coordination office set up	15,000	4	60,000					
	Office equipment	2,500	4	10,000					
	Local services, e.g., selection of service providers and recipients, distribution of equipment			150,000					
	Travel	50	200	10,000					
	Report and sundries			10,000					
Element Total				346,000	74,000	69,000	69,000	64,000	70,000
<b>TECHNICAL SUPPORT COMPONENT</b>				400,000		0	0	200,000	200,000
<b>FOAM SECTOR PROGRAM</b>									
Equipment, foam operation				353,000	353,000	0	0		
Contingency				35,300		35,300	0		
Incremental operating cost				68,444			68,444		
Element total				456,744	353,000	35,300	68,444	0	0
<b>REFRIGERATION MANUFACTURING SECTOR PROGRAM</b>									
Equipment, foam operation				443,500	443,500				
Equipment, refrigerant operation				116,500			116,500		
Contingency				56,000			56,000		
Incremental operating cost				149,340			149,340		
Element total				765,340	443,500	0	321,840	0	
<b>NATIONAL PROJECT FOR TRAINING SERVICE TECHNICIANS</b>									
Establishment of training centres									
Training of trainers		500	15	7,500	7,500				
Training equipment	Teaching aids	400	15	6,000	6,000				
	Training rigs	1,000	15	15,000	15,000				
	Recovery machine	500	15	7,500	7,500				
	Recycling machine to be used for both training and recycling in R&R project	6,000	15	90,000	90,000				
	Cylinders, 13 kg	30	30	900	900				
	Vacuum pumps	150	30	4,500	4,500				
	Refrigerant identifier	1,000	15	15,000	15,000				
	Service tools, piercing valve, gauge manifold etc.	300	15	4,500	4,500				

Items	Description	unit cost	Q'ty	Sub total	2003 tranche	2004 tranche	2005 tranche	2006 tranche	2007 tranche
	Leak detector	300	15	4,500	4,500				
Mobile training facility for remote area		25,000	0	0					
Contingency				20,000			20,000		
Training workshops	150 x 3-days workshops with 10 trainees								
	Support for outstation trainees	50	1,000	50,000		0	50,000		
	Material - preparation drafting, translation, printing 3,000 copies			40,000		10,000	30,000		
	Fee for teachers	150	150	22,500		10,000	12,500		
	Certification, arrangement	200	150	30,000			30,000		
<b>Element Total</b>				<b>317,900</b>	<b>155,400</b>	<b>20,000</b>	<b>142,500</b>	<b>0</b>	
<b>NATIONAL RECOVERY AND RECYCLING PROJECT</b>									
Establishment of recycling centre	Total 25 recycling centres								
Training of recovery centre staff		500	15	7,500	7,500				
Centre equipment	Recycling machine with air purge function	8,000	15	120,000	120,000				
	Recovery cylinders	50	200	10,000	10,000				
	Storage cylinders	200	15	3,000	3,000				
	Service tools (piercing valve, gauge manifold etc.)	300	45	13,500	13,500				
	Refrigerant analyzer	1000	15	15,000	15,000				
	<b>Sub total</b>			<b>169,000</b>					
Equipment for service shops	For 2,500 shops								
	Recovery unit with filters	1000	1500	1,500,000		375,000	375,000	375,000	375,000
	Recovery unit	700	1,000	700,000		175,000	175,000	175,000	175,000
	Recovery bag	30	1,000	30,000		7,500	7,500	7,500	7,500
	Vacuum pump	200	2,000	400,000		100,000	100,000	100,000	100,000
	Recovery cylinder	30	2,000	60,000		15,000	15,000	15,000	15,000
	Flushing unit with non-CFC	500	1,000	500,000		125,000	125,000	125,000	125,000
	Service tools (piercing valve, gauge manifold etc.)	300	2,500	750,000		187,500	187,500	187,500	187,500
	<b>Sub total</b>			<b>3,940,000</b>					
Contingency				410,900					410,900
<b>Element Total</b>				<b>4,519,900</b>	<b>169,000</b>	<b>985,000</b>	<b>985,000</b>	<b>985,000</b>	<b>1,395,900</b>
<b>INCENTIVE PROGRAM FOR RETROFITTING, REPLACEMENT</b>									
		20000	50	1,000,000					1,000,000
<b>Element total</b>				<b>1,000,000</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1,000,000</b>
<b>Total funding</b>				<b>7,805,884</b>	<b>1,194,900</b>	<b>1,109,300</b>	<b>1,586,784</b>	<b>1,249,000</b>	<b>2,665,900</b>
<b>IA Cost</b>				<b>585,441</b>	<b>89,618</b>	<b>83,198</b>	<b>119,009</b>	<b>93,675</b>	<b>199,943</b>
<b>Total Grant by MFMP</b>				<b>8,391,325</b>	<b>1,284,518</b>	<b>1,192,498</b>	<b>1,705,793</b>	<b>1,342,675</b>	<b>2,865,843</b>