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Executive Committee of
the Multilateral Fund for the
Implementation of the Montreal Protocol

Tenth Meeting
Montreal, 28–30 June 1993

COUNTRY PROGRAMME: FIJI

This document consists of:

- (a) Country Programme Evaluation Sheet (prepared by the Fund Secretariat)
- (b) Country Programme Cover Sheet (prepared by the Fund Secretariat)
- (c) Transmittal Letter from Government of Fiji
- (d) The Country Programme

FIJI COUNTRY PROGRAMME EVALUATION SHEET

The Fiji Country Programme is submitted to the Tenth Meeting of the Executive Committee as document UNEP/OzL.Pro/ExCom/10/22. The document is consistent with the format indicated in the Procedures for Presentation of Country Programmes and Project Proposals to the Executive Committee (UNEP/OzL.Pro/ExCom/5/16)

It consists of:

- Letter of Transmittal
- Country Programme Cover Sheet (Prepared by the Secretariat)
- Executive Summary
- Introduction
- Consumption and Use of Control Substances
- Analysis of Future Demand for the Controlled Substances
- Industry Structure
- The Status of Response to the Montreal Protocol
- Institutional Framework
- Existing Policy and Operational Framework
- Strategy Statement by the Government
- Action Plan
- Summary and Budget for the Action Plan

The total ODS consumption in Fiji in 1991 was 46.6 ODP tonnes. The consumption of CFC-11 and CFC-12 constituted 12.2 and 28.1 ODP tonnes respectively. Distribution of consumption per sector for the same year was estimated as follows:

- 68% in the refrigeration sector
- 18% in the foam sector
- 12% in the solvent sector
- 2% for fire extinguishers

The predicted ODS consumption following the unconstrained demand is estimated at 171 tonnes by the year 2010.

The Government of Fiji is committed to phasing out the consumption of controlled substances by the year 2000.

Incremental cost for the phase-out of controlled substances have been estimated for two scenarios:

- (a) Accelerated phase-out through the implementation of this Country Programme which targets the phase-out at year 2000. The incremental costs are estimated based on the planned activities under the Action Plan.

- (b) Phase-out in the year 2010 in accordance with the requirements of the Montreal Protocol for countries operating under paragraph 1 of Article 5. (Freeze at 1995-1997 level by 1999; 50% reduction by 2005; 85% reduction by 2007; complete Phase-out by 2010). The consumption of the controlled substances is assumed to follow the maximum allowable consumption.

The incremental costs for the accelerated phase-out scenario and phase-out in accordance with the Montreal Protocol are US \$28.5 million and US \$20.7 million respectively.

To achieve the accelerated ODS phase-out the Government has developed the Action Plan based on Government and industry actions. Government actions consist of a broad scope of policy and legislative measures including control of importation of the controlled substances and their products, compulsory recovery and recycling and workshop licensing, adjustments of the custom's coding system, duty exemptions/reductions for ozone-friendly equipment, institutional strengthening programme, public awareness, information exchange and training. ODS phase-out monitoring programme.

The industry actions will consist of implementation of the following projects:

1. Recycling of refrigerants and better servicing practice
2. Retrofitting industrial refrigeration systems to use ammonia
3. Retrofitting existing commercial refrigerators
4. Converting the existing CFC using flexible and rigid foam industry to use alternatives
5. Converting the garment industries from using methyl chloroform to other substances
6. Recycling and recovery of halons
7. Central halon banking system

Total budget of the Action Plan is estimated to be US \$466,300.

The implementation government and industry action is scheduled for 1993 to 1996, leading to the elimination of up to 27 tonnes of ODSs.

Recommendations

The following recommendations are made for the consideration of the Executive Committee:

1. The Country Programme be approved without approval of the indicated funding level.
2. The implementing agencies be requested to submit proposals for funding activities and projects listed therein for consideration by the Executive Committee at its following meetings.

COUNTRY PROGRAMME COVER SHEET

Country : Fiji

Date Received : 13 May 1993

Period Covered : 1993-1996

Lead National Agency : Ministry of Housing and Urban Development

1. Phase-out schedule

Substances	Current Consumption (Tonnes X ODP) in 1991	Planned Total Consumption till Phase-out Tonnes X ODP		Planned Year of Phase-out	
		Article 5 schedule	Accelerated Schedule	Article 5 schedule	Accelerated Schedule
CFC-11	12.2	64.3 ¹	25.9 ¹	2010	2000
CFC-12	28.1	81.0 ²	41.2 ²	2010	2000
CFC-115	1.8	8.4 ²	4.3 ²	2010	2000
Halon-1211	3.7	-	-	2010	1998
CTC	0.2	-	-	2010	2000
Methyl Chloroform	0.6	1.7 ²	0.9 ²	2010	2000
TOTAL	46.6	155.4	72.3		

¹ The average growth rate of CFC-11 consumption is assumed to be 10% in the foam sector and 4% from 1992 to 1999 and 7% from 2000 to 2010 in the refrigeration and AC sectors.

² The growth rate of CFC-12, CFC-115 and Methyl Chloroform consumption is assumed to be 4% from 1992 to 1999 and 7% from 2000 to 2010.

GOVERNMENT ACTION PLAN

Description of Actions	Commencement/Duration	Estimated Cost US \$
1. Adoption of an overall policy for the protection of the ozone layer.	February 1993 (begin preparation) August 1993 (adoption)	
2. Adoption of various legislations to control and monitor the consumption of controlled substances	February 1993 (begin preparation) December 1993 (adoption)	
3. Establishment of Ozone Fund under the Min. of Housing and Urban Dev. for the implementation of the Country Programme	March 1993	
4. Establishment of an ODS Sub-Unit under the Min. of Housing and Urban Development	August 1993 1993-1996	97.500
5. Establishment of an ODS Inspectorate under the Mins. of Employment and Industrial Rel. to ensure compliance with laws by industries	February 1993 (begin preparation) January 1994 (implementation) 1993-1996	78.400
6. Various projects for public awareness: information exchange and training. Information pamphlets, public lectures, logo, articles, radio/TV/newspaper, adverts/announcements, custom officers training, etc.	To be conducted as appropriate	
7. Customs coding system: adoption of separate subheadings for each controlled substances and reporting to the ODS Sub-Unit	April 1993 (begin preparation) January 1994 (implementation)	
8. Industry reports: reporting by each industry on the import and use of controlled substances	1993 (begin preparation) January 1994 (implementation)	
TOTAL		275,900

PROJECT SUMMARY

Project Description	Commencement/Duration	Use Sector	Tonnes ODP Phased Out	Estimated Cost US \$
1. Recycling of refrigerants	1995-1996	Refrig.	10-15 tonnes (CFC-12)	9,600
2. Training element: training course for refrigeration and a/c technicians	October 1994/5			44,600
3. Retrofitting existing industrial refrigeration systems to ammonia	Before 2000	Refrig.	1-2 tonnes (CFC-12) 1-2 tonnes (CFC-11)	
4. Training element: training of technicians on safety measure when operating ammonia refrigeration systems in industries	June 1995/6			9,700
5. Retrofitting existing commercial refriger. equipment to use HFC-134a	1995-1996	Refrig.	5-10 tonnes (CFC-12)	100,000
6. Conversion of flexible and rigid foam industries from using CFC-11 to substitutes	1996 (submission of proposals by industries)	Foams		
7. Training element: special technical lecture on the conversion of CFC-11 using foam industries to methylene chloride (including safety aspects for the workers)	June 1994			16,000
8. Substituting the use of methyl chloroform in garment industries	November 1994 (submission of proposals by industries 1996)	Solvents		
9. Training element: special technical lecture on substitutes for methyl chloroform (garment industries)				10,000
10. Recovery and recycling of halons	January 1994 onwards	Halons		
11. Central halon banking system	January 1994 onwards	Halons		
TOTAL			17-28	189,400

COST

Cost of activities and projects in the Country Programme is US \$ 465,300.



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URBAN DEVELOPMENT

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708/30/1-I

12 May 1993

Mr El-Arini
Chief Officer
UN Multilateral Fund
Montreal Protocol
27th Floor, Montreal Trust Building
1800 McGill College Ave
Quebec Montreal H3A 3J6
CANADA.

Dear Sir

Re: Fiji Country Programme
For the reduction and phase-out of
Ozone Depleting Substances
Controlled under the Montreal Protocol

We are pleased to inform you that the Fiji Country Programme for the Reduction and Phase-out of Ozone Depleting Substances has been completed and has been approved by the Fiji Government's Cabinet on 4/5/93.

The Ministry hereby officially submits to you a copy of the Country Programme for presentation to, and approval by, the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol at its next meeting.

As you are aware, Fiji is a Party to the Protocol and is operating under paragraph 1 of Article 5.

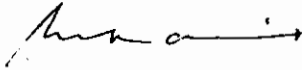
The Country Programme, amongst other things, includes Fiji Government's commitment to implementing the actions contained in the Country Programme with financial and technical assistance from the Fund. It is proposed to set up a monitoring unit within the Ministry of Labour and Industrial Relations.

/2..

We would like to record our appreciation for the assistance provided by UNEP's Industry and Environment Programme Activity Centre in the development of the Country Programme and for valuable advice.

The Ministry looks forward to your responses in due course.

Yours faithfully



B. Nair
Deputy Permanent Secretary
for Permanent Secretary for Housing
and Urban Development

cc: Mr R M Shinde
Coordinator
UNEP IE/PAC Ozone Action Programme

FJI
COUNTRY PROGRAMME

**FOR THE REDUCTION AND PHASE-OUT OF OZONE DEPLETING SUBSTANCES
CONTROLLED UNDER THE MONTREAL PROTOCOL**

M A Y 1 9 9 3

MINISTRY OF HOUSING AND URBAN DEVELOPMENT
Consultative Committee on Ozone Depleting Substances [Fiji]

UNITED NATIONS ENVIRONMENT PROGRAMME
[Industry and Environment Programme Activity Centre]

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EXECUTIVE SUMMARY

1. Introduction

This Country Programme reflects the commitment of the Government of Fiji to comply with the obligations of the Montreal Protocol on Substances that Deplete the Ozone Layer, to which Fiji is a Party. It provides the framework for activities to be undertaken by Fiji to achieve the required phase out of ozone depleting substances controlled under the Montreal Protocol and its London Amendment (controlled substances) and forms the basis for requesting assistance from the Multilateral Fund (and the Interim Multilateral Fund) for those activities.

The Country Programme was prepared between the period February-October 1992 and it should be updated during 1996. The updated Country Programme should be implemented from 1997.

The Country Programme contains the following:

- (a) Data and information on the consumption and use pattern of ozone depleting substances (ODS) controlled under the Montreal Protocol and its Amendment (adopted in London in 1990) collected through a survey of controlled substances and products containing controlled substances, undertaken by the Institute of Natural Resources of University of the South Pacific (Report by the Institute attached as Annex I to the Country Programme report). Data and information for the years 1986, 1989, 1990 and 1991 are contained.
- (b) Analyses of possible future demands for the controlled substances (unconstrained demand) and an indication of the total incremental cost for the phase-out of the controlled substances.
- (c) Information on the existing institutional and policy framework that are relevant to the use of controlled substances and the implementation of the Montreal Protocol.
- (d) Government strategy statement with regard to the implementation of the Montreal Protocol and the phase-out of controlled substances.
- (e) Action Plan of Fiji to phase out the consumption and use of controlled substances, based on the 1991 status of consumption and use of those substances. The Action Plan covers the period from 1993 to 1996 and it consists of various programmes and projects categorized under Government Programmes and Industry Actions. Budget estimates are included for the programmes and projects for which assistance is requested from the Multilateral Fund. The timetable for the implementation of the Action Plan clearly reflects the prioritization of the programme and projects. The necessary institutional strengthening and improvements in the record keeping and reporting by the industries for future monitoring purposes are included in the Action Plan.

The Country Programme was prepared under the responsibility of the Ministry of Housing and Urban Development and its Environment Management Unit with technical assistance of Industry and Environment Programme Activity Centre (IE/PAC) of the United Nations Environment Programme (UNEP) and financial support from the Interim Multilateral Fund through IE/PAC. The Consultative Committee on Ozone Depleting Substances (CCODS) provided advice and assistance throughout the process of the Country Programme preparation.

The Country Programme was adopted by the Ministry of Housing and Urban Development and finally approved by the Cabinet. It was decided that Fiji should implement the Country Programme under the responsibility of the

(ii)

Ministry of Housing and Urban Development.

2. Consumption and use of controlled substances

(a) Past situation

Consumption of controlled substances as bulk chemicals:

Fiji does not produce or export any controlled substances, but imports CFCs (CFC-11, CFC-12 and CFC-115) for servicing refrigerators and air-conditioners, as well as for production of foams. Import of halons ceased in 1992. Methyl chloroform and carbon tetrachloride are imported as bulk chemicals for use as solvents.

The total consumption, calculated consumption and calculated per capita consumption for the years 1986, 1989, 1990 and 1991 of the controlled substances were as follows:

Year	Consumption (Tonnes)	Calculated consumption (Tonnes x ODP)	Calculated per capita consumption (kg)
1986	23.0	24.6	0.03
1989	44.5	45.5	0.06
1990	39.4	40.8	0.05
1991	50.7	52.1	0.07

The consumption (Tonnes) of CFC-12 in the years 1986, 1989, 1990 and 1991 were 10.3, 23.9, 20.0 and 28.1, respectively. All the CFC-12 are used by servicing workshops to refill refrigerator systems and air-conditioners (mainly automotive).

The consumption (Tonnes) of CFC-11 in the years 1986, 1989, 1990 and 1991 were 5.3, 13.1, 14.0 and 12.2, respectively. CFC-11 primarily used by one foam manufacturing company producing flexible foam products (mainly for mattresses and furniture) and a very small quantity is used to manufacture floatation. In 1989, 1990 and 1991, the percentages of the total imported CFC-11 that were used for manufacture of foam were 61% (8 Tonnes), 64% (9 Tonnes) and 74% (9 Tonnes), respectively. The remaining percentages of CFC-11 were used for servicing refrigeration and air-conditioning equipment. The percentages of the total import of CFC-11 that were used under the refrigeration and air-conditioning sector in the three years were 39% (5.1 Tonnes), 36% (5 Tonnes), and 26% (3.2 Tonnes), respectively.

Small quantities of CFC-115 are imported as part of a refrigerant mixture R-502. The consumption of CFC-115 in 1986, 1989, 1990 and 1991 were 2.1, 5.1, 2.7 and 2.9 Tonnes. In 1989, 1990, and 1991, consumption of CFC-115 constituted approximately 18%, 11% and 9% of the total refrigerant consumption, respectively.

Methyl chloroform and carbon tetrachloride are imported as solvents. In 1986, 1989, 1990 and 1991, the quantities of import of methyl chloride, used primarily by garment industry for spot cleaning and bottled gas companies for cleaning out gas lines, were 3.9, 0.7, 1.2 and 6.0, respectively. Import of carbon tetrachloride, used as laboratory solvent were 0.2 Tonnes in each of the four years.

Products Containing Controlled Substances:

Refrigeration and air conditioning equipment containing controlled substances: the demand for refrigerator systems are met through import. All air-conditioning systems (stationary and mobile) systems are imported and not

(iii)

locally manufactured. The importation of domestic refrigerators and freezers in 1986, 1989, 1990 and 1991 were 3,173, 5,000, 6,238 and 7,779, respectively. The main source countries include New Zealand and USA. The estimate of the number of domestic refrigerators and freezers that were operating in Fiji in 1991 is 87,800 units.

The number of commercial and industrial refrigeration equipment imported in 1986, 1989, 1990 and 1991 were 468, 1,332, 1,080 and 1,193. There were an estimated number of 6,300 units of commercial and industrial refrigeration systems in operation in Fiji in 1991. The equipment include open-top freezers, coolers and refrigerated display cases in shops and stores which use CFC-12 as refrigerant; cold storage/rooms, freezer rooms and chillers in various industries dominantly using CFC-12 refrigerant; ice-making machines in the ice-making industries. Number of commercial refrigeration systems in operation are estimated to be 3,000, and cold stores and rooms, 3,600.

Several automobiles are imported with air-conditioners using CFC-12 refrigerant. It is estimated that the vehicles with air-conditioners imported in 1986, 1989, 1990 and 1991 constituted 15%, 45%, 55% and 75% of the total numbers of vehicles imported in the four years respectively. An estimated 7,000-8,000 automotive air-conditioners exist in Fiji.

Almost all the air-conditioning equipment found in Fiji use HCFC-22 as refrigerant. There are some 5-10 large central air-conditioning systems that are using CFC-11 as refrigerant.

Flexible and rigid foams: Flexible foam products (mattresses, cushions, etc.) are produced in the country and most of the demand for these products are met through local production. Foam for floatation are also produced but in limited quantities.

Aerosols: All aerosols are imported, mainly from Australia and New Zealand. In 1989, Australia and New Zealand discontinued the use of CFCs as propellants in most uses. Majority (98%) of the aerosols imported are labelled as ozone friendly or specify hydrocarbon as propellant.

Halon fire extinguishers: All fire extinguishers are imported. A number of large halon fire extinguisher systems in Fiji, but most of the users intend to discontinue the use. Some portable halon units are also found. Since the cost of maintenance is high, the users are amiable to any replacement proposals and some users have already started to phase out the use of halons. Importation of portable halon fire extinguisher has been decreasing: in 1986, 1989, 1990 and 1991, 234, 177, 104 and 35 were imported, respectively.

(b) Analyses of Future Demand for the Controlled Substances

Unconstrained Demand:

The future demand for the controlled substances is estimated assuming that the Montreal Protocol did not exist. The annual GDP growth rate from 1986 to 1991 and the assumed GDP growth rate for 1992 to 2010 are as below and the average annual population growth rate from 1976 to 1986 was 2.0%.

The actual and predicted annual GDP growth rate:

1986:	8.3%
1987:	-6.6%
1988:	0.9%
1989:	11.9%
1990:	5.0%
1991:	0.4%
1992 - 1999:	4.0%
2000 - 2010:	7.0%

(iv)

The demand for refrigerants is assumed to grow at a similar rate as the assumed GDP growth rate, i.e. 4.0% growth rate in CFC-12 consumption is assumed for years 1992 to 1999 and 7.0% for the years 2000 to 2010. The demand for CFC-11 used for servicing refrigeration and air-conditioning equipment, mainly for cleaning the equipment, is assumed to grow at the same rate. The demand for CFC-11 used as foam blowing agent is assumed to show an average annual growth rate of 20%. Consumption of methyl chloroform is also assumed to grow at the same rate as the assumed GDP growth rate.

The GDP growth rate, the assumed unconstrained demand growth for the refrigeration, foam and solvent sector (for methyl chloroform); the predicted consumption of each controlled substance; and the total consumption are shown in the Table A below:

Table A: Summary of the yearly predicted consumption following the unconstrained demand

Year	GDP %	Assumed Growth Rates foam/refrig.& solv.	CFC-11 (foam) Consump.	CFC-11 (refrig) Consump.	CFC-115 Consump.	CFC-12 Consump.	Meth.ch Consump	Total Consump.
1991	4		9.0	3.2	2.9	28.1	6.0	49.2
1992	4	10% / 4%	9.9	3.3	3.0	29.2	6.2	51.6
1993	4	" / 4%	10.9	3.5	3.1	30.4	6.5	54.4
1994	4	" / 4%	12.0	3.6	3.3	31.6	6.7	57.2
1995	4	" / 4%	13.2	3.7	3.4	32.9	7.0	60.2
1996	4	" / 4%	14.5	3.9	3.5	34.2	7.3	63.4
1997	4	" / 4%	15.9	4.0	3.7	35.6	7.6	66.8
1998	4	" / 4%	17.5	4.2	3.8	37.0	7.9	70.4
1999	4	" / 4%	19.3	4.4	4.0	38.5	8.2	74.4
2000	7	" / 7%	21.2	4.7	4.3	41.2	8.8	80.2
2001	7	" / 7%	23.3	5.0	4.6	44.1	9.4	86.4
2002	7	" / 7%	25.7	5.4	4.9	47.2	10.0	93.2
2003	7	" / 7%	28.2	5.8	5.2	50.5	10.7	100.4
2004	7	" / 7%	31.1	6.2	5.6	54.0	11.5	108.4
2005	7	" / 7%	34.2	6.6	6.0	57.8	12.3	116.9
2006	7	" / 7%	37.6	7.1	6.4	61.8	13.2	126.1
2007	7	" / 7%	41.4	7.6	6.9	66.2	14.1	136.2
2008	7	" / 7%	45.5	8.1	7.4	70.8	15.1	146.9
2009	7	" / 7%	50.0	8.7	7.9	75.7	16.1	158.4
2010	7	" / 7%	55.0	9.3	8.4	81.0	17.3	171.0

Estimation of incremental cost:

The incremental cost is estimated for two phase-out scenarios:

- Accelerated phase-out following the Action Plan under this Country Programme;
- Phase-out in accordance with the requirements of the Montreal Protocol for countries operating under paragraph 1 of Article 5.

The method used in the attempt to estimate the incremental costs for Fiji is a simple one, based on several simplistic assumptions. The estimation of the incremental costs are only roughly indicative and would not be comparable to incremental costs estimated for other countries due to the wide differences in the assumptions made and the methodologies for the estimation. The estimated incremental costs does not indicate the costs of the Action Plan.

The total incremental costs estimated for the two scenarios using 10% discount rate are as follows:

(v)

- (a) Accelerated phase-out: US \$ 28,452,956 (appr. 28,500,000)
- (b) Phase-out in accordance with the Montreal Protocol: US \$ 20,740,041 (appr. 20,700,000)

The comparison of the discounted costs (10% discount rate) of phase-out under the two scenarios indicates that the incremental costs are lower when the phase out schedule under the Montreal Protocol is followed. However, this should not lead to a conclusion that developing countries operating under paragraph 1 of Article 5 should rather follow the Montreal Protocol phase-out schedule rather than an accelerated one. The following points need to be kept in mind:

- In reality the controlled substances will soon become unavailable and the prices of the substances are already rising. Prolonged use of the controlled substances will result in difficulties and considerable cost increase to the consuming countries, in particular the countries that do not produce controlled substances, to meet the demand for the substances. The delayed phase-out would impose such burden to the developing countries;
- The magnitude of seeming cost advantage in delaying the phase out is dependant upon the discount rate chosen. If a lower discount rate is chosen, the cost advantage would become smaller;
- Most importantly, the environmental benefits of less consumption, hence emission of controlled substances would far outweigh the extra costs that may be incurred in accelerating the phase-out.

3. Implementing phase-out

(a) Action Plan

The Government of Fiji is committed to phasing out the consumption of controlled substances by the year 2000, before the required phase-out year for Parties operating under paragraph 1 of Article 5. In order for Fiji to meet this goal, financial and technical assistance from the Multilateral Fund (and the Interim Multilateral Fund) is essential so that the Country Programme could be implemented effectively.

The Action Plan for phasing out the controlled substances consists of two parts: the Government Actions comprising six programmes; and Industry Actions comprising seven phase-out projects. The various programmes, projects and elements under the Action Plan are summarized in the table below with indications of the expected reduction of consumption of controlled substances and the total budget for each programme, project or element.

Since the programme and project budgets are estimates, there may be either surplus or shortage of funds to carry out the planned activities. Any surplus would be accounted for in the Country Programme update and shortage would have to be re-requested from the Multilateral Fund. An account will be submitted annually to the Secretariat for the Multilateral Fund.

Table B: Summary of the programmes, projects and elements under the Action plan including indications of expected reduction of consumption of controlled substances and the total budget for each programme, project or element.

Programmes/projects/elements	Brief Description	Commencement/Duration	Use sector	Budget
GOVERNMENT ACTIONS				
Programme 1				
1. policy	Adoption of an overall policy for the protection of the ozone layer.	February 1993 (begin preparation) August 1993 (adoption)	All	
2. legislation	Adoption of various legislations to control and monitor the consumption of controlled substances.	February 1993 (begin preparation) December 1993 (adoption)	All	
Programme 2				
1. Ozone Fund	Establishment of Ozone Fund under the Min. of Housing and Urban Dev. for the implementation of the Country Prog.	March 1993	All	
Programme 3				
1. ODS Sub-Unit	Establishment of an ODS Sub-Unit under the Min. of Housing and Urban Development	August 1993	All	197,500
2. ODS Inspectorate	Establishment of an ODS Inspectorate under the Min. of Employment and Industrial Rel. to ensure compliance with laws by industries.	February 1993 (begin preparation) January 1994 (implementation)	All	78,400
Programme 4				
Various projects for public awareness, information exchange and training	Information pamphlets; public lectures; logo; articles; radio/TV/newspaper adverts/announcements; custom officers training; etc.	To be conducted as appropriate	All	incorporated under budget for the ODS Sub-Unit
Programme 5				
1. Customs coding system	Adoption of separate subheadings for each controlled substances and reporting to the ODS Sub-Unit	April 1993 (begin preparation) January 1994 (implementation)	All	
2. Industry reports	Reporting by each industry on the import and use of controlled substances.	1993 (preparations) January 1994 (implementation)	All	

Table B continued_ /

Programmes/projects/elements	Brief Description	Commencement/Duration	Use sector	Budget
INDUSTRY ACTIONS				
1. Project R1	Recycling of refrigerants.	1995-1996	Refrig.	53,700
- Training element	Training course for refrigeration and a/c technicians.	October 1994/5		
2. Project R2	Retrofitting existing industrial refrigeration systems to ammonia.	Before 2000	Refrig.	9,700
- Training element	Training of technicians on safety measures when operating ammonia refrigeration systems in industries.	June 1995/6		
3. Project R3	Retrofitting existing commercial refrigeration equipment to use HFC-134a.	1995-1996	Refrig.	100,000
4. Project F1	Conversion of flexible and rigid foam industries from using CFC-11 to substitutes.	1996 (submission of proposals by industries)	Foams	16,000
- Training element	Special technical lecture on the conversion of CFC-11 using foam industries to methylene chloride (including safety aspects for the workers).	June 1994		
5. Project S1	Substituting the use of methyl chloroform in garment industries	1996 (submission of proposals by industries) November 1994	Solvents	10,000
- Training element	Special technical lecture on substitutes for methyl chloroform (garment industries)			
6. Project H1	Recovery and recycling of halons	January 1994 onwards	Halons	[10,000]
7. Project H2	Central halon banking system	January 1994 onwards	Halons	

TOTAL BUDGET	Government Actions:	US \$	275,900
	Industry Actions:	US \$	189,400 [+10,000]
GRAND TOTAL		US \$	465,300 [+10,000]

1. INTRODUCTION

1.1 Purposes

This country programme reflects the commitment of the Government of Fiji to comply with the obligations of the Montreal Protocol on Substances that Deplete the Ozone Layer, to which Fiji is a Party. It provides the framework for activities to be undertaken by Fiji to achieve the required phase out of ozone depleting substances controlled under the Montreal Protocol and its London Amendment (controlled substances) and forms the basis for requesting assistance from the Multilateral Fund for those activities.

The objectives of this Country Programme are:

- (a) To survey, assess and analyze the situation with regard to consumption and use pattern of the controlled substances for the years 1986, 1989, 1990 and 1991;
- (b) To record the existing institutional framework in Fiji, including Governmental bodies and industry associations and related organizations, as well as policy framework that are relevant to issues of ozone layer protection and ozone depleting substances (ODS);
- (c) To analyse the possible future demands for controlled substances if no measures are taken to control the consumption (unconstrained demand) and to estimate the incremental cost for phasing out the controlled substances;
- (d) To spell out the Government strategy with regard to the phase-out of controlled substances;
- (e) To outline the Action Plan including strengthening of the institutional capacity and capability in Fiji for phasing out the consumption of the controlled substances;
- (f) To provide a framework (including a budget) for the future programmes and projects for which financial and technical assistance from the Multilateral Fund is sought and to prioritize those activities through a time schedule for the activities;
- (g) To outline the scheme for implementing the Action Plan and for monitoring the consumption of the controlled substances to:
 - (i) ensure that the Country Programme is implemented;
 - (ii) enable observation/evaluation of effectiveness of the implementation of the Action Plan in reducing and phasing out the consumption and use of the controlled substances; and
 - (iii) ensure compliance with the reporting requirements of the Protocol (Article 7).

1.2 Status of the Country Programme

The Country Programme was prepared between the period February-October 1992, and contains data and information on the consumption and use of controlled substances for the years 1986, 1989, 1990 and 1991. It is the first country programme prepared for Fiji. No country study for Fiji has been carried out previously by any international organizations.

The possible future demands for the controlled substances have been analysed and an indication of the total cost for the phase-out of the controlled substances was derived.

The Action Plan of Fiji to phase out the consumption and use of controlled substances is based on the 1991 status of consumption and use of those substances. The Action Plan covers the period from 1993 to 1996 and it consists of various programmes and projects categorized under Government Actions and Industry Actions. Budget estimates have been made for the programmes and projects for which financial and technical assistance are requested from the Multilateral Fund for the implementation. The timetable for the implementation of the Action Plan reflects the prioritization of the programmes and projects.

The existing institutional framework for dealing with the issues under the Montreal Protocol is recorded. The Action Plan includes plans for expanding and strengthening this framework in order to:

- (i) coordinate the implementation of the country programme;
- (ii) monitor the consumption of the controlled substances and the execution of the various projects for reduction and phase-out of the controlled substances; and
- (iii) evaluate the effectiveness of the programmes and projects in achieving the reduction and phase-out.

This Country Programme should be updated during 1996 and the updated Country Programme should be implemented from 1997.

1.2.1 Preparation and Adoption of the Country Programme

The country programme was prepared under the responsibility of the Ministry of Housing and Urban Development with technical assistance of Industry and Environment Programme Activity Centre (IE/PAC) of the United Nations Environment Programme (UNEP) and financial support from the Interim Multilateral Fund through IE/PAC.

The Country Programme was prepared in two phases:

- Phase I: A survey of the consumption and use of the controlled substances and existing policy and institutional framework with regard to the controlled substances;
- Phase II: Analyses of data and information collected through the survey; development of strategy and Action Plan; identification of programmes and projects and their prioritization; and preparation, review and adoption of the report on the Country Programme.

The survey was undertaken by the Institute for Natural Resources of the University of the South Pacific, directed and coordinated by the Ministry of Housing and Urban Development, its Environmental Management Unit and Fiji's Consultative Committee on Ozone Depleting Substances (CCODS). In the course of the survey, the survey team met weekly, inviting several specialists to brief the team on various matters regarding the use of ozone depleting substances (ODS). The CCODS also met a number of times to discuss the progress of the survey. The report of the Institute for Natural Resources is attached as Annex I to this report.

The Ministry and CCODS decided upon the strategy and Action Plan for the phase-out with assistance from IE/PAC consultant, and reviewed and adopted the report.

The final approval of the report was given by the [Minister for Housing and Urban Development][Cabinet] upon recommendation of the [Ministry and] [CCODS]. It was decided that Fiji should implement the country programme under the responsibility of the Ministry of Housing and Urban Development. The CCODS

will undertake an advisory role in the implementation of the Country Programme.

1.2.2 Participation in the Preparation of the Country Programme:
Responsibilities and Roles

Short description of the various bodies involved in the preparation of this Country Programme and their responsibilities and roles in the preparation are given below:

- (a) Ministry of Housing and Urban Development and its Environmental Management Unit:

Took the leadership in the preparation of the Country Programme. Coordinated the survey, the process of developing the strategy and action plan and the process of review and adoption of the report. Developed and decided on the strategy and action plan with appropriate inputs from the CCODS and IE/PAC; reviewed and adopted the report; and recommended it for consideration, approval and final adoption by the Government.

- (b) Consultative Committee on Ozone Depleting Substances (CCODS): The Minister for Housing and Urban Development, with the approval of the Cabinet, appointed the Committee to advise him on (i) the phasing out of ozone depleting substances (ODS); and (ii) introduction of technology that is ozone friendly. The Committee comprises members that represent the following interests: chemistry field; building industry; hotel industry; refrigeration industry; shipping industry; motor traders association; consumer council; fire control; ODS distribution; and the Government:

Provided advice for the conducting of the survey; undertook the responsibility of overseeing that the survey was conducted as required; assisted in facilitating the acquisition of data by the survey team; provided advice and inputs for the development of the strategy and action plan for the phase-out of the controlled substances; recommended the strategy and action plan; and reviewed and adopted the report.

- (c) Institute of Natural Resources of the University of the South Pacific:

Conducted the survey of the consumption, use, imports and exports of the controlled substances and the products that contain controlled substances; compiled the collected data into a report to the CCODS (report attached as Annex I); assisted in the analyses of data; and contributed ideas and views on the country's strategy and action plan for phasing out the consumption of the controlled substances.

- (d) Industry and Environment Programme Activity Centre of UNEP (UNEP IE/PAC) -Implementing Agency:

Provided the financial support and technical assistance including assistance in:

- (i) outlining the overall strategy and plans for the preparation of the Country Programme;
- (ii) conducting the survey;
- (iii) carrying out the necessary analyses of the data and information collected through the survey;
- (iv) developing the strategy and the Action Plan for phase-out of the controlled substances; and
- (v) the preparation of the report.

1.2.3 Sources of Data and Information

Both government and private industries/companies cooperated and supported the survey by providing the necessary data and information to the survey team and in some cases, acting as a full partner in the conduct of the survey. The bodies and the data and information they provided are as follows:

Governmental bodies:

- (a) Department of Energy: provided most of the information on refrigeration;
- (b) Fiji Bureau of Statistics: provided data on the importation of refrigeration and air-conditioning units;

Industries and industry associations:

- (a) CIG: provided data on the CFC imports;
- (b) Fire Control Ltd: provided data and information on the halon consumption and stocks;
- (c) Carpenters Motors: provided data and information on mobile as well as stationary air-conditioners;
- (d) Individual industries: provided data on the consumption and use of the controlled substances in their own companies. (List of the companies contacted are included in the report on the survey attached as Annex I to this report.)

2. CONSUMPTION AND USE OF CONTROLLED SUBSTANCES

2.1 The Consumption of the Controlled Substances in 1986, 1989, 1990 and 1991

Fiji does not produce the controlled substances, but imports CFC-11, 12 and 115 which are used for servicing and recharging various refrigeration and air-conditioning systems and in the manufacture of foams. Some methyl chloroform is imported for use as cleaning solvents and carbon tetrachloride is imported as laboratory solvents.

Halon 1211 was imported prior to 1992 for recharging halon fire extinguisher systems.

2.1.1 The Consumption of Each Controlled Substance (as bulk chemicals)

The consumption, calculated level of consumption as well as calculated per capita consumption for the years 1986, 1989, 1990 and 1991 of each of the controlled substances (substances under Annex A of the Montreal Protocol and Annex B of the Amendment) are shown in Table 1.

Tables A.1 - A.4 in Annex II of this report show the production, imports, exports and consumption of each of the controlled substances for the four years. The Tables are in the form that is ready for submission to the Ozone Secretariat to fulfill the reporting requirements of Article 7 of the Protocol.

2.1.2 Consumption of Each Controlled Substance by Use Sectors

Figures 1.1 - 1.4 below show, for the years 1986, 1989, 1990 and 1991, respectively, the percentages of total consumption of the controlled substances consumed under each use sector.

Table 1 Consumption, calculated consumption and calculated per capita consumption of controlled substances in 1986, 1989, 1990 and 1991

Substances	1986		1989		1990		1991	
	cns	calc	cns	calc	cns	calc	cns	calc
ANNEX A								
<u>Group I</u>								
CFC 11	5.3	5.3	13.1	13.1	14.0	14.0	12.2	12.2
CFC 12	10.3	10.3	23.9	23.9	20.0	20.0	28.1	28.1
CFC 113	0	0	0	0	0	0	0	0
CFC 114	0	0	0	0	0	0	0	0
CFC 115	2.1	1.3	5.1	3.1	2.7	1.6	2.9	1.8
Sub-total	17.6	16.8	42.1	40.1	36.7	35.7	43.3	42.1
<u>Group II</u>								
Halon 1211	1.2	3.7	1.5	4.5	1.2	3.7	1.2	3.7
Halon 1301	0	0	0	0	0	0	0	0
Halon 2402	0	0	0	0	0	0	0	0
Sub-total	1.2	3.7	1.5	4.5	1.2	3.7	1.2	3.7
TOTAL	18.9	20.5	43.6	44.6	38.0	39.4	44.5	45.8
ANNEX B								
<u>Group I</u>								
CFC 13	0	0	0	0	0	0	0	0
CFC 111	0	0	0	0	0	0	0	0
CFC 112	0	0	0	0	0	0	0	0
CFC 211	0	0	0	0	0	0	0	0
CFC 212	0	0	0	0	0	0	0	0
CFC 213	0	0	0	0	0	0	0	0
CFC 214	0	0	0	0	0	0	0	0
CFC 215	0	0	0	0	0	0	0	0
CFC 216	0	0	0	0	0	0	0	0
CFC 217	0	0	0	0	0	0	0	0
Sub-total	0	0	0	0	0	0	0	0
<u>Group II</u>								
Carbon tet	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
<u>Group III</u>								
Methyl chl	3.9	3.9	0.7	0.7	1.2	1.2	6.0	6.0
TOTAL	4.1	4.1	0.9	0.9	1.4	1.4	6.2	6.3
Population	715,000		729,000		744,000		759,000	
per capita consmp. Kg. (calcul.)	Annex A: 0.029 Annex B: 0.006		Annex A: 0.061 Annex B: 0.001		Annex A: 0.053 Annex B: 0.002		Annex A: 0.080 Annex B: 0.008	

Notes:

- (a) cns = consumption in Tonnes
calc = calculated consumption (Tonnes x ODP)
- (b) Population for 1986, 1989, and 1991 have been estimated from the statistics given in "Environment: Fiji, The National State of the Environment Report, March 1992.

Refrigeration and air-conditioning sector:

In 1989, 1990 and 1991, the CFC-11 imported as refrigerants for servicing and recharging refrigeration and air-conditioning systems constituted approximately 39% (5.1 Tonnes), 36% (5 Tonnes), and 26% (3.2 Tonnes), respectively, of the total CFC-11 imported.

All the CFC-12 imported are refrigerants.

CFC-115 is imported as refrigerant R-502 (48.8% HCFC-22 and 51.2% CFC-115 by weight) for commercial refrigeration systems.

Foams sector:

In 1986, 1989, 1990 and 1991, the CFC-11 imported as foam blowing agent constituted 61% (8 Tonnes), 64% (9 Tonnes) and 74% (9 Tonnes), respectively, of the total CFC-11 imported. Some of this CFC-11 is contained in the blowing agent 'Daltolac' which is 5% CFC-11, used for production of floatation (polyethylene). The rest are used for producing slabstocks.

Solvents sector:

Methyl chloroform imported is used for spot cleaning by garment manufacturers and for cleaning out gas lines by bottled gas companies. Carbon tetrachloride is imported for use by chemical laboratories as laboratory solvent.

Halons:

The only type of halon imported since 1986 is halon 1211. All the halon 1211 imported are for recharging fire extinguishing systems. Importation of halons as bulk chemicals stopped in 1992.

Figure 1.1: 1989 consumption of controlled substances by end-use

TOTAL CONSUMPTION = 44.5 Tonnes

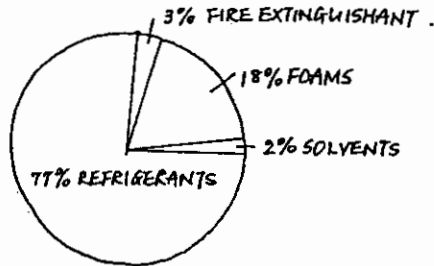


Figure 1.2: 1990 consumption of controlled substances by end-use

TOTAL CONSUMPTION = 39.4 Tonnes

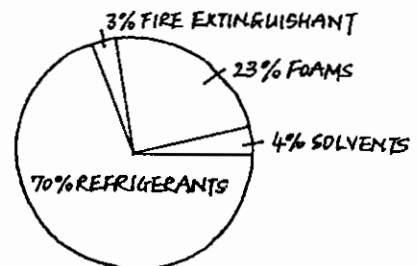
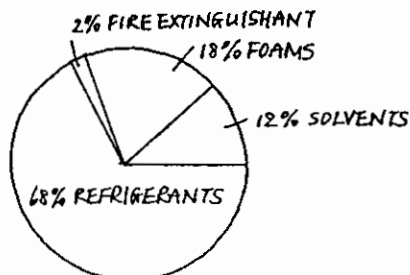


Figure 1.3: 1991 consumption of controlled substances by end-use

TOTAL CONSUMPTION = 50.7 Tonnes



2.1.3 Products Containing Controlled Substances

Except for some foam products, Fiji does not manufacture products that contain controlled substances. Refrigerators, air-conditioners, aerosols and fire extinguishers are imported. The types of products imported, data on the quantities of each type of product imported, and information on where the products were imported from are shown in Table 2.1.

Estimates of the numbers of various equipment containing controlled substances that were in operation in Fiji in 1991 have been made. These estimates are shown in Table 2.2. The Table also shows the type of controlled substances contained in each category of equipment and approximation of the total quantity of the controlled substances contained for each category of products. There are some large freezers in Fiji that use ammonia as refrigerant. Those are not included in the Table. With regard to automotive air-conditioners, 15%, 45%, 55% and 75% of the cars imported in the years 1986, 1989, 1990 and 1991 are assumed to be fitted with air-conditioners.

Table 2.1 Importation of products containing controlled substances

TYPE OF PRODUCT	QUANTITY IMPORTED				MAJOR SOURCE COUNTRIES
	1986	1989	1990	1991	

(A) REFRIGERATION AND AIR-CONDITIONING

domestic refrigerators	3,173	5,000	6,238	7,779	New Zealand USA (small no.)
domestic freezers	468	1,332	1,080	1,193	
refrig./freezers other than domestic	168	29	58	236	
stationary a/c	-	-	-	-	Japan, S.Korea
automotive a/c	100	1,740	1,840	2,305	

(B) AEROSOLS (CONTAINING CFCs)

cosmetic sprays	9,400	26,000	0	0	New Zealand/Australia
insecticides	0	0	0	0	New Zealand/Australia

(C) FIRE EXTINGUISHERS (HALONS)

portable	234	177	104	35	
fixed systems	9	7	4	0	

Table 2.2 Estimation of the numbers of equipment containing controlled substances that are currently in operation in the country

TYPE OF EQUIPMENT	QUANTITY IN OPERATION	CONTROLLED SUBSTANCE CONTAINED	ESTIMATED TOTAL CONTENT OF CONTROLLED SUBSTANCES
-------------------	-----------------------	--------------------------------	--

(A) REFRIGERATION AND AIR-CONDITIONING

domestic friges/freezers	87,800	CFC-12	17.6 Tonnes
refrigeration systems other than domestic	6,300	CFC-12	12.7 Tonnes
central a/c	5 - 10	CFC-11	4 Tonnes
automotive a/c	7,000 - 8,000	CFC-12	3.5 - 4 Tonnes

(B) FIRE EXTINGUISHERS (HALONS)

portable (3 kg)	1,000	Halon 1211	3 Tonnes
fixed (and other) systems (22 kg)	37	Halon 1211	0.8 Tonnes

Halon fire extinguishers: The current status of large halon fire extinguishers in Fiji is as follows: (i) the CAAF uses 22 kg halon units at some of its outlying airstrips but they intend to discontinue fire services at those airstrips; (ii) FEA uses 22 kg halon units but is looking into replacing them with CO2 systems; (iii) Flour Mills of Fiji has a large halon flooding system which is currently decommissioned and there are no plans to recommission it; (iv) other large halon units currently in service and with no plans for replacement are located at M.V. "Tui Tai", Mocambo Hotel, Air Terminal Services, Marine Department (3 vessels), M.V. "Island Express", and the Reserve Bank of Fiji. Significant amounts of portable halon units are found at F.S.C., A.T.S., Fiji Times, F.E.A., Housing Authority, Reserve Bank of Fiji, Fiji Military Forces, Naviti Beach Resort, Fijian Hotel, the Regent of Fiji and aircrafts. Most of the users have expressed dissatisfaction with the cost of maintaining halon fire extinguishers and would therefore be amiable to any replacement proposals. Some organizations such as Sheraton Fiji Resort, Mobil Oil (Australia) Ltd. and F.E.A. have already started to phase out the use of halons.

2.2 Analyses of Future Demand for the Controlled Substances

2.2.1 The Economy

The Government decided in 1990 to promote the economy and raise the standard of living through deregulation with an emphasis on an export-led growth strategy and increased private sector development. The significant sectors of national economy are agriculture, forestry, fisheries, mining and to a large degree, tourism. These accounted for 60% of domestic exports in 1990. Fiji's economy is heavily dependent on international trade and finance. The main imports include food, energy (including petrol), manufactured goods and chemicals. Development assistance represent approximately 3% of GDP.

The annual GDP growth rate from 1986 to 1991 has been as follows:

1986:	8.3
1987:	-6.6
1988:	0.9
1989:	11.9
1990:	5.0
1991:	0.4

The average annual GDP growth rate until the year 2010 is assumed as follows:

1992 - 1999:	4.0% (the average GDP growth rate between 1986 and 1991 is approximately 3.3%)
2000 - 2010:	7.0%

2.2.2 Projection of Demand for Controlled Substances: Unconstrained Demand

Basic Assumptions:

The future demand for the controlled substances is estimated assuming that the Montreal Protocol did not exist. The estimation of the unconstrained demand is based on the assumed GDP growth rate stated in the sub-section above (2.3.1 The Economy). The population growth rate is assumed to be 2.0%. The average population growth rate for 1966 to 1976 was 2.1% and from 1976 to 1986 was 2.0%.

Fiji consumes CFC-11, CFC-12, CFC-115, methyl chloroform and carbon tetrachloride. Importation of halon 1211 has stopped in 1992.

At present, there is no indication that any new industries which would use controlled substances will be established in Fiji.

Projection of demand of each controlled substance:

CFC-12 is used entirely for refilling and servicing refrigeration and air-conditioning equipment. It is assumed that the increase in demand for the CFC-12 will follow the GDP growth rate: annual average of 4% from 1992 to 1999 and 7% from 2000 to 2010. The consumption of CFC-12 in the years 2000 and 2010 would, therefore, be 41.2 and 81.0 Tonnes, respectively (see Table 2.2 below).

CFC-11 is primarily used by one foam manufacturer to produce flexible foam (slabstocks), mainly for mattresses and furniture. There are two other manufacturers of flexible foam, using methylene chloride. One company uses small quantities of Daltolac (5% CFC-11) for production of floatation. The increase in demand for the foam products is assumed to increase at a faster rate than the GDP growth rate largely because the market is likely to be far from saturated and the foam products are relatively easy to afford with improvement in the economy. The average growth rate of the CFC-11 consumption in the foam production is assumed to be 10%. Therefore, the consumption of CFC-11 in the foam production is estimated to be 21.2 and 55.0 Tonnes in the years 2000 and 2010, respectively (see Table 2.2 below).

CFC-11 is also being used in Fiji for servicing some large central air-conditioning installations. The consumption of CFC-11 under the refrigeration and air-conditioning sector were 5.1, 5 and 3.2 Tonnes in 1989, 1990 and 1991, respectively. The growth in the consumption is assumed to increase at the same pace as the CFC-12 growth rate: annual average of 4% from 1992 to 1999 and 7% from 2000 to 2010. Therefore, the consumption of CFC-11 in the

refrigeration and air-conditioning sector in the years 2000 and 2010 would be 4.7 and 9.3 Tonnes, respectively (see Table 2.2 below).

The total CFC-11 consumption for the years 2000 and 2010 are estimated to be 25.9 and 64.3 Tonnes, respectively.

CFC-115 is imported as refrigerant mixture R-502. The consumption is assumed to increase at the same rate as the GDP growth rate. The consumption of CFC-115 in the years 2000 and 2010 would therefore be 4.3 and 8.4 Tonnes, respectively (see Table 2.2 below).

Methyl chloroform is mainly used as cleaning solvent by garment industry and bottled gas companies. The growth in consumption of methyl chloroform is also assumed to follow the GDP growth rate. The consumption in 2000 and 2010 would be 8.8 and 17.3 Tonnes, respectively (see Table 2.2 below).

Consumption of carbon tetrachloride, used as laboratory solvent, has not been included in the estimation of the unconstrained demand or the incremental cost analyses (sub-section 2.2.3 below). The consumption of carbon tetrachloride is small and using substitutes should not result in large incremental cost.

The total unconstrained demand for the controlled substances in the years 2000 and 2010 are calculated to be 80.2 and 171.0 Tonnes, respectively (see Table 2.2 below). Figure 2.1 below shows graphically the future unconstrained demand for the controlled substances.

Figure 2.1 Graph showing the unconstrained demand for each controlled substance up to year 2010

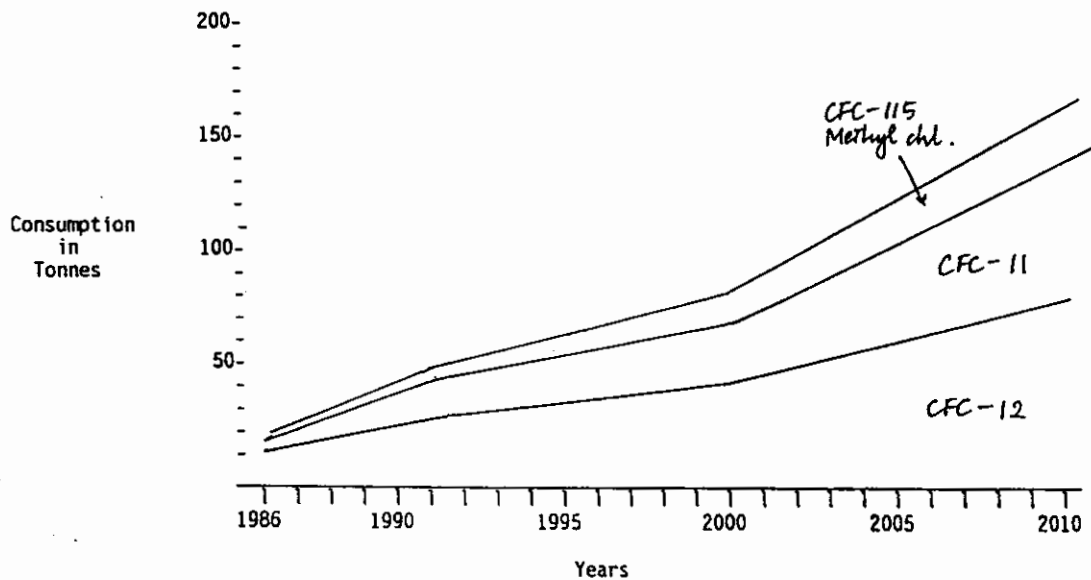


Table 2.3 Summary of the yearly predicted consumption following the unconstrained demand

Year	GDP %	Assumed Growth Rates foam/refrig.& solv.			CFC-11 (foam) Consump.	CFC-11 (refrig) Consump.	CFC-115 Consump.	CFC-12 Consump.	Meth.ch Consump	Total Consump.
1991	4				9.0	3.2	2.9	28.1	6.0	49.2
1992	4	10%	/	4%	9.9	3.3	3.0	29.2	6.2	51.6
1993	4	"	/	4%	10.9	3.5	3.1	30.4	6.5	54.4
1994	4	"	/	4%	12.0	3.6	3.3	31.6	6.7	57.2
1995	4	"	/	4%	13.2	3.7	3.4	32.9	7.0	60.2
1996	4	"	/	4%	14.5	3.9	3.5	34.2	7.3	63.4
1997	4	"	/	4%	15.9	4.0	3.7	35.6	7.6	66.8
1998	4	"	/	4%	17.5	4.2	3.8	37.0	7.9	70.4
1999	4	"	/	4%	19.3	4.4	4.0	38.5	8.2	74.4
2000	7	"	/	7%	21.2	4.7	4.3	41.2	8.8	80.2
2001	7	"	/	7%	23.3	5.0	4.6	44.1	9.4	86.4
2002	7	"	/	7%	25.7	5.4	4.9	47.2	10.0	93.2
2003	7	"	/	7%	28.2	5.8	5.2	50.5	10.7	100.4
2004	7	"	/	7%	31.1	6.2	5.6	54.0	11.5	108.4
2005	7	"	/	7%	34.2	6.6	6.0	57.8	12.3	116.9
2006	7	"	/	7%	37.6	7.1	6.4	61.8	13.2	126.1
2007	7	"	/	7%	41.4	7.6	6.9	66.2	14.1	136.2
2008	7	"	/	7%	45.5	8.1	7.4	70.8	15.1	146.9
2009	7	"	/	7%	50.0	8.7	7.9	75.7	16.1	158.4
2010	7	"	/	7%	55.0	9.3	8.4	81.0	17.3	171.0

2.2.3 Estimation of Incremental Cost for the Phase-out of Controlled Substances

Incremental costs are estimated for two different scenarios:

- (a) Accelerated phase-out through the implementation of this Country Programme which targets the phase-out at year 2000. The incremental costs are estimated based on the planned activities under the Action Plan.
- (b) Phase-out in the year 2010 in accordance with the requirements of the Montreal Protocol for countries operating under paragraph 1 of Article 5. (Freeze at 1995-1997 level by 1999; 50% reduction by 2005; 85% reduction by 2007; Complete phase-out by 2010). The consumption of the controlled substances is assumed to follow the maximum allowable consumption.

In estimating the incremental costs to the economy of the country, there are some uncertainties. For example: (i) the change over the coming years in the costs associated with substitute chemicals and alternative technologies; (ii) the period for which the operational costs could be accounted; and (iii) timing, costs and intensity of the various activities (including training, public awareness and institutional strengthening) that are needed to effectuate the phase out. The incremental cost estimation is therefore dependent upon the assumptions made which differ for every country study/programme.

The method used in the attempt to estimate the incremental costs for Fiji is a simple one, based on several simplistic assumptions. The estimation of the incremental costs are only roughly indicative and would not be comparable to the estimates for other countries due to the wide differences in the assumptions made and the methodologies for the estimation. The estimated incremental costs do not indicate the costs of the Action Plan.

Basic assumptions in the analyses that apply to all the use sectors are:

- The consumption of the controlled substances will increase according to the predicted unconstrained demand until control is effected according to the Action Plan or the Montreal Protocol control measures.
- The controlled substances will be available in sufficient quantities at constant prices.
- The estimates of the incremental costs are based on 1991-1992 prices.
- A real discount rate of 10% has been used to calculate the present 1992 value of the costs. Both discounted and undiscounted figures are given.

The phase-out activities and the sector-specific assumptions are briefly described for each use sector as well as for the Government Actions. Under each use sector, the descriptions of the activities and assumptions is followed by analyses of the incremental costs that correspond to the two scenarios.

The expected consumption of the controlled substances under each of the scenarios is shown graphically below:

Figure 2.2 Graph showing the expected consumption of the controlled substances (Annex A substances) under the accelerated phase out scenario (maximum consumption under the Action Plan)

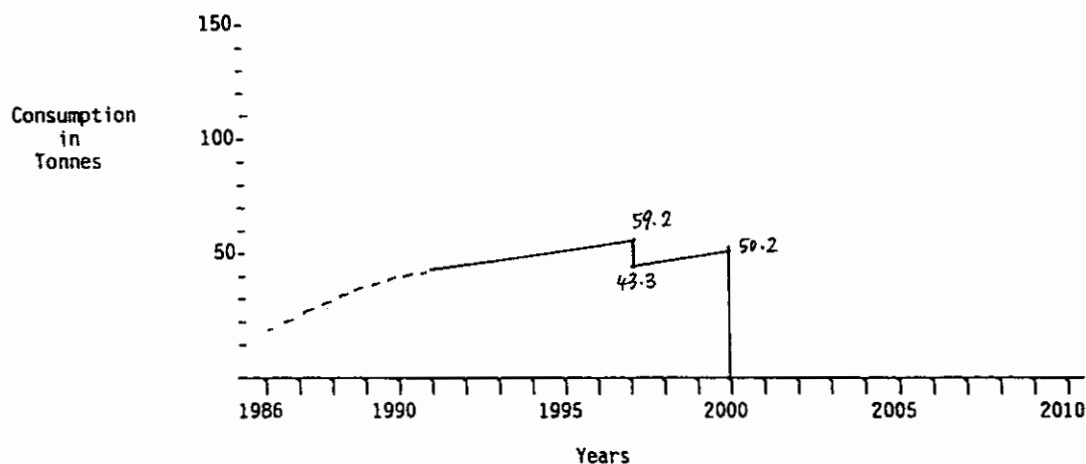
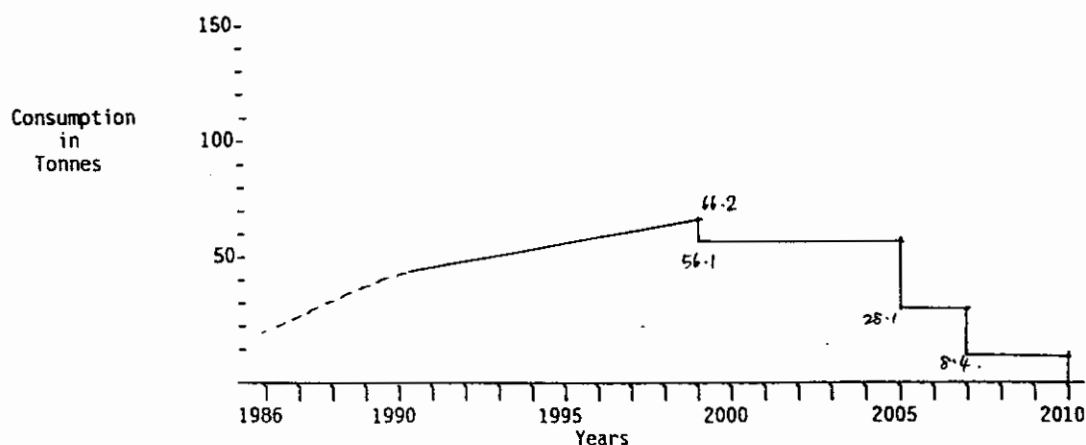


Figure 2.3 Graph showing the expected consumption of the controlled substances (Annex A substances) under the Montreal Protocol phase-out scenario (maximum allowable consumption)



Foams sector:

Under the Industry Actions, the foam producing industries are given the opportunity to choose an appropriate substitute or alternative. Conversion should occur before the year 2000 when the importation of controlled substances will be banned. A special technical workshop and a study visit for the foam industries is planned to be organized in 1994. Through the workshop the industries will be informed of the existing and emerging substitute chemicals and alternative technologies for blowing foams and receive advice on the possible conversions for their industries.

For the production of flexible foam, the two conversion options that do not involve use of HCFCs and are relatively cheap and simple are substitution to methylene chloride and elimination of the blowing agent altogether. Using CFC-11 as auxiliary blowing agent enables production of low density foams of 21kg per cubic meter and below.

Methylene chloride is currently the commonly used substitute for CFC-11. It is substantially cheaper than CFC-11 (methylene chloride is approximately 20% of CFC-11 price) and less of it is required as foam blowing agent as compared with CFC-11. Methylene chloride also enables production of low density foams and it is basically a drop-in substitute for CFC-11. Hence, adequately-functioning CFC-11-using equipment need not undergo retrofit. However, methylene chloride is toxic and a possible carcinogen. Occupational health safety measures must be taken when using methylene chloride. The required safety measures such as adequate ventilation systems and protective clothing may involve substantial capital investment.

When auxiliary blowing agent is eliminated from foam production, the sole blowing agent becomes the CO₂ produced through reaction between isocyanate (material that constitutes the foam) and water. Without the auxiliary blowing agent, low density foam cannot be produced without high risk of isocyanate catching fire. However, it is possible to produce foam of density 22kg per cubic meter without much fire risk. Since high density foam would require more isocyanate, the cost of foam production may increase. However, some part of the cost can be compensated by elimination of the auxiliary blowing agent and selling foam products that are denser but less thick.

For the purpose of estimating the incremental cost for the phase-out, it is assumed that the foam manufacturer will convert to using methylene chloride. Experience from large flexible foam factories in developed countries indicate that conversion to methylene chloride has led to cost savings. Although this may not necessarily be true for smaller scale factories in developing countries, it is assumed that the incremental cost is zero.

In Fiji, there is also manufacturing of floatation using daltolac (containing 5% CFC-11) as blowing agent. The incremental cost for substituting the use of daltolac has not been included. (Further advice from foams expert is required.)

Solvent sector:

It is assumed that substituting the methyl chloroform, used for spot cleaning in garment factories would not incur large incremental costs. Same is assumed for the substitution of carbon tetrachloride used as laboratory solvents.

Incremental costs included for this sector are the costs for convening technical workshops to advise the industries on the available substitutes. The costs are included as training which is under Government Actions.

Refrigeration and air-conditioning sector:

The Government will encourage the use of HFC-134a equipment which are predicted to be widely available in the international market from around 1995. The price of a domestic refrigerator using HFC-134a is expected to be 10-20% more expensive than the CFC-12-using refrigerator. The Report of the Technical Options Committee on Refrigeration and Air-conditioning states that the extra costs on the HFC-134a equipment should gradually disappear in about 5 years time (in 1997).

At present, the incremental costs for purchasing new equipment that do not contain controlled substances is not eligible for funding through the Multilateral Fund. If such incremental costs can be funded, the consumers will be purchasing new equipment at an early stage. Without the incremental costs being funded, it would not be easy to convince/motivate the consumers to purchase the more expensive new equipment until the prices of the new equipment become comparable to those of CFC-equipment. Hence, the consumers will continue to purchase the CFC-equipment which would have to be replaced when the controlled substances become unavailable. This incurs costs for early, forced replacement of equipment. It is expected that this issue will further be discussed by the Executive Committee, and a decision will be taken as to whether incremental costs for purchasing new equipment should be covered by the Multilateral Fund.

For the estimation of the incremental cost, it is assumed that the consumers will continue to purchase domestic refrigeration equipment containing controlled substances until a ban on importation of such equipment is effected.

The issue of energy consumption of the various equipment have not been taken into account. With regard to HFC-134a equipment, energy efficiency as compared with CFC-12 equipment is uncertain. In some experimental cases, the energy efficiency was shown to improve while in other cases opposite was indicated. Any change in energy efficiency when industrial refrigeration systems are converted to ammonia has not been taken into account.

The higher cost of HFC-134a and lubricant oil for servicing has not been included in the estimation of incremental costs. HFC-134a is currently at least 5 times as expensive as CFC-12 (HFC-134a: approximately US \$ 20 per kg as compared with CFC-12: approximately US \$ 3 per kg), but less of it is necessary for the new equipment using HFC-134a. It is also difficult to predict how the cost of HFC-134a would change over the years. Some of the costs will also be recovered through recovery and recycling of HFC-134a.

The estimated increase in the stock of various types of refrigeration equipment following the unconstrained demand is shown in Table 2.3 below. In the survey of the refrigeration equipment, the commercial refrigeration systems and industrial refrigeration systems were classified under one category - refrigerators other than domestic. The estimated number of refrigerators other than domestic in operation in Fiji in 1991 is estimated to be 6,300 units. All these units are assumed to be containing CFC-12 (the number of equipment using R-502 refrigerant is not known). Out of the 6,300 units, 3000 are assumed to be commercial refrigeration systems and the rest are assumed to be industrial refrigeration systems (including cold storage and rooms, large ice machines and other types of large refrigeration systems in factories).

Table 2.4 Summary of the yearly predicted stock of refrigeration equipment following the unconstrained demand

Year	GDP Growth Rate	Assumed Growth Rate for refrig. equipment	Domestic Refrig.	Commercial Refrig.	Industrial Refrig.	Central a/c (CFC-11)
1991			87,800	3,000	3,300	10
1992	4	4.0%	91,312	3,120	3,432	11
1993	4	4.0%	94,965	3,245	3,570	11
1994	4	4.0%	98,764	3,375	3,713	12
1995	4	4.0%	102,714	3,510	3,861	12
1996	4	4.0%	106,823	3,650	4,015	13
1997	4	4.0%	111,096	3,796	4,176	13
1998	4	4.0%	115,539	3,948	4,342	14
1999	4	4.0%	120,161	4,106	4,517	14
2000	7	7.0%	128,572	4,394	4,832	15
2001	7	7.0%	137,572	4,701	5,171	15
2002	7	7.0%	147,202	5,030	5,533	16
2003	7	7.0%	157,506	5,382	5,920	17
2004	7	7.0%	168,532	5,759	6,335	17
2005	7	7.0%	180,329	6,162	6,778	18
2006	7	7.0%	192,952	6,593	7,253	19
2007	7	7.0%	206,458	7,055	7,760	19
2008	7	7.0%	220,910	7,549	8,303	20
2009	7	7.0%	236,374	8,077	8,885	21
2010	7	7.0%	252,920	8,642	9,507	22

The retrofiting of industrial refrigeration has not been included in the analyses of incremental costs. It is assumed that these equipment will be retrofitted to use ammonia as refrigerant and that although some capital investment will be required for the retrofit, the operational cost would be cheaper. It is assumed that the cheaper operational cost would offset the investment required for the retrofit.

The incremental cost for phasing out CFC-12 consists of following elements:

Retrofitting of commercial refrigerators and central air-conditioners

(a) Accelerated phase-out:

Estimated incremental cost:	undiscounted:	US \$ 1,831,500
	discounted:	US \$ 979,806

- The average cost to the owners of commercial refrigeration equipment for retrofitting the equipment is taken to be US \$ 500. It is assumed that all the existing units will eventually be retrofitted, therefore, cost of early retirement/replacement of commercial refrigerators is not included in the calculations of the incremental costs.
- Retrofitting central air-conditioners is also assumed to cost US \$ 500.
- A ban on the importation of refrigeration and air-conditioning equipment containing controlled substances will be effected in 1997.
- In 1996, the number of commercial refrigerators that would be in operation in Fiji is estimated to be approximately 3,650 units and the number of central air-conditioners is estimated to be 13.
- It is assumed that the retrofitting would start in 1995 at yearly rate assumed as below until year 2001. The corresponding annual cost for retrofitting is also shown:

Year	% and no. of equip. retrofitted		cost US \$	discounted cost US \$
1995	5%	184	92,000	69,121
1996	10%	348	174,000	118,844
1997	15%	470	235,000	145,917
1998	20%	533	266,500	150,432
1999	30%	639	319,500	163,954
2000	50%	745	372,500	173,774
2001	the rest	744	372,000	157,764
TOTAL		3663	1,831,500	979,806

(b) Phase-out in accordance with the Montreal Protocol:

Estimated incremental cost: undiscounted: US \$ 1,981,000
 discounted: US \$ 696,525

- Business will continue as usual until 1999 when the consumption of CFC-12 would have to be frozen at 1995-1997 average level. By 1998 the number of units of commercial refrigerators in Fiji is estimated to increase to 3,948 and central air-conditioners using CFC-11 to 14.
- It is assumed that from 1999 the imports of equipment containing controlled substances would stop because the import of controlled substances will have to be restricted. However, restricted amounts of controlled substances will continue to be imported for servicing equipment until the year 2010.
- The retrofitting is assumed to occur during the whole period of phase out, i.e. between 1999 and 2009 (inclusive). The yearly rate at which the retrofit would occur have been assumed as below. The associated costs for retrofit is also shown:

Year	% and no. of equip. retrofitted		cost US \$	discounted cost US \$
1999	5%	199	99,500	51,059
2000	10%	377	188,500	87,937
2001	15%	508	254,000	107,721
2002	20%	576	288,000	111,036
2003	25%	576	288,000	100,942
2004	30%	518	259,000	82,525
2005	35%	423	211,500	61,264
2006	40%	314	157,000	41,343
2007	50%	236	118,000	28,248
2008	50%	118	59,000	12,840
2009	the rest	117	58,500	11,574
TOTAL		3962	1,981,000	696,525

Domestic refrigeration: costs of forced replacement of CFC-12 equipment

(a) Accelerated phase-out

Estimated incremental cost: undiscounted: US \$ 64,977,750
 discounted: US \$ 26,971,708

- In Fiji, a life time of a domestic refrigerator is estimated to be 15-25 years, with compressor replacement occurring once every 8 years on average. The current cost to a consumer for having a compressor replaced is approximately US \$ 100. The average cost of a domestic

- refrigeration equipment is assumed to be US \$ 1000.
- For the purpose of estimation of incremental costs, the lifetime of a fridge is assumed to be 16 years with compressor replacement occurring once during the life time. Hence, the total investment cost to a consumer would be $1000 + 200 = \text{US } \$ 1200$. Therefore, 'annual value' of a domestic refrigeration equipment to a consumer is estimated to be US \$ 75.
 - Cost of forced replacement is assumed to be remaining life time of an equipment multiplied by the 'annual value (US \$ 75)'.
 - It is assumed that the forced replacement of equipment would start in 1997 when the ban on importation of equipment using controlled substances (including compressors) will be effected.
 - By 1996, the stock of domestic refrigeration equipment is estimated to have increased to 106,823.
 - The equipment acquired before 1981 would not qualify for replacement cost. The estimated number of such equipment is 21,186. Therefore, the number of equipment that would qualify for replacement cost is $106,823 - 21,186 = 85,637$.
 - The importation of controlled substances will be banned from the year 2000, but CFC-12 would be available thereafter through recovery and recycling.
 - The average remaining life time of the equipment being replaced is assumed to be 10 years.
 - The yearly number of forced replacement is assumed as below. The associated incremental costs are also shown:

Year	no. of equip.	cost US \$	discounted cost US \$
1997	5,000	3,750,000	2,328,455
1998	6,000	4,500,000	2,540,133
1999	8,000	6,000,000	3,078,949
2000	10,000	7,500,000	3,498,805
2001	10,000	7,500,000	3,180,732
2002	12,000	9,000,000	3,469,890
2003	15,000	11,250,000	3,943,056
2004	20,637	15,477,750	4,931,688
TOTAL:	86,637	64,977,750	26,971,708

(b) Phase-out in accordance with the Montreal Protocol:

Estimated incremental cost: undiscounted: US \$ 62,786,250
 discounted: US \$ 19,533,431

- Business will go on as usual with regard to importation of domestic refrigeration equipment until 1998. It is assumed that the importation of equipment will stop in 1999 and the replacement would begin.
- The total number of CFC-12 equipment in existence in 1998 is estimated to be 115,539.
- The equipment acquired before 1983 would not qualify for replacement cost. The number of equipment imported prior to 1984 is estimated to be 31,824. Hence, the number of refrigerators that would have to be replaced is $115,539 - 31,824 = 83,715$.
- The yearly number of forced replacement is assumed as below. The associated incremental costs are also shown:

Year	no. of equip.	cost US \$	discounted cost US \$
1999	5,000	3,750,000	1,924,343
2000	6,000	4,500,000	2,099,283
2001	6,000	4,500,000	1,908,439
2002	6,000	4,500,000	1,734,945
2003	7,000	5,250,000	1,840,093
2004	7,000	5,250,000	1,672,812
2005	8,000	6,000,000	1,737,986
2006	9,000	6,750,000	1,777,486
2007	9,000	6,750,000	1,615,896
2008	10,000	7,500,000	1,632,219
2009	10,715	8,036,250	1,589,929
TOTAL:	83,715	62,786,250	19,533,431

Recovery and recycling of refrigerants

The incremental cost for recovery and recycling is calculated to be the costs of recovery and recycling units minus the cost savings made by the recycled CFC refrigerant until the phase out year. It is assumed that 30% of refrigerants will be recovered and recycled. Figure of 30% has been chosen because usually when a refrigeration equipment is brought for service, much of the refrigerant gas has already escaped. It is also assumed that cost saved for CFC-12 refrigerant is US \$ 1.5 per kg refrigerant. This value is approximately half of the prices of new CFC refrigerant. This is to attempt to subtract operational costs for the recovery and recycling equipment from the cost savings.

It should be noted that with recovery and recycling, HFC-134a refrigerants will also be recovered and recycled, hence, in actual fact, cost savings will be achieved through recycling of HFC-134a refrigerants. However, this has not been included in the estimation of the incremental costs.

In Fiji, recovery and recycling of refrigerants will be carried out by servicing workshops, each of which will acquire a recovery and recycling equipment. Life time of a recovery and recycling equipment has not been taken into account. The incremental cost estimation only includes costs of one time investment per servicing workshop.

(a) Accelerated phase-out

Estimated incremental cost:	undiscounted:	US \$ 102,173
	discounted:	US \$ 71,288

- The number of servicing workshops is assumed to stay at the present number of 35 until year 1997, because of the requirements under the Action Plan that every workshop would have to acquire a recovery and recycling unit. This requirement is actually likely to drive some of the smaller workshops out of business. After 1997 the number of workshops is assumed to increase at the same rate as the growth rate of refrigerants.
- It is assumed that all the servicing workshops will acquire a recovery and recycling equipment between 1995 and 1997.
- The average price of a recovery and recycling unit is taken to be US \$ 4,000.
- The estimation of annual savings from recycled CFC-12 has been simplified where the annual recycled amount is taken to be 30% of the CFC-12 for that year and the percentages of the total amount of CFC recycled is assumed equal to the percentage of workshops that have acquired a recovery and recycling equipment.

- Until the ban on importation of the controlled substances is effected in 2000, the importation of CFC-12 refrigerants is assumed to increase at the same rate as for the unconstrained demand.
- The estimated annual incremental costs are shown below:

Year	no.of equip.	cost of equip.	savings from recycled CFC	incremental cost	discounted cost
1995	10	40,000	3,613	36,387	27,338
1996	10	40,000	7,509	32,491	22,192
1997	15	60,000	13,680	46,320	28,761
1998	2	8,000	14,220	-6,220	- 3,511
1999	2	8,000	14,805	-6,805	- 3,492
TOTAL	39	156,000	53,872	102,173	71,288

(b) Phase-out in accordance with the Montreal Protocol:

Estimated incremental cost: undiscounted: US \$ 186,361
discounted: US \$ 83,971

- The number of servicing workshops is assumed to grow at the same rate as the growth in demand for refrigerants. Hence, in 1998, there would be 46 servicing workshops and in 2009 there would be 94. It is assumed that the servicing workshops will acquire a recovery and recycling unit between 1999 and 2010.
- The consumption of CFC-12 is taken to be the maximum allowable consumption following the Montreal Protocol control measures for Article 5 countries. The rest of the demand for refrigerants is assumed to be met by HFC-134a.
- The estimation of annual savings from recycled CFC-12 has been simplified where the annual recycled amount is taken to be 30% of the CFC-12 for that year and the percentages of the total amount of CFC recycled is assumed equal to the percentage of workshops that have acquired a recovery and recycling equipment.
- The estimated annual incremental costs are shown below:

Year	no.of equip.	cost of equip.	savings from recycled CFC	incremental cost	discounted cost
1999	15	60,000	4,627	55,373	28,415
2000	15	60,000	8,879	51,121	23,848
2001	10	40,000	11,651	28,439	12,161
2002	10	40,000	14,110	25,890	9,982
2003	10	40,000	16,500	23,500	8,237
2004	7	28,000	18,267	9,733	3,101
2005	5	20,000	19,845	155	45
2006	5	20,000	21,240	-1,240	- 326
2007	5	20,000	22,451	-4,300	-1,029
2008	6	24,000	24,300	- 300	- 65
2009	6	24,000	26,010	-2,010	- 398
TOTAL	94	376,000	187,880	186,361	83,971

The Government Actions:

The costs of Government Actions comprise: institutional strengthening, public awareness activities and training (including training of various technicians to enable safe substitution). Only the years up to phase-out is included in the estimation of incremental costs. (Please refer to sub-section 3.2.2 for the various elements and projects under the Government Actions and sub-section 3.2.3 for the training components under industry projects.)

(a) Accelerated phase-out

Estimated incremental cost: undiscounted: US \$ 615,725
 discounted: US \$ 430,154

- The costs of Government Actions (including training) is estimated for period from 1993 to 1999 (inclusive).
- The costs of Government Actions estimated for this Country Programme (the first 4 years of Action - 1993 to 1996) are US \$ 355,700. A simplistic assumption is made that the annual cost of Government Actions is the average for the four years, excluding the cost of equipment (US \$ 9,000):

$$\text{i.e. } (355,700 - 9,000)/4 = 86,675$$

- It is assumed that the equipment will be acquired in the first year of action - 1993.
- Hence, the total cost for years 1993 to 2000 is estimated to be:

Year	cost	Discounted cost (1992 value)
1993	95,675	86,978
1994	86,675	71,633
1995	86,675	65,121
1996	86,675	59,201
1997	86,675	53,818
1998	86,675	48,925
1999	86,675	44,478
TOTAL	615,725	430,154

(b) Phase-out in accordance with the Montreal Protocol:

Estimated incremental cost: undiscounted: US \$ 1,135,775
 discounted: US \$ 426,114

- The costs of Government Actions is estimated for period from 1997 (two years before the reduction in consumption must begin) to 2009 (inclusive).
- Annual cost for the Government Actions is assumed to be US \$ 86,675 and the total cost of necessary equipment is assumed to be US \$ 9,000. It is also assumed that the equipment will be acquired by the Government in 1997.

Year	cost	Discounted cost (1992 value)
1997	95,675	59,407
1998	86,675	48,926
1999	86,675	44,478
2000	86,675	40,435
2001	86,675	36,759
2002	86,675	33,417
2003	86,675	30,380
2004	86,675	27,618
2005	86,675	25,107
2006	86,675	22,825
2007	86,675	20,750
2008	86,675	18,863
2009	86,675	17,149
TOTAL	1,135,775	426,114

Conclusions:

The total incremental costs estimated for the two scenarios are as follows:

(a) Accelerated phase-out:

Undiscounted:	US \$	67,527,148	(appr. 67,500,000)
Discounted:	US \$	28,452,956	(appr. 28,500,000)

(b) Phase-out in accordance with the Montreal Protocol:

Undiscounted:	US \$	66,089,386	(appr. 66,100,000)
Discounted:	US \$	20,740,041	(appr. 20,700,000)

As mentioned in the beginning of this sub-section, the estimated incremental costs are only indicative based on the particular assumptions made for the estimation.

The comparison of the discounted costs (10% discount rate) of phase-out under the two scenarios indicates that the incremental costs are lower when the phase out schedule under the Montreal Protocol is followed. It should be kept in mind that the magnitude of seeming cost advantage in delaying the phase out is dependant upon the discount rate chosen. If a lower discount rate is chosen, the cost advantage would become smaller.

The incremental cost figures above should not lead to a conclusion that developing countries operating under paragraph 1 of Article 5 should rather follow the Montreal Protocol phase-out schedule rather than an accelerated one. In reality the controlled substances will soon become unavailable and the prices of the substances are already rising. Prolonged use of the controlled substances will result in difficulties and considerable cost increase to the consuming countries, in particular the countries that do not produce controlled substances, to meet the demand for the substances. The delayed phase-out would impose such burden to the developing countries.

Furthermore, and most importantly, the environmental benefits of less consumption, hence emission of controlled substances would far outweigh the extra costs that may be incurred in accelerating the phase-out.

The Indicative List of Categories of Incremental Costs adopted by the Parties to the Montreal Protocol at their Second Meeting in London states that the most cost-effective and efficient options for phase-out projects should be chosen to be financed through the Multilateral Fund. It is important that the evaluation of the cost effectiveness takes into consideration all the benefits and the costs such as increased cost of controlled substances that the developing countries would have to pay for.

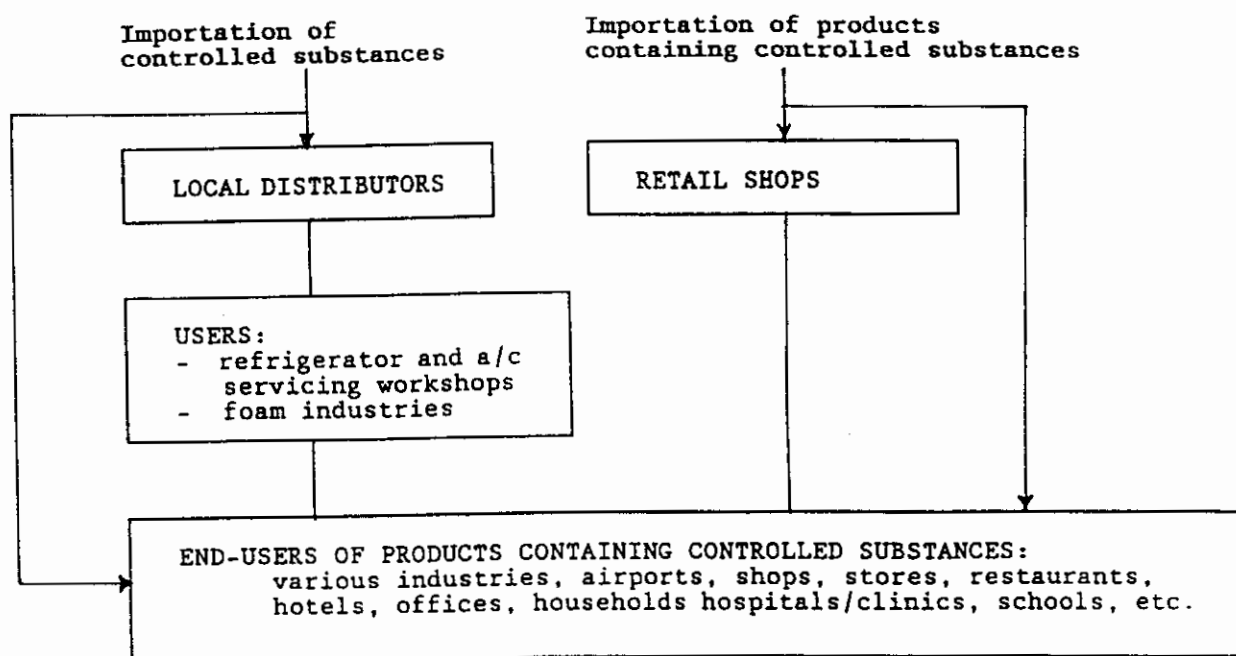
2.3 Industry Structure

The controlled substances are imported by local chemical distributors. The users are the foam manufacturers and the servicing workshops for refrigeration and air-conditioning systems.

The products containing controlled substances are imported by retail shops and also by large scale end-users such as hotels and some industries.

The structure of the industries that deal with controlled substances are shown in Figure 2.1 below:

Figure 2.4: Flow chart showing the structure of the industries that deal with controlled substances and products that contain controlled substances.



The type and estimated number of the industries that import and use controlled substances are as follows:

Importers of controlled substances (as bulk chemicals):

- (a) 3 importers of CFCs
(for distribution to the users)
- (b) 3 importers of halons
(for servicing halon fire extinguisher systems)
- (c) 3 importers of methyl chloroform
(for cleaning purposes)
- (d) 2 importers of carbon tetrachloride
(laboratory solvents)

The users of the bulk chemicals (all buy the controlled substances from the importers listed above):

- (a) 3 boat building companies
(use Daltolac for manufacture of floatation)
- (b) 1 foam manufacturing company
(using CFC-11 for manufacture of slabstocks)
N.B. There are 2 other foam companies in operation but they use methylene chloride
- (c) 15 (an estimate) refrigerator and stationary air-conditioner servicing and maintenance workshops
- (d) 20 (an estimate) mobile air-conditioner servicing/installation workshops

- (e) 5 garment manufacturers
(using methyl chloroform for spot cleaning)
- (f) 2 bottled gas companies
(using methyl chloroform for cleaning out gas lines)
- (g) Various industries and companies
(using methyl chloroform mixtures for cleaning electronics and other equipment)
- (h) End-users (industries and hotels that maintain their own refrigeration system)

Importers of products containing controlled substances:

- (a) 3 major retail shops sell domestic refrigerators and freezers
- (b) 6 car dealers import and sell vehicles, some fitted with mobile air-conditioners
- (c) 3 companies sell and maintain fire extinguishers
- (d) 10 larger-scale hotels and industries import their own refrigeration systems.

End-users of the products that contain controlled substances:

- (a) hotels
- (b) 5 airlines
- (c) Shipping, fishing, and agricultural (chicken, slaughter houses, dairy) companies, stores, super markets, restaurants, institutions, offices and households.

2.4 The status of response to the Montreal Protocol

2.4.1 The Government response

Fiji acceded to the Vienna Convention for the Protection of the Ozone Layer and its Montreal Protocol on 23 October 1989 and both the Convention and the Protocol entered into force for Fiji on 21 January 1990.

Fiji has participated with interest in the various meetings convened under the Vienna Convention and the Montreal Protocol and has submitted the information required under the two legal instruments, as requested by the Ozone Secretariat, UNEP. The information submitted includes: estimates of data on production, imports and exports of the controlled substances required by Article 7 of the Montreal Protocol; measures adopted by Fiji to implement the Convention and the Protocol; and a report on the country's activities and situation with regard to the implementation of the Protocol and the ozone depleting substances.

In order to submit the statistical data as required by Article 7 of the Protocol, the Environmental Management Unit of the Ministry of Housing and Urban Development carried out a survey in 1990 of the industries that use the controlled substances to find out the 1986 consumption of the controlled substances. The response by the industries to the questionnaires were generally poor but the results were submitted to the Ozone Secretariat as a preliminary indication of the 1986 consumption of the controlled substances by Fiji. UNEP, from the preliminary indication from the Government's survey as well as available information from other sources, estimated Fiji's consumption to be approximately 70 Tonnes. In 1991, further attempt was made to refine the estimate for 1986 consumption and to estimate the 1990 consumption. The commodities listed in the Bureau of Statistic Report on Overseas Trade was used for this purpose.

In 1991, copies of booklets, "Cleaning and degreasing without CFC-113" received from the Government of Australia were distributed to relevant

industries as well as to various national agencies for reference and research. Several Articles on the issue of ozone layer and ozone depleting substances have been written by the Consumer Council and published in a series of articles in the Fiji Times newspaper.

The Government nominated experts from industries to attend various regional training courses, for example, Halons Recycling Workshop in Japan (January 1992) and Ozone Conference in Australia (March 1992).

The Government of Fiji is committed to phasing out the consumption of controlled substances in Fiji as soon as possible but not later than the year 2000. The Government has already taken actions to pursue this goal. Early phase-out is not only necessary for protecting the ozone layer, but the controlled substances are already becoming scarce because the producers are phasing out their production. Early conversion to substitute chemicals and alternative technologies would, therefore, be essential in meeting the demand for refrigeration, foam products, solvents and fire extinguishing.

Although Fiji, as a developing country operating under paragraph 1 of Article 5, is entitled to delay the phase out by 10 years (i.e phase-out by 2010 except methyl chloroform (2015)), it will not await the elapse of the grace period before embarking on action to phase out its consumption of the controlled substances. With timely and efficient provision of the necessary financial and technical support from the Multilateral Fund under the Montreal Protocol, and effective technology transfer and implementation of the country programme, Fiji could meet its goal to phase out the consumption of the controlled substances earlier than the Protocol requires for Article 5 countries.

2.4.2 The industry response

Generally, the awareness regarding the need to phase out the consumption of the CFCs and halons is high among the industries that use the substances concerned. The refrigeration sector which involves several small-scale workshops is perhaps the field in which there is awareness and expertise to deal with the conversion from controlled substances. The three importers of halons have already voluntarily stopped importing halons.

Fiji Chapter of the Australian Institute of Refrigeration, Air-conditioning and Heating has conducted two industrial seminars on the Montreal Protocol and its implications on the refrigeration and air-conditioning sector. The seminars were attended widely by the industry experts.

2.5 Institutional framework

Under the existing institutional framework, the issues of environment which includes global environmental issues such as the protection of the ozone layer, falls under the responsibility of the Ministry of Housing and Urban Development. The Environmental Management Unit within the Ministry is the contact point for both national and international matters on the environment and is also the focal point for UNEP matters.

The Cabinet approved by Decision No.138 in 1991, that the Minister for Housing and Urban Development whose portfolio includes the environment, should appoint a Consultative Committee on Ozone Depleting Substances (CCODS) to advise him on the phasing out of ODS and the introduction of technology that is ozone friendly. The Committee thus established represents the following interests: chemistry field; building industry; hotel industry; refrigeration industry; shipping industry, Motors Traders Association; Consumer Council; distributor of ODS; fire control; and the Government (Ministry of Housing and Urban Development). The terms of reference of the Committee includes the following tasks: (i) to quantify the consumption of CFCs in Fiji; (ii) to

recommend the quantum of progressive reduction of harmful CFCs to meet the phase-out deadline of year 2000; (iii) to recommend the structure of the Government's regulatory unit to ensure that the phasing out target are achievable; (iv) to recommend the most practical way to control/monitor this phasing out and the ensuing introduction of products less harmful to the ozone layer; (v) in the period before the phasing out is implemented, to suggest suitable training programmes for regulatory officers/technicians to become acquainted with the necessary chemical and engineering expertise to perform the responsibilities allocated to them.

The inauguration meeting was held on 24 February 1992 and the Committee also considered the elements for the preparation of the country programme. All matters regarding the ODS in Fiji will be decided in consultation with the CCODS.

Industry associations and related organizations in Fiji that are dealing with ozone depleting substances include:

(a) **Consumer Council of Fiji:**

The Council consists of eight members that are selected by the Minister of Trade and Commerce. The Council undertakes activities to protect consumers basic rights to goods and services that are fairly priced, produced safely and of good quality.

(b) **Motor Traders Association:**

Members include automotive dealers in light and heavy vehicles. The activities of the Association includes assessment of supplies and demands for the various types of vehicles.

(c) **Fiji Hotel Association:**

Most hotels in Fiji are members of the Fiji Hotel Association. Among other things, the Association assists in the employment of engineers in the hotel refrigeration sectors.

(d) **Fiji Building Association:**

This Association protects the interests of building and civil engineers and assists in their employment. The members include building and civil engineering contractors.

(e) **Shipping Association:**

The members are mainly the local shipping companies. The Association looks after the interest of the companies, especially the routes and berthing spaces.

Institutions and organizations in Fiji that offer various opportunities for training are as below. These institutions could play an important role in training and educating the technicians as well as the public in matters related to the ozone depleting substances, and their use.

(a) **Fiji Institute of Technology:**

Offers training and education for technicians in the field of commerce, engineering, building and administration.

(b) National Training Council:

Its activities include a programme for industrial skill development. This programme will give attention to potential investment areas such as micro electronics and information industries.

Partnership with technologically advanced countries are sought in transfer of technology and to train personnel in science and technology management.

(c) Garment training school:

Has been established for training skilled garment workers.

2.6 Existing policy and operational framework in Fiji that govern trade and industries

In Fiji, there are at least 25 Acts that are relevant to environmental protection and management, administered by various ministries. Most of these Acts are old and ineffective in a modern environmental management context or suffer from lack of enforcement of regulations through inadequate staffing, administrative failures or lack of technical and financial resources.

A specific environmental planning function has been developed within the Ministry of Housing and Urban Development, including the establishment of an inter-ministerial Environment Management Committee (EMC) which has been in operation since 1980, and an Environment Management Unit which has been operating since 1989.

Development Plan 9 under the national policies specifies an objective to ensure that environmental impact assessment, supporting legislation and institutional framework are established to provide the coordination, planning and management of environmental matters. This broad policy encompasses the issue of ozone depleting substances. However, no specific laws and regulations have yet been enacted in Fiji to reduce and phase-out the consumption of controlled substances.

The general policy and operational framework and regulations relevant to trade and industries affecting trade and use of controlled substances and their products, are explained below.

2.6.1 Trade

Companies are registered with the Registrar of Companies under the Ministry of Justice. License of Registration is granted upon registration. This registration is a pre-requisite for applying for import licenses for specific commodities.

Import licenses are issued by Ministry of Trade and Commerce. However, Fiji is currently in the process of phasing out the import license control system. With this phasing out, tariffs will replace non-tariff barriers as the main means of controlling trade. By 1995, duty rates for protective purposes will be reduced gradually to target level of 15%. Duty on raw materials, machinery and equipment for industry will be reduced to 7.5% in the short term, with a view to eventual elimination of duties on these items.

Customs control the actual import of commodities and keep record of transactions.

2.6.2 Industries

Industries are required to register with the Registrar of Companies, with clear indication of their operations. In addition to the registration, the industries are required to acquire licenses for operation from the Ministry of Trade and Commerce.

Under Ministry of Employment and Industrial Relations, the Factory Inspectors check the technical operations and practices of industries. The Factories Act (1971) and Public Health Act (1936) which are enacted, implemented and enforced by the Ministry of Employment and Industrial Relations and Ministry of Health, require safe and appropriate functioning of industrial operations. Non-compliance with the required standards should result in various punitive measures and penalties such as Abatement Order, Prohibition Order and Closing Order.

Pollution control is perhaps the least effective of all the environmental laws. Prosecution of polluters has been practically impossible and has never been carried through. Strong political directive and resolve would be necessary in order to effectively control the activities that cause pollution. The only form of pollution control that is in effect at present is through imposing certain standards and requirements when licenses are granted to new industries and plants.

3. IMPLEMENTING PHASE OUT

3.1 Strategy Statement by the Government

Fiji is a Party to the Montreal Protocol, operating under paragraph 1 of Article 5, hence is required to phase out the consumption of CFCs, halons and carbon tetrachloride controlled under the Montreal Protocol by the year 2010 and methyl chloroform by the year 2015, 10 years later than the phase-out years for non-Article 5 countries. Government of Fiji, as a Party to the Montreal Protocol, is committed to take every possible action to ensure compliance and is prepared to go faster than the Protocol requires for the phasing out the consumption of controlled substances.

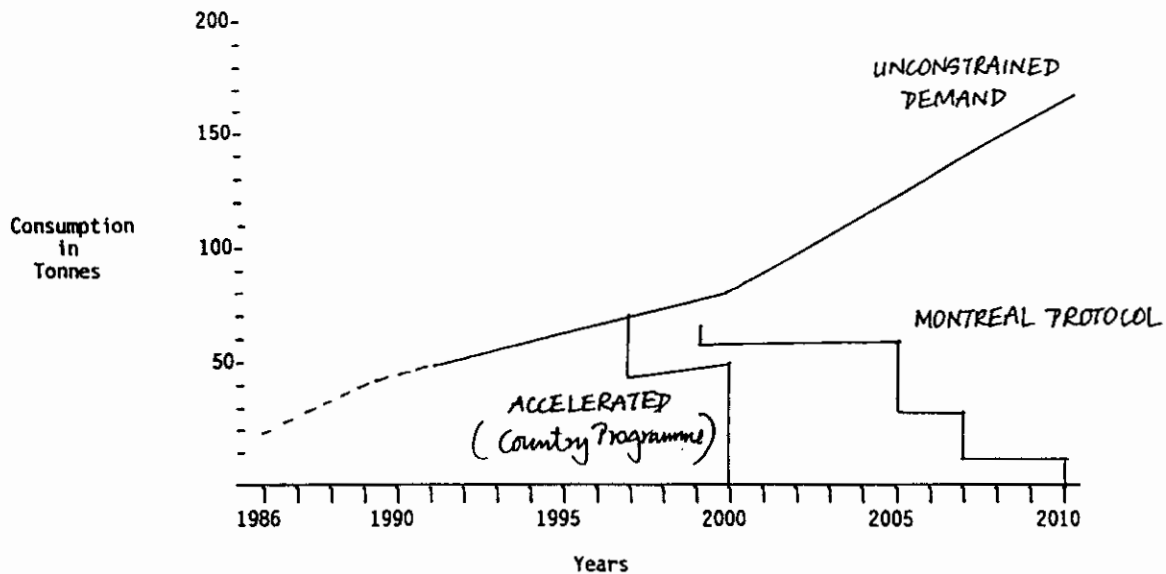
The Action Plan outlined in section 3.2 should enable Fiji to phase out the consumption of controlled substances as follows:

Annex A.	Group I - CFCs:	2000
Annex B.	Group I - methyl chloroform	2000
	Group II - carbon tetrachloride:	2000

The steps for reduction up to complete phase-out of consumption for each group of substances are presented graphically in Figures 3 below:

Figure 3

Graph showing the expected consumption of the controlled substances following the Government strategy for the phase-out as compared with the phase-out in accordance with the requirements of the Montreal Protocol for Article 5 countries



For the above phase out schedules to be met, it is essential that the programmes and projects including feasibility and pre-investment studies under the Action Plan are carried out in an effective and timely manner, with the necessary financial and technical support from the Multilateral Fund under the Montreal Protocol.

Although the consumption of the controlled substances in Fiji is small at present, substantial growth in demand for the substances and products containing controlled substances can be anticipated. Institutional strengthening, public awareness programmes, training and information exchange and dissemination are the four aspects that would play a crucial role in changing the demand for the controlled substances and associated products to ozone friendly substitutes and alternatives at an early stage. Investments in these areas now would prevent future growth in demand and avoid greater investments to be made at a later stage to tackle the problem. For the success of this Country Programme implementation, institutional strengthening is of paramount importance in setting up the necessary basis for the implementation.

The experience in tackling the problem of ozone layer depletion and in complying with the Montreal Protocol would be valuable in dealing with other environmental issues and international agreements to which Fiji has become a Party (Climate and Biological Diversity Conventions). Institutional strengthening, public awareness and training aspects of the Action Plan are vital in smoothly phasing out the ODSs. The experience gained through these activities would also be useful in the field of other global environmental problems. Assistance in institutional strengthening, public awareness, training and information acquisition and dissemination for the purpose of ODS phase out would be indirectly beneficial in the long run in other aspects of environment protection.

Under the Action Plan several training projects are contemplated. Assistance from the Implementing Agencies, in particular, UNEP IE/PAC as a clearing house under the Multilateral Fund and UNDP as the main agency responsible for training and demonstration project, in identifying appropriate experts to undertake the training and teaching would be essential.

3.2 Action Plan

The Action Plan for phasing out the controlled substances consists of:

- (i) Government Actions comprising various programmes;
- (ii) Industry Actions comprising a number of phase out projects.

The programmes under the Government Actions will either require or otherwise create an incentive for actions to be taken by the industries. At the same time, the Government Actions will assist in the implementation of the Industry Actions through providing the necessary framework to, for example, initiate and coordinate the projects; obtain and disburse the necessary funds that are obtained from the Multilateral Fund; ensure the convening of appropriate training programmes; as well as monitor the implementation of the Industry Action.

Furthermore, the Government Actions will include elements that are essential for effective phase-out. Those elements include institutional strengthening, efforts to increase public awareness, and providing for means to disseminate information to the various community sectors within the country as well as to exchange information between Fiji and International Communities.

The elements that comprise the Government Actions and Industry Actions are described under sub-sections 3.2.2 and 3.2.3, respectively.

3.2.1 Key Assumptions Made under the Action Plan

Under this country programme, there are a total of seven projects under Industry Actions. Three of them are in the refrigeration sector, the largest use sector in Fiji. A critical assumption for the projects under the refrigeration sector is that the refrigerators containing HFC-134a and the refrigerant HFC-134a itself will be widely available in international markets by around the year 1995.

The incremental cost for purchasing and using HFC-134a (for servicing) has not been included in this Country Programme. Currently HFC-134a is approximately 3 times as expensive as CFC-12, hence the incremental cost would be substantial. Since new equipment using HFC-134a would only start being imported and purchased from 1993, it is assumed that servicing and refilling would be negligible during the implementation of this Country Programme. However, for the retrofitting of commercial refrigerators to use HFC-134a, considerable amount of HFC-134a is likely to be required.

To date, research in the developed countries for domestic refrigerators has concentrated on development of new non-CFC refrigerants and new equipment that use new refrigerants. The technology for retrofitting domestic refrigerators has not yet been developed because in developed countries, people can afford to replace their refrigerators with a new one when the equipment breaks down. The demand for retrofitting domestic refrigerators is close to being nil, hence, the industries have not been motivated to invest in research in retrofit technology. However, experts (of the Technical Options Committee on Refrigeration and Air-conditioning, Technology and Economics Assessment Panel under the Montreal Protocol) are hopeful that such technology would be developed during late 1990s. (Refer to sub-section below 3.3.4,

Future Developments in the Action Plan.)

With regard to conversion of flexible foam production, existing information indicates that switching to methylene chloride or eliminating the use of auxiliary blowing agent (just using water) altogether are generally cheaper than using CFC-11. In the former case methylene chloride is cheaper than CFC-11. However, since methylene chloride is toxic, adequate safety precautions would be necessary which may incur extra costs. When foam is blown with just water (and CO₂) the density of the foam is increased hence more isocyanate is required. However, some of the cost increase from increased amount of isocyanate would be offset by the elimination of the CFC-11 and the decrease in the thickness of the final product to be sold.

3.2.2 Government Actions

Six programmes constitute the Government Actions for phase-out of the controlled substances:

PROGRAMME 1: Policies and Legislation Programme

Element 1: Government Policies for the Protection of the Ozone Layer

Adoption by the Government of an overall policy strategy, 'Government Policies for the Protection of the Ozone Layer' that outlines the intentions of the Government with regard to compliance with the Montreal Protocol and the implementation of the Country Programme.

The preparation of the Policy Strategy should begin in early 1993 for adoption and release by around August 1994.

The Policy Strategy will include:

- The target year for phasing out the consumption of controlled substances in Fiji;
- The intention of the Government to introduce legislations to control the importation of the controlled substances and their products as well as descriptions of those legislations;
- Announcement that refrigerators and air-conditioners service workshops will be required by law to have a recovery and recycling unit, and that new licensing system will be implemented;
- Description of incentives to be given to the industries that import/use controlled substances and their products;
- The plans for organizing various public awareness activities for industries as well as for the public;
- The plans for organizing various training and educational activities in the field of use of controlled substances for technicians and for general public.

Element 2: Legislation

The Ministry of Housing and Urban Development will, with the assistance of CCODS, prepare a legislation on Ozone Depleting Substances and will also propose amendments to existing legislation as appropriate for controlling the importation and consumption of controlled substances and products containing controlled substances. The provisions will include:

- Control of halons (as discussed and accepted by all halon distribution and service companies in Fiji):

- A ban from the year 1994, on the importation, sales and installation of halons and halon fire extinguishers. (Exemptions for essential uses is not necessary.)
- A ban from the year 1994, on refilling of halon fire extinguishers in non-essential applications. The essential applications will include: ship machinery space; electrical switch boards (systems only); aircraft flight lines; computer rooms; and kitchens (systems only).
- A ban from the year 1999, on refilling of halon fire extinguishers in essential applications.
- All recovery, recycling and refilling of halon to be done by equipment complying to U.L. Rating 2006.
- Requirement to deposit all halon removed from service to the Central Banking Facility for safe recovery and storage.
- Amendment to the Building codes to eliminate the use of halons in non-essential uses.
- A ban on the importation of vehicles that incorporate automotive air-conditioners that contain controlled substances and importation of such automotive air-conditioner units for installations from the year 1995.
- A ban on the importation of any refrigeration and central/room air-conditioning equipment (including compressors) that contain or are made for CFCs from year 1997.
- A ban on the importation of all controlled substances (as bulk chemicals) from the year 2000.
- Requirement for every refrigeration and air-conditioning service workshops (including motor garages that undertake refilling of automobile air-conditioners) to be equipped with a recovery and recycling unit. Such units must be able to recover and recycle CFC, HCFC and HFC refrigerants.
- Requirement for every refrigeration and air-conditioning service workshops to acquire a licence to operate. Licenses will be issued according to the categories of work that the particular workshop is qualified to undertake. Criteria for issuing of licenses will be developed.
- Requirement for every refrigeration and air-conditioning technicians to acquire a 'Certificate of Qualification' before being allowed to practice. Certificates will be issued for different categories of work, such as for servicing (i) automotive air-conditioners; (ii) domestic refrigeration and air-conditioning; and (iii) commercial refrigeration and air-conditioning. The categories of work and the standard of skill and knowledge required will be defined.
- Adjustments of the Customs' coding system to allow for monitoring of each substance controlled under the Montreal Protocol, and a requirement for the Customs to submit a copy of the importation license and invoice to the Ministry of Housing and Urban Development (ODS Sub-Unit).
- Requirements for every industry or company that deal with controlled substances to annually report on the imports/consumption of the controlled substances and/or the production of products

containing/using controlled substances to the Ministry of Housing and Urban Development (ODS Sub-Unit).

- Licensing system for establishment or operation of new industries or companies that would deal with controlled substances. The licenses will only be issued upon approval of the Ministry of Housing and Urban Development.
- Incorporation of minimum standards of practice based upon the "Good Code of Practice for Industries that Use Ozone Depleting Substances" (to be developed).

The following laws and regulations will be included under existing legislations as appropriate:

- Import duty reduction from 1995 to 1996 (inclusive) for domestic and other refrigeration equipment (including compressors) that do not contain or use CFCs or HCFCs.
- Import duty reduction for the recycling and recovery units for refrigerants. The equipment must be able to recycle CFC, HCFC as well as HFC refrigerants from 1994 to 1996 (inclusive).
- Requirement for industries having ammonia refrigeration systems to operate with appropriate code for safety and good practices (to be developed).

The preparation of the legislation should begin in February 1993. The amended legislation should be passed in late 1993 for the implementation to start in 1994.

PROGRAMME 2: Programme for Financial Assistance and Incentives

Element 1: Establishment of Ozone Layer Protection Fund

The Government of Fiji will receive funds from the Multilateral Fund for the implementation of the Country Programme. An Ozone Layer Protection Fund (OLPF) will be established under the Ministry of Housing and Urban Development to receive the necessary funds.

The ODS Sub-unit (to be established under the Ministry of Housing and Urban Development, within the Environmental Management Unit) will coordinate the programmes and projects under the Country Programme. The Sub-unit will draw up a budget annually for the implementation of the Country Programme activities and funds will be disbursed to and through the ODS Sub-unit upon approval of [the Minister].

The OLPF should be established soon after this Country Programme is approved by the Executive Committee in early 1993.

Element 2: Duty exemption/reductions

- No import duty will be placed on equipment for recovery and recycling. Every servicing workshop will be requirement by law to acquire such recovery and recycling unit (see Programme 1, Policy and legislation programme). Duty exemption should also provide an incentive.
- Import duty will be reduced for new domestic and other refrigeration

equipment that do not contain controlled substances or HCFCs. The duty exemption will be implemented for the initial period of two years from January 1995. The purpose is to provide incentives for industries/companies and the public to purchase equipment that do not contain controlled substances or HCFCs at an early stage. Appropriate reuaction will be decided during 1993 for new import duty will be placed from 1994.

PROGRAMME 3: Institutional Strengthening Programme

The existing institutional framework needs to be strengthened in order to ensure that the Country Programme is implemented effectively. The Institutional Strengthening Programme will consist of following elements:

Element 1: Ministry of Housing and Urban Development

Establishment of an ODS Sub-Unit within the Environmental Management Unit of the Ministry of Housing and Urban Development. The ODS Sub-Unit will coordinate, monitor and follow-up on the implementation of the Country Programme with appropriate assistance of the CCODS and cooperation of ODS Inspectorate, other Governmental and non-Governmental institutions as well as industries/companies that will be involved in the implementation of the various programmes, projects and elements under the Action Plan.

Until the officers for the ODS Sub-unit are recruited, the preparatory work that are required for the implementation of the Action Plan will be undertaken by the Ministry of Housing and Urban Development and its Environment Management Unit with assistance and cooperation of CCODS. The officers for the ODS Sub-Unit is expected to be recruited by around August 1993. Purchase and installation of necessary equipment should start as soon as the funding for the activities under the Country Programme is approved by the Executive Committee.

The specific functions and responsibilities of the ODS Sub-Unit will include:

- (a) working in close cooperation with the CCODS in drawing up the Government Policy on the Protection of the Ozone Layer, and in formulating the legislation (Programme 1, Policy and Legislation Programme);
- (b) designing the ozone friendly logo (Programme 2, Financial Assistance and Incentives);
- (c) monitoring and recording (as database) the consumption and use of the controlled substances and report the data and information as necessary (Programme 4, ODS Monitoring Programme);
- (d) organizing and coordinating the various training projects (Programme 5, Training Programme) and public awareness programmes (Programme 6).

Personnel requirements for the ODS Sub-Unit is as follows:

- Two officers:

- (a) one technical officer - should have some technical knowledge in ODS and their use and also have knowledge in computers especially data bases;
- (b) one general officer (senior level) - should be a professional with experience in the field of information and public affairs with good writing skills and knowledge in computers (including

word processing and graphics); and with policy and legal knowledge.

- The administrative work including secretarial work and fund management will be taken care of by the Ministry of Housing and Urban Development.
- Within the allocated budget for equipment, the ODS Sub-Unit will purchase the necessary equipment to enable it to function efficiently and effectively. The equipment may include the following:
 - (a) A personal computer (with computer softwares for word processing, data base and graphics and the necessary equipment to enable connections to the OzonAction database) and a printer to ensure information gathering (e.g. through OzonAction Data Base being developed by IE/PAC), production of information pamphlets and newsletters as well as for record keeping and monitoring of relevant industries and the consumption of the controlled substances;
 - (b) A fax machine; and
 - (c) A heavy duty photocopier.

Budget (in US \$):

	1993	1994	1995	1996	Total
Personnel cost 2 officers	30,000	30,000	30,000	30,000	120,000
Equipment	9,000	-	-	-	9,000
Local travels (2 officers: @20 days)	3,600	3,600	3,600	3,600	14,400
Public awareness	7,000	7,000	7,000	7,000	28,000
Miscellaneous (commun., equipmt. maintenance, etc.)	2,000	2,000	2,000	2,000	8,000
Sub-total	51,600	42,600	42,600	42,600	179,400
contingency (10%) 1/	5,200	4,300	4,300	4,300	18,100
GRAND TOTAL	56,800	46,900	46,900	46,900	197,500

Notes: 1/ Rounded up to the nearest hundred.

Element 2: Ministry of Employment and Industrial Relations

ODS Inspectorate will be established under the Ministry of Employment and Industrial Relations. The tasks of the ODS Inspectorate will be to:

- (i) ensure that the industries are in compliance with relevant codes of good practice;
- (ii) the proper use of ozone friendly logo;
- (iii) ensuring that industries and companies dealing with controlled substances are operating with appropriate licenses and that the requirements for the operations under the licenses are being met.

The ODS Inspectorate would have two officers. The salaries of the officers and the costs of local travels are requested to be covered by the Multilateral Fund.

Budget (in US \$):

	1993	1994	1995	1996	Total
Personnel cost 2 officers	16,000	16,000	16,000	16,000	64,000
Local travels	3,600	3,600	3,600	3,600	14,400
Total	19,600	19,600	19,600	19,600	78,400

PROGRAMME 4: Public Awareness, Information Exchange and Training Programme

This programme will consist of public awareness, information exchange and training projects which are essential for the successful implementation of the Country Programme.

The projects will be organized and coordinated by the ODS Sub-Unit in consultation with the CCODS. An annual budget of US \$ 10,000 is allocated under the budget for the ODS-Sub Unit. The ODS Sub-Unit and the CCODS will choose the projects to be conducted, according to the availability of budget and assessment of the effectiveness of the projects.

Project 4.1: Existing and new courses on refrigeration and air-conditioning

Under the Policies and Legislation Programme, various legislation requiring servicing workshops and technicians to obtain appropriate licenses in order to operate/practice. Suitable training courses in refrigeration and air-conditioning would have to be designed and implemented.

During 1993, the Ministry of Housing and Urban Development, in consultation with CCODS as well as technicians and engineers, will examine the existing training courses on refrigeration and air-conditioning and consider improvements to be made. Establishment of new courses will also be considered. Aspects to be incorporated include recovery and recycling; teaching on substitutes and alternatives (including servicing of new HFC-134a equipment); safety precautions when using ammonia; and better practices.

The officers of ODS Sub-Unit, members of CCODS and staff of the Ministry of Housing and Urban Development and its Environment Management Unit as appropriate, will attend to the short training courses for refrigeration technicians (Project 5.2 below) in order to gain extra knowledge and obtain from the invited experts (trainers) some advice on the training courses to be designed.

New training courses will be started from 1995.

Assistance is requested from the Implementing Agencies (UNDP and UNEP) in training the local trainers through organization of national/regional technical seminars and training courses for the trainers. During 1993, it will be possible to identify the specific areas in which the Fijian trainers would require training. Needs for training of trainers will be communicated to the Implementing Agencies.

Project 4.2: Training of Customs officers

Training of appropriate Customs Officers will be organized. The Customs Officers will be trained on the new coding system, how to identify the controlled substances imported, their trade names and how to categorize them under the coding system for each controlled substance.

Officers in the ODS Sub-Unit, with assistance of CCODS members will undertake the training. Appropriate documents will be prepared which will form the basis for the training. The documents should also serve as a manual to be used by the Customs Officers.

The training will be conducted once in late 1993. The new coding system will be implemented from 1994. The trained officers will train other officers as necessary.

Project 4.3: Acquisition and dissemination of information on new technologies and products

Biennial pamphlets:

- In 1993, the ODS Sub-Unit, with assistance of CCODS will collect information on the new refrigeration equipment that do not contain CFCs or HCFCs and issue pamphlets to encourage the consumers to buy such new products. The chemical distributors and servicing workshops will be encouraged to start importing and using HCF-134a. Information on exemption/reduction of import duty (to be effected from 1994) and other incentive/refunding schemes will also be disseminated. The pamphlets will be distributed to all retail shops that sell refrigeration equipment, all servicing workshops (through industry associations) and to local distributors of controlled substances. The pamphlets should be made available to the end-users of equipment through retail shops and servicing workshops. The pamphlets should be launched during the last quarter of 1993. The pamphlets will be updated biennially.

Quarterly newsletter:

- The ODS Sub-Unit will establish a link to the UNEP IE/PAC's OzonAction Data Base which contains up-to-date information on substitutes, new technologies and products, contacts to producer industries, and other activities in the field of protection of the ozone layer. Information will also be gathered from other sources such as through direct contacts with manufacturing industries abroad.

The ODS Sub-Unit will disseminate information to the industries and public through issuing of a quarterly newsletter which will include information on the substitutes/alternatives and new products as well as international and national activities in the field of ozone layer protection.

Project 4.4: Ozone Friendly Logo

A logo will be designed by the Ministry of Housing and Urban Development in cooperation with the CCODS to indicate that a product is ozone friendly. The manufacturers of foam products can imprint the logo on their products if the products are not made using controlled substances or HCFCs.

For imported products including aerosol products, refrigerators and

air-conditioners, the retail shops will be authorized to imprint the logo on the products that they import and sell if those products do not contain or are not made using controlled substances. Places such as hotels, stores and shops may use the same logo in their advertisements or promotion if no controlled substances or HCFCs are used in any of the products or equipment they are dealing with.

HCFCs are not yet controlled under the Montreal Protocol but are ozone depleting although to a much lesser degree as compared with the controlled substances. The Government will only allow the ozone friendly logo to be used on products and equipment that are truly ozone friendly, i.e. those that have nothing to do with controlled substances or HCFCs. The ODS Inspectorate (to be established under the [Ministry of Employment and Industrial Relations]) will check on the relevant manufacturers and retail shops to ensure correct utilization of the logo.

The logo will be designed during the latter half of 1993 and should be launched in January 1994. The Minister for Housing and Urban Development will hold a press conference on the launch of the logo (see Programme 6, Information Exchange and Public Awareness Programmes; Element 2, Public Awareness Programmes).

Project 4.5: Public awareness raising

- The ODS Sub-Unit with necessary assistance of CCODS will undertake the following public awareness campaigns:
 - (a) Arrange for TV and radio programmes on ozone layer depletion, ozone depleting substances, international efforts being made to protect the ozone layer and the Fiji Country Programme to be implemented. Copies of various video films on the ozone layer issue will be requested from UNEP for broad casting in Fiji. The films will be shown from 1993 at suitable intervals.
 - (b) Release notices on the new policies and legislations through TV and radio announcements as well as on newspapers.
 - (c) Make announcements on TV, radio and newspapers on the launching of the Ozone Friendly logo.
- Two press conferences will be arranged for the Minister of Housing and Urban Development to announce:
 - the adoption of the Fiji Country Programme; and
 - the launch of the Ozone Friendly Logo.
- The ODS -Sub-Unit will organize a 1-day workshop for the media in 1993, to inform them of the issue of depletion and protection of the ozone layer and on the Fiji Country Programme.
- The University of the South Pacific (Institute of Natural Resources) will organize in cooperation with the ODS Sub-Unit:
 - (a) A series of popular articles featuring the problem of depletion of the ozone layer and focusing on efforts being made to protect the ozone layer. The articles will also highlight the progress on the implementation of Fiji Country Programme. Scientific experts will be hired as consultants to prepare articles on the issue. On average, four articles will be prepared each year from 1993 to

1996.

- (b) Public lectures on the ozone layer: depletion and its impacts, and measures for protection. One lecture will be held every year from 1993 to 1996 at the University of the South Pacific.

PROGRAMME 5: ODS Phase-out Monitoring Programme

The monitoring programme will also comprise the following elements:

Element 1: ODS Sub-Unit

Monitoring of the consumption of the controlled substances and the implementation of the Country Programme will be undertaken by the ODS Sub-Unit. The ODS Sub-Unit will also be responsible for ensuring that relevant industries/companies comply with the reporting requirements.

The ODS Sub-Unit will monitor the consumption of the controlled substances in order to monitor and evaluate the effectiveness of the Action Plan and to report statistical data to the Ozone Secretariat for fulfilling the reporting requirement under Article 7 of the Montreal Protocol.

The ODS Sub-Unit will establish a database on the controlled substances and the industries/companies dealing with controlled substances. The imports of controlled substances as well as consumption and use of the substances by each industry/company will be recorded in the database.

Element 2: Monitoring of industries and companies dealing with controlled substances and products containing controlled substances

When the legislation under Programme for Policies and Legislation programme is enacted, each of the industries/companies dealing with controlled substances or HCFCs (those listed under Annex C of the London Amendment to the Montreal Protocol) will be required to report on the consumption and use of the substances annually to the ODS Sub-Unit. The ODS Sub-Unit will request the necessary data from each industry/company using the reporting format to be designed by the Sub-Unit.

When new industries that would deal with controlled substances, HCFCs and/or their products apply for license to operate, the Ministry of Trade and Commerce will seek approval of the Ministry of Housing and Urban Development. The information on establishment of such industries will be included in the database of the ODS Sub-Unit.

When new industries that would deal with importation of controlled substances, HCFCs and/or their products apply for import license, the Ministry of Trade and Commerce will seek approval of the Ministry of Housing and Urban Development. The import license issued by the Ministry of Trade and Commerce will be copied to the ODS Sub-Unit.

Element 3: Import data

The Customs' coding system will be adjusted to include classification code (sub-headings) for each controlled substance listed in Annex A of the Montreal Protocol, in accordance with the recommendation of the Customs Cooperation Council. This will enable monitoring of importation

of individual controlled substance listed in Annex A of the Montreal Protocol. Customs will report the relevant importation data to the ODS Sub-Unit on quarterly basis.

The coding system will be adjusted for implementation from 1 January 1994. Appropriate training of the Customs Officers will take place in early 1993 (see Programme 5, Training; Project 5.3).

3.2.3 Industry Actions

The Industry Actions will consist of 7 projects which are categorized by use sectors.

SECTOR: Refrigeration and Air-conditioning

Project R1: Recycling of refrigerants and better servicing practice

To exempt import duty on the recycling and recovery equipment as well as to provide financial assistance to local companies (excluding the multinational companies) for purchasing such equipment. 20% of the cost of an equipment will be provided to the company as financial assistance. The equipment should be able to recycle CFC, HCFC and HFC refrigerants. The cost of financial assistance is requested to be covered by the Multilateral Fund. The project will be implemented for an initial trial period of two years starting from 1 January 1995.

The mechanism for the provision of financial assistance, including criteria for receiving such assistance, will be established in 1994. It is expected that the workshop owners will purchase the equipment and upon presentation of the receipt, 20% of the price paid will be refunded to the workshop.

Any eligible company which purchases the equipment before 1995 can claim the refund in 1995.

Budget:

Total estimated cost: US\$ 24,000

Assumptions for the estimation:

- The number of workshops (including motor garages servicing automobile air-conditioners) that will purchase a recycling and recovery unit is assumed to be the total number of workshops existing in the country: 30
- The price of one unit equipment is assumed to be US\$ 4,000.

US \$ 9,600 is requested from the Multilateral Fund for the two years (1995 and 1996). This is 40% of the estimated total cost of the project.

TRAINING ELEMENT:

Short training course for refrigeration technicians

A short training course will be organized in 1994 and 1995 for the technicians that deal with various refrigeration systems. The motor garages that deal with refilling of automobile air-conditioners will

also be invited. The courses will include:

- (i) teaching of better practices for servicing refrigerators in order to minimize the emission of the refrigerant gases into the atmosphere (1-2 days);
- (ii) demonstrations on the use of recycling units (1-2 days);
- (iii) lecture on the substitutes and new equipment (1 day); and
- (iv) training on the retrofitting of CFC-using commercial refrigeration equipment (with large compressors) to use HFC-134a refrigerant (3 days);
- (v) training to service HFC-134a equipment (1-2 days).

The short courses will be organized in two places: Suva and Lautoka at suitable premises.

Appropriate experts (2 experts: one on better practices and substitutes and new equipment; one on retrofitting) in the field of refrigeration will be invited from abroad to teach the courses. The invited experts will spend about three weeks in Fiji.

For the demonstration on recovery and recycling equipment, a number of companies manufacturing such equipment will be contacted. The company that would be willing to cover the cost for its expert to undertake the demonstration will be invited. This company will benefit from promoting its equipment.

If the technology for retrofitting domestic refrigeration systems become available before the implementation of the updated Country Programme, this project will be adjusted to include training of technicians on the technology. The necessary funds for this has been included in the budget.

Budget:

	1994	1995
Fee for three experts:	6,000	7,000
Travel for three experts:	4,500	5,000
Daily Subsistence Allowance:	10,000	11,000
Advertising:	500	600
TOTAL	20,500	23,600

GRAND TOTAL US \$ 44,100

Project R2: Retrofitting industrial refrigeration systems to use ammonia

Since it is cheaper to operate industrial refrigeration systems with ammonia, the industries will be required to retrofit their systems to use ammonia at their own cost. If the industries wish to retrofit their refrigeration equipment with substitutes other than ammonia or HCFCs, they can submit proposals to the ODS Sub-Unit for consideration of financing incremental cost. The retrofitting should occur before the year 2000 when importation of controlled substances will be banned.

The refrigeration technicians of the relevant industries will be required to attend the training course on safety for ammonia refrigeration systems (Programme 5, Training Courses Programme, Project 5.4).

TRAINING ELEMENT:

A training course on the safety measures for industrial refrigeration systems using ammonia

A one-week course will be conducted in 1995 and 1996 for training industrial refrigeration technicians on the safety precautions for operating ammonia systems. The course will also train the technicians to teach the other staff in the industry on measures to be taken to ensure safety.

Existing international code of good practice for ammonia systems will be used and an appropriate expert in the field will be invited from abroad to teach the course.

All industrial refrigeration technicians will be urged to take the course.

Budget:

	1995	1996
Fee for the expert:	2,000	2,200
Travel for the expert:	1,500	1,700
Daily Subsistence Allowance:	1,100	1,200
TOTAL	4,600	5,100

GRAND TOTAL: US \$ 9,700

Project R3: **Retrofitting existing commercial refrigerators (with large compressors)**

When a commercial refrigeration equipment needs a compressor replacement or other major repairs the equipment will be retrofitted to use HFC-134a refrigerant. This project will be implemented first on a trial basis for two years, starting on 1 January 1995. The incremental cost to the servicing workshops or in some cases the owners of the equipment, for purchasing HFC-134a compressors, HFC-134a refrigerant, replacement lubricant oil and other refrigerator components are requested to be covered by the Multilateral Fund.

The owner of a commercial refrigeration system, after having retrofitted their equipment, will submit appropriate receipts to the ODS Sub-Unit. The receipts may be either: (i) importation licenses and invoices for the importation of HFC-134a, ester oil and components necessary for the retrofit as well as receipt for the labour; or (ii) detailed receipt from a servicing workshop that undertook the retrofiting. The incremental cost (any extra cost for having the equipment retrofitted instead of having it serviced under normal circumstances) will be worked out and this incremental cost will be refunded to the owner of the equipment.

(N.B. The import duty on HFC-134a compressor will be reduced (see Government Actions, Programme 2, Element 3).)

Budget:

Total estimated cost of the project for the initial trial period: US \$ 100,000.

Assumptions for the estimate:

- It is assumed that there are a total of 3,000 commercial refrigeration systems that are currently in operation in Fiji. By the end of 1996 an estimated 3,650 units of equipment will be in operation. All these units are assumed to be CFC-12 equipment. It is assumed that 200 units of equipment would be retrofitted in the two years (1995 and 1996).
- Retrofitting may involve either: (i) compressor replacement which would necessitate replacement of other components such as expansion valve, dessicator and nostrils; or (ii) thorough cleaning out and replacement of the CFC-12 with HFC-134a and lubricant oil. The HFC-134a is currently about 50% more expensive than the CFC-12 and the replacement oil (ester oil) is also expensive. The cost for the retrofit is dependant upon the age, size and the construction of the equipment being retrofitted hence, difficult to estimate. The average incremental cost of retrofitting a commercial refrigeration equipment is taken to be US \$ 500.

SECTOR: Foams

Project F1: Converting the existing CFC-using flexible and rigid (floatation) foam industry to use alternatives

After the special technical workshop on substitutes and alternatives for CFC-11 in the production of foam (Programme 5, Training Programme, Project 5.5), the industries will conduct any further research necessary and decide on the conversion.

In the flexible foam production, if conversion to methylene chloride is chosen, the industry will cover any necessary capital costs for the conversion. If the industry chooses other alternatives that are more expensive than CFC-11 method, the industry will submit a proposal (including detailed indications of the costs) for the conversion to the ODS Sub-Unit for consideration for financial assistance. Similarly for the production of floatation, the industry will submit a proposal for conversion if the alternative technology chosen by the industry is more expensive than using daltolac. The proposals should be submitted during early 1996 so that if incremental costs are justifiable, it will be incorporated into the Country Programme update for implementation in 1997). This plan will be communicated to the industries during the special technical workshop.

TRAINING ELEMENT:

A special technical workshop for the foam industry (flexible and rigid foam) to convert from using CFC-11 to methylene chloride or other substitutes and alternative technology

In 1994, a special one-week technical workshop, including visits to local industries, will be organized for the foam factory owners (flexible foam industry and producer of floatation) and workers on substitution to methylene chloride or other substitutes and alternatives. Safety precautions for using methylene chloride or other substitutes and alternatives will be incorporated.

Appropriate foams experts (3) will be invited from abroad as resource persons.

The technical workshop will give an overview of the available substitutes and alternatives to CFC-11 in flexible foam production and to dalatolac in floatation production. The industries will choose the substitute chemical (HCFC will not be encouraged) or alternative technology for conversion.

The foam industries will be required to convert from using CFC-11 by the year 2000 at the latest when the ban on importation of controlled substances will come into effect.

Budget:

Fees for the three resource persons: US \$ 6,000
Travel and Daily Subsistence Allowance: US \$ 10,000

TOTAL: US \$ 16,000

SECTOR: Solvents

Project S1: Converting the garment industries from using methyl chloroform to other substances

After the special technical workshop on substitutes and alternatives for methyl chloroform (Programme 5, Training Programme, Project 5.6), the industries will conduct any further research necessary and decide on the conversion.

If the alternatives chosen by the industries are more expensive than using methyl chloroform the industries will submit a proposals (including detailed indications of the costs) for the conversion to the ODS Sub-Unit for consideration for financial assistance. The proposals should be submitted during early 1996 so that if incremental costs are justifiable, it will be incorporated into the Country Programme update for implementation in 1997). This plan will be communicated to the industries during the special technical workshop.

TRAINING ELEMENT:

A special technical workshop for the industries using methyl chloroform (garment industries) to convert to using other solvents

In 1994, a special one-week technical workshop, including visits to local industries, will be organized for the industries using methyl chloroform. Availability of substitute solvents, the economic and technological implications for using such substitutes will be discussed. Appropriate experts (2) will be invited from abroad as resource persons.

The industries will choose the substitute chemical (HCFC will not be encouraged) or alternative technology for conversion. The industries will be required to convert from using CFC-11 by the year 2000 at the latest when the ban on importation of controlled substances will come into effect.

Budget:

Fees for the three resource persons: US \$ 4,000
Travel and Daily Subsistence Allowance: US \$ 6,000

TOTAL: US \$ 10,000

SECTOR: Halons

Project H1: Recycling and recovery of halons

Through halon recycling project organized by UNDP, Fiji is expected to receive a recovery and recycling machine, Model 866 HE Recharge/Recovery System, manufactured by Amerex Corporation. It is designed to transfer halon 1211 between extinguishers and any combination of storage and supply containers, with minimum of 99% efficiency. This is the efficiency required by the Underwriters Laboratory rating 2006 which is stated in the N.F.P.A. 10 as the requirement for all transfer of halon.

The machine is air operated and incorporates a filter/dryer assembly for "cleaning" the halon before passing it to the storage container so as not to contaminate existing halon. The system is also equipped with moisture indicators, sight glasses, air filters and a variety of integrated safety features.

Fire Control Fiji Limited has in place the wide variety of adapters as well as the large capacity air compressor needed to run the machine, hence costs of establishing the infrastructure to support the machine would not be necessary. Fire Control Fiji is also willing to install and maintain the system at its premises and cover the costs for the installation and maintenance.

If the machine has to be bought, by Fiji, the necessary funds will be requested from the Multilateral Fund. The estimated cost of a machine is US \$ 10,000.

Project H2: Central halon banking system

The existing infrastructure at Fire Control Fiji Limited could easily be expanded to include storage for halons. The local distributors have agreed that the Central Banking facility could be established at the Fire Control Fiji Limited to store halons from voluntarily surrendered extinguishers. These halons will be recycled for essential applications only from 1994, when the ban on refilling halon extinguishers for non-essential applications is effected. Import of any new halons will also be banned from 1994.

Fire Control Fiji Limited already has two small storage containers and these are expected to be sufficient until there is a complete ban on the use of halons in 1998. Should this be insufficient storage capacity, funds may be requested at a later stage from the Multilateral Fund for obtaining an empty container.

The Central Banking System would be maintained by the Fire Control Fiji Limited and will be controlled by CCODS.

3.3.4 Future Developments in the Action Plan

As explained under sub-section 3.2.1 (Key Assumptions Made under the Action Plan), project that takes into account the incremental cost for servicing refrigeration equipment with HFC-134a refrigerant and lubricant oil has not been included under this Country Programme. An appropriate project may be developed for the Country Programme update to be implemented from 1997.

Under the Industry Actions, no project for domestic refrigeration sector

has been included at this stage. As mentioned under the sub-section 3.2.1 (Key Assumptions made under the Action Plan), the technological developments in the field of domestic refrigerators are ongoing at a rapid pace. Due to the fact that in developed countries, people are able to easily afford new refrigerators, research in the field of retrofitting existing domestic refrigerators containing CFCs to use HFC-134a has been minimal.

The ODS Sub-Unit will keep abreast of the developments in the field of retrofitting of domestic refrigerators. In the update of the Country Programme, projects for dealing with CFC-containing domestic refrigeration systems will be included for implementation from 1997 when the ban on importation of equipment containing or are made for CFCs (including compressors that are made for CFCs) will be effected.

In 1996, before deciding on the projects, feasibility studies will be requested to be carried out by one of the Implementing Agencies (UNDP, UNEP or the World Bank). One of the important concerns is the economic implications for retrofitting domestic refrigerators. Due to the fact that the energy efficiency of the current equipment is up to four times greater than the older models, retrofitting refrigerators manufactured prior to 1990 projects may not be economical. However, this would also depend upon the energy efficiency of the HFC-134a equipment.

The two foreseeable options of domestic refrigeration project are briefly described below:

(a) Replacing old domestic refrigerators and freezers

If technology for retrofitting domestic refrigerators are not sufficiently developed in the world for introduction into Fiji by 1997, the domestic refrigerators and freezers that need compressor replacement from 1997 onwards will be scrapped. Such retrofitting technology would have to be available by 1996 in order to allow time for the technicians in Fiji to be trained.

The incremental cost to the consumers of forced replacement of refrigeration equipment will be requested from the Multilateral Fund. The replacement will be calculated on the basis of 'annual value' of the equipment (i.e. the total cost of the equipment divided by the expected life time of the equipment) and the remaining life time of the equipment.

The old refrigerators and freezers should be deposited with specified servicing workshops which will certify that the compressors need to be replaced. Upon deposit of the old equipment, the depositor will be given a 'deposit fee'. This fee should equal the replacement cost explained in paragraph above.

Some means of disposal of the scrapped refrigerators will also be included in the project. A part of the cost for this may also be requested from the Multilateral Fund.

(b) Retrofitting domestic refrigerators and freezers

If the technology for retrofitting CFC-using refrigerators and freezers are developed in the world for introduction into Fiji by 1997, the domestic refrigerators and the freezers will be retrofitted. The training programmes under this Country Programme will be adjusted in 1996 to incorporate training on the retrofitting techniques for domestic refrigerator systems.

The incremental costs for retrofitting the refrigerators will be requested from the Multilateral Fund.

3.3 Timetable for the Implementation of the Action Plan and Consumption Implications

The planned time schedule for the programmes and projects under the Action Plan is shown in Table 3.1. The time schedule reflects the priorities for the funding in terms of when the funds would be required.

3.4 Summary and Budget for the Action Plan

3.4.1 Implications of the Action Plan on the Consumption of Controlled Substances

The programmes, projects and elements under the Action Plan are summarized under Table 3.2 with indications of direct implications on the consumption of controlled substances. The implications are expressed in terms of the estimated quantity of controlled substances reduced during the duration of the project under this Country Programme.

Most of the activities do not have direct and measurable implication on the consumption of controlled substances, but are obviously essential in enabling effective and successful phase-out. Institutional strengthening is crucial in implementing the Country Programme. (See also section 3.1, Strategy Statement by the Government.)

The expected total cumulative consumption of the controlled substances (Annex A substances only) under the Country Programme (until complete phase-out) is 388 Tonnes. The expected cumulative consumption under the Montreal Protocol phase-out schedule and unconstrained demand are compared below:

Cumulative consumption (Tonnes)

Country Programme:	388	(1992-1999, inclusive)
Montreal Protocol:	793	(1992-2009, inclusive)
Unconstrained demand:	1,473	(1992-2009, inclusive)

3.4.2 Budget for the Action Plan

The budget for the Action Plan is shown in Table 3.3. The Table also shows the use sector affected by the programme or project and where relevant, shows the implication on the consumption of controlled substances.

Each project outlined under the Action Plan will be further developed at a later stage into project proposals for submission to the Fund Secretariat/Executive Committee. The Ministry of Housing and Urban Development (ODS Sub-Unit) will prepare the project proposals with necessary assistance of the Implementing Agencies. The budget estimates contained in the Country Programme will be further refined when project proposals are prepared.

The detailed plan for the implementation of each project and the modalities for preparing accounts of expenditures will be worked out with appropriate Implementing Agency.

Table 3.1 Planned time schedule for the implementation of the Action Plan

Programmes/projects	1993 J F M A M J J A S O N D	1994 J F M A M J J A S O N D	1995 J F M A M J J A S O N D	1996 J F M A M J J A S O N D
GOVERNMENT ACTIONS				
Programme 1 1. policy 2. legislation	<---P---> A <---P---P---> A	<---Implementation---		
Programme 2 1. Ozone Fund	E			
Programme 3 1. OOS Sub-Unit 2. OOS Inspectorate	<---P---> <---Imple- <---P---P--->	mentation--- <---Implementation---		
Programme 4	<---Implementation			
Programme 5 1. Customs coding system 2. Industry reports	<---P---> <---P--->	<---Implementation--- <---Implementation---		
INDUSTRY ACTIONS				
1. Project R1 - Training element		X	<---Implementation--- X	
2. Project R2 - Training element			X	X
3. Project R3			<---Implementation---	
4. Project F1 - Training element		X		<---proposals-->
5. Project S1 - Training element				<---proposals-->
6. Project H1		<---Implementation---		
7. Project H2		<---Implementation---		
Feasibility study (dom.ref.)				<---study-->

KEY: P = preparation L = launch X = event A = adoption R = release n = newsletter p = pamphlet

Table 3.2 Summary of the programmes, projects and elements under the Action Plan with indications of the implications on the consumption

Programmes/projects/elements	Brief Description	Commencement/Duration	Use sector	Implications on consump.
GOVERNMENT ACTIONS				
Programme 1 1. policy	Adoption of an overall policy for the protection of the ozone layer.	February 1993 (begin preparation) August 1993 (adoption)	All	
2. legislation	Adoption of various legislations to control and monitor the consumption of controlled substances.	February 1993 (begin preparation) December 1993 (adoption)	All	
Programme 2 1. Ozone Fund	Establishment of Ozone Fund under the Min. of Housing and Urban Dev. for the implementation of the Country Prog.	March 1993	All	
Programme 3 1. ODS Sub-Unit	Establishment of an ODS Sub-Unit under the Min. of Housing and Urban Development	August 1993	All	
2. ODS Inspectorate	Establishment of an ODS Inspectorate under the Min. of Employment and Industrial Rel. to ensure compliance with laws by industries.	February 1993 (begin preparation) January 1994 (implementation)	All	
Programme 4 Various projects for public awareness, information exchange and training	Information pamphlets; public lectures; logo; articles; radio/TV/newspaper adverts/announcements; custom officers training; etc.	To be conducted as appropriate	All	
Programme 5 1. Customs coding system	Adoption of separate subheadings for each controlled substances and reporting to the ODS Sub-Unit	April 1993 (begin preparation) January 1994 (implementation)	All	
2. Industry reports	Reporting by each industry on the import and use of controlled substances.	1993 (preparations) January 1994 (implementation)	All	

Table 3.2 continued_

Programmes/projects/elements	Brief Description	Commencement/Duration	Use sector	Implications on consump.
INDUSTRY ACTIONS				
1. Project R1	Recycling of refrigerants.	1995-1996	Refrig.	10-15 Tonnes (CFC-12)
- Training element	Training course for refrigeration and a/c technicians.	October 1994/5		
2. Project R2	Retrofitting existing industrial refrigeration systems to ammonia.	Before 2000	Refrig.	1- 2 Tonnes (CFC-12) 1- 2 Tonnes (CFC-11)
- Training element	Training of technicians on safety measures when operating ammonia refrigeration systems in industries.	June 1995/6		
3. Project R3	Retrofitting existing commercial refriger. equipment to use HFC-134a.	1995-1996	Refrig.	5-10 Tonnes (CFC-12)
4. Project F1	Conversion of flexible and rigid foam industries from using CFC-11 to substitutes.	1996 (submission of proposals by industries)	Foams	
- Training element	Special technical lecture on the conversion of CFC-11 using foam industries to methylene chloride (including safety aspects for the workers).	June 1994		
5. Project S1	Substituting the use of methyl chloroform in garment industries	1996 (submission of proposals by industries) November 1994	Solvents	
- Training element	Special technical lecture on substitutes for methyl chloroform (garment industries)			
6. Project H1	Recovery and recycling of halons	January 1994 onwards	Halons	
7. Project H2	Central halon banking system	January 1994 onwards	Halons	

Table 3.3 Budget for the various programmes and projects under the Action Plan

Programmes and projects	1993	1994	1995	1996	TOTAL
GOVERNMENT ACTIONS					
Programme 3					
1. ODS Sub-Unit	56,800	46,900	46,900	46,900	197,500
2. ODS Inspectorate	19,600	19,600	19,600	19,600	78,400
SUB-TOTAL	76,400	66,500	66,500	66,500	275,900
INDUSTRY ACTIONS					
1. Project R1	-	-	9,600	-	9,600
- Training element	-	20,500	23,600	-	44,100
2. Project R2	-	-	?	?	?
- Training element	-	-	4,600	5,100	9,700
3. Project R3	-	-	100,000	-	100,000
4. Project F1	-	-	-	-	-
- Training element	-	16,000	-	-	16,000
5. Project S1	-	-	-	-	-
- Training element	-	10,000	-	-	10,000
6. Project H1	-	[10,000]	-	-	-
7. Project H2	-	-	-	-	-
SUB-TOTAL	-	46,500 [10,000]	137,800	5,100	189,400 [10,000]
GRAND TOTAL	76,400	113,000 [10,000]	204,300	71,600	465,300 [10,000]

ANNEX II

Table A.1 Production, imports, exports and consumption of controlled substances in 1986

Tonnes Substances	Prod.	Imports	Exports	Consump.	ODP	Calcul. Consump.
ANNEX A						
<u>Group I</u>						
CFC 11	0	5.260	0	5.260	1.0	5.260
CFC 12	0	10.257	0	10.257	1.0	10.257
CFC 113	0	0	0	0	0.8	0
CFC 114	0	0	0	0	1.0	0
CFC 115	0	2.112	0	2.112	0.6	1.267
Sub-total	0	17.629	0	17.629		16.784
<u>Group II</u>						
Halon 1211	0	1.226	0	1.226	3.0	3.678
Halon 1301	0	0	0	0	10.0	0
Halon 2402	0	0	0	0	6.0	0
Sub-total	0	1.226	0	1.226		3.678
TOTAL	0	18.855	0	18.855		20.462
ANNEX B						
<u>Group I</u>						
CFC 13	0	0	0	0	1.0	0
CFC 111	0	0	0	0	1.0	0
CFC 112	0	0	0	0	1.0	0
CFC 211	0	0	0	0	1.0	0
CFC 212	0	0	0	0	1.0	0
CFC 213	0	0	0	0	1.0	0
CFC 214	0	0	0	0	1.0	0
CFC 215	0	0	0	0	1.0	0
CFC 216	0	0	0	0	1.0	0
CFC 217	0	0	0	0	1.0	0
Sub-total	0	0	0	0		0
<u>Group II</u>						
Carbon tet	0	0.190	0	0.190	1.1	0.209
<u>Group III</u>						
Methyl chl	0	3.928	0	3.928	1.0	3.928
TOTAL	0	4.118	0	4.118		4.137

Table A.2 Production, imports, exports and consumption of controlled substances in 1989

Tonnes Substances	Prod.	Imports	Exports	Consump.	OOP	Calcul. Consump.
ANNEX A						
<u>Group I</u>						
CFC 11	0	13.089	0	13.089	1.0	13.089
CFC 12	0	23.927	0	23.927	1.0	23.927
CFC 113	0	0	0	0	0.8	0
CFC 114	0	0	0	0	1.0	0
CFC 115	0	5.119	0	5.119	0.6	3.071
Sub-total	0	42.135	0	42.135		40.087
<u>Group II</u>						
Halon 1211	0	1.500	0	1.500	3.0	4.500
Halon 1301	0	0	0	0	10.0	0
Halon 2402	0	0	0	0	6.0	0
Sub-total	0	1.500	0	1.500		4.500
TOTAL	0	43.635	0	43.635		44.587
ANNEX B						
<u>Group I</u>						
CFC 13	0	0	0	0	1.0	0
CFC 111	0	0	0	0	1.0	0
CFC 112	0	0	0	0	1.0	0
CFC 211	0	0	0	0	1.0	0
CFC 212	0	0	0	0	1.0	0
CFC 213	0	0	0	0	1.0	0
CFC 214	0	0	0	0	1.0	0
CFC 215	0	0	0	0	1.0	0
CFC 216	0	0	0	0	1.0	0
CFC 217	0	0	0	0	1.0	0
Sub-total	0	0	0	0		0
<u>Group II</u>						
Carbon tet	0	0.190	0	0.190	1.1	0.209
<u>Group III</u>						
Methyl chl	0	0.676	0	0.676	1.0	0.676
TOTAL	0	0.866	0	0.866		0.885

Table A.3 Production, imports, exports and consumption of controlled substances in 1990

Tonnes Substances	Prod.	Imports	Exports	Consump.	ODP	Calcul. Consump.
ANNEX A						
<u>Group I</u>						
CFC 11	0	14.035	0	14.035	1.0	14.035
CFC 12	0	20.043	0	20.043	1.0	20.043
CFC 113	0	0	0	0	0.8	0
CFC 114	0	0	0	0	1.0	0
CFC 115	0	2.657	0	2.657	0.6	1.594
Sub-total	0	36.735	0	36.735		35.672
<u>Group II</u>						
Halon 1211	0	1.226	0	1.226	3.0	3.678
Halon 1301	0	0	0	0	10.0	0
Halon 2402	0	0	0	0	6.0	0
Sub-total	0	1.226	0	1.226		3.678
TOTAL	0	37.962	0	37.962		39.350
ANNEX B						
<u>Group I</u>						
CFC 13	0	0	0	0	1.0	0
CFC 111	0	0	0	0	1.0	0
CFC 112	0	0	0	0	1.0	0
CFC 211	0	0	0	0	1.0	0
CFC 212	0	0	0	0	1.0	0
CFC 213	0	0	0	0	1.0	0
CFC 214	0	0	0	0	1.0	0
CFC 215	0	0	0	0	1.0	0
CFC 216	0	0	0	0	1.0	0
CFC 217	0	0	0	0	1.0	0
Sub-total	0	0	0	0		0
<u>Group II</u>						
Carbon tet	0	0.190	0	0.190	1.1	0.209
<u>Group III</u>						
Methyl chl	0	1.218	0	1.218	1.0	1.218
TOTAL	0	1.408	0	1.408		1.427

Table A.4 Production, imports, exports and consumption of controlled substances in 1991

Tonnes Substances	Prod.	Imports	Exports	Consump.	ODP	Calcul. Consump.
ANNEX A						
<u>Group I</u>						
CFC 11	0	12.237	0	12.237	1.0	12.237
CFC 12	0	28.130	0	28.130	1.0	28.130
CFC 113	0	0	0	0	0.8	0
CFC 114	0	0	0	0	1.0	0
CFC 115	0	2.920	0	2.920	0.6	1.752
Sub-total	0	43.287	0	43.287		42.119
<u>Group II</u>						
Halon 1211	0	1.226	0	1.226	3.0	3.678
Halon 1301	0	0	0	0	10.0	0
Halon 2402	0	0	0	0	6.0	0
Sub-total	0	1.226	0	1.226		3.670
TOTAL	0	44.513	0	44.513		45.797
ANNEX B						
<u>Group I</u>						
CFC 13	0	0	0	0	1.0	0
CFC 111	0	0	0	0	1.0	0
CFC 112	0	0	0	0	1.0	0
CFC 211	0	0	0	0	1.0	0
CFC 212	0	0	0	0	1.0	0
CFC 213	0	0	0	0	1.0	0
CFC 214	0	0	0	0	1.0	0
CFC 215	0	0	0	0	1.0	0
CFC 216	0	0	0	0	1.0	0
CFC 217	0	0	0	0	1.0	0
Sub-total	0	0	0	0		0
<u>Group II</u>						
Carbon tet	0	0.203	0	0.203	1.1	0.223
<u>Group III</u>						
Methyl chl	0	6.038	0	6.038	1.0	6.038
TOTAL	0	6.241	0	6.241		6.261

ANNEX I

**SURVEY OF
OZONE DEPLETING SUBSTANCES
IN FIJI**

**A Report to the
Consultative Committee on Ozone Depleting Substances
Government of Fiji**

by

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30 April, 1992

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Overall this survey was an example of the ability of university, government, and industry to work together promptly and efficiently towards solving a problem. The tripartite nature of the CCODS committee was instrumental in allowing this co-operation, and we appreciate the opportunity to perform this interesting work for the committee.

1. INTRODUCTION

Under the Montreal Protocol on Substances that Deplete the Ozone Layer, the signatories are required to phase out the consumption of the controlled substances (five CFCs and three halons) by the year 2000. The Amendment to the Montreal Protocol requires the phase-out of twelve other compounds. In view of the apparently rapid destruction of the ozone layer, most parties to the Protocol are not utilizing the ten year grace period and are attempting to end the use of the nineteen controlled substances by 1995. Fiji is a signatory to the Montreal Protocol, and has established a Consultative Committee on Ozone Depleting Substances (CCODS) which is beginning the process of implementing the Montreal Protocol in Fiji.

The Institute of Natural Resources was contracted by the Consultative Committee on Ozone Depleting Substances to conduct a survey of the use of the nineteen controlled substances in Fiji. Data on the manufacture, import, and use of controlled substances in Fiji was requested for the years 1986, 1989, 1990 and 1991.

In fact, no controlled substances are manufactured in Fiji, so the survey devolved to ascertaining data on their importation and use.

2. METHODS

The survey was undertaken by a survey team which broke into four groups dealing with: refrigerants; foams; aerosols and halons; and solvents. The survey team met each Tuesday for six weeks, and at the outset several specialists were invited to brief the team on various matters regarding ozone-depleting chemicals.

In collecting the data, the survey team utilized the Fiji Bureau of Statistics extensively for the importation of refrigeration and airconditioning units. Most of the other information was obtained through questionnaires to the various companies in the target industries, usually obtained through personal visits. Information on aerosol propellants was harder to obtain, since CFC propellants are not used any more. The summation of CFC importation in aerosol cans in 1986 and 1989 had to be pieced together from various fragments of information on can imports and historical use of CFCs in aerosol sprays. Halon information was supplied almost exclusively by Mr. Steven Hay of Fire Control (Fiji) Ltd.

The results of the survey are summarized by chemical in the tables in the following section.

3. RESULTS

The data for each controlled substance in Fiji are summarized in the following tables.

TABLE 1: CFC-11 IMPORTS INTO FIJI (in kilograms)

	1986	1989	1990	1991
Corrie and Co.	0	9,026	9,526	9,753
CIG	5,260	3,780	4,320	2,484
As Daltolac for foam	0	283	189	0
Aerosol propellants	4,700	13,000	0	0
TOTAL	9,960	26,089	14,035	12,237

Notes:

1. Chemical name: trichlorofluoromethane
ODP: 1.0
2. Daltolac is used in foam manufacture and is said to contain 5% CFC-11.
3. CFC-11 is used both in foam manufacture and as a refrigerant. The only foam manufacturer using CFC-11 is Manubhai Industries Ltd., Ba, who are presently using about 9000 kg/year to produce about foam mattresses (approximately \$1,000,000/yr in sales).
4. The refrigerant use of CFC-11 is by large plants for air-conditioning purposes. There are just a few such systems: examples are the Government Printer and the Warwick Hotel.
5. CFC-11 was used as a propellant in aerosol cans, usually as a 1:1 mix with CFC-12, and this constituted the major import avenue for the compound until manufacturers switched to hydrocarbon and other propellants in 1989. See Table 4 and Appendix C for more information on CFCs in aerosol sprays.

TABLE 2: CFC-12 IMPORTS INTO FIJI (in kilograms)

	1986	1989	1990	1991
Car Airconditioning	90	1,566	1,691	2,074
Commercial frig/freezers	336	448	42	472
Domestic frig/freezers	728	1,177	1,464	1,796
Corrie and Co.	0	10,350	7,081	13,616
CIG	9,257	12,577	11,962	13,514
Kooline	1,000	1,000	1,000	1,000
Aerosol propellants	4,700	13,000	0	0
TOTALS	16,111	40,118	23,240	32,472

Notes:

1. Chemical name: dichlorodifluoromethane
ODP: 1
2. For car airconditioning, only the number of imported cars is known. The following ratio of airconditioned to non-airconditioned cars has been assumed:
1986: 15%
1989: 45%
1990: 55%
1991: 75%
Each air-conditioned car has been assumed to have a charge of 0.9 kg of CFC-12. See Appendix D for details on imported cars.
3. Domestic refrigerators and freezers have been assumed to have an average charge of 0.2 kg CFC-12 per unit. See Appendix D for details on imported units.
4. Imported commercial refrigerators and freezers have been assumed to have an average charge of 2 kg/unit. See Appendix D for details on imported units. Larger commercial installations are usually charged in the field, and contain in the range of 5 to 100 kg CFC-12.
5. Some large CFC-12 systems exist in Fiji: the Reserve Bank has the largest, with two chilling units used for air-conditioning each containing 295 kg of CFC-12. The Sheraton has similar size units. (Note: the largest freezers in Fiji at the PAFCO fish cannery use ammonia).
6. CFC-12 was used as a propellant in aerosol sprays, usually as a 1:1 mix with CFC-11, up until 1989, when manufacturers switched to hydrocarbon and other propellants. This major avenue of CFCs entering Fiji ended in 1990, as far as we can ascertain. See Table 4 and Appendix C for more information on CFCs as propellants in aerosol sprays.

TABLE 3: CFC-115 IMPORTS INTO FIJI (in kilograms)

	1986	1989	1990	1991
CIG	1,362	2,463	1,090	817
Corrie and Co.	0	1,906	817	1,361
Kooline	750	750	750	750
TOTAL	2,112	5,119	2,657	2,920

Notes:

1. Chemical name: chloropentafluoroethane
ODP: 0.6
2. Imported as R-502, which is 48.8% HCFC-22 and 51.2% CFC-115.
3. R-502 is primarily used in cold-temperature commercial freezers. The largest R-502 freezer is at Crest Chicken, and contains 1000 kg. There are hundreds of smaller systems, such as the open-topped freezers used in supermarkets.

TABLE 4: AEROSOL IMPORTS INTO FIJI WITH CFC PROPELLANT

	1986	1989	1990	1991
Hairspray	1,764	4,860	0	0
Antiperspirant	6,000	16,560	0	0
Deodorant	1,225	3,395	0	0
Shaving foam	392	1,078	0	0
Oven cleaner	0	0	0	0
Household insecticide spray	0	0	0	0
Stain remover	0	0	0	0
TOTAL	9,400	26,000	0	0

Notes:

1. The most popular CFC propellant was a mix of 50% CFC-11 and 50% CFC-12.
2. CFCs were discontinued as propellants in Australia and New Zealand in 1989 for most uses.
3. A cursory survey of retail outlets in Suva showed that perhaps 2% of the stock did not have the propellant specified. The vast majority (98%) specify hydrocarbon propellant or ozone friendly. It is now law in New Zealand and Australia to specify the propellant (as of January, 1992).
4. The assumptions required to obtain these figures are quite complex, and are included as Appendix C.
5. The figures from this table have been used in the CFC-11 and CFC-12 summary tables.

TABLE 5: HALON 1211 IMPORTS INTO FIJI (in kilograms)

	1986	1989	1990	1991
Bulk Halon	1,226	1,500	1,226	1,226
In extinguishers	873	664	388	105
TOTAL	2,099	2,164	1,614	1,321

Notes:

1. Chemical name: bromochlorodifluoromethane
ODP: 3, recently revised to 6
2. The primary product containing halon is the 3 kg portable extinguisher. About one thousand portable 3 kg halon fire extinguishers are thought to be in Fiji. These are with organizations such as FSC, ATS, Fiji Times, FEA, Housing Authority, Reserve Bank, Fiji Military Forces, Naviti Beach resort, Fijian Hotel, Regent of Fiji, Sheraton, and Mobil.
3. Approximately twenty larger portable fire-extinguisher systems containing 22 kg of halon 1211 are in Fiji with CAAF (outlying airstrips) and FEA.
4. Approximately seventeen 22 kg stationary flooding systems are in Fiji at miscellaneous locations such as the Flour Mills of Fiji, MV Tui Tai, Mocambo Hotel, Air Terminal Services, Marine Dept (three vessels), MV Island Express, Reserve Bank of Fiji.
5. In calculating the amount of halon 1211 entering Fiji in extinguishers we have assumed that number of 3 kg portable systems shown in Appendix D were imported, and that an additional 9, 7, 4 and 0 larger 22 kg systems were imported in the respective years.

TABLE 6: OZONE-DEPLETING SOLVENT IMPORTS INTO FIJI (in kilograms)

	1986	1989	1990	1991
trichloroethane	3,928	676	1,218	6,038
carbon tetrachloride	190	190	190	203
TOTALS	4,118	866	1,408	6,241

Notes:

1. ODP for 1,1,1-trichloroethane is 0.1
ODP for carbon tetrachloride is 1.1
2. Trichloroethane figures are the sum of imports by ICI, Greem Chemicals, and Interchem.
3. Carbon tetrachloride figures are the sum of imports by USP and Greem Chemicals.
4. Uses of trichloroethane in Fiji are spot cleaning (garment manufacturers), cleaning out gas lines (eg CIG), cleaning printing presses, and cleaning electronics (eg. Choy Wong Ltd and Fiji Sugar Corp).
5. Users of carbon tetrachloride are chemical laboratories. (Drycleaners have not used carbon tetrachloride since about 1985. They use white spirit, or perchloroethylene).
6. The density of carbon tetrachloride is 1.59 g/mL and the density of trichloroethane is 1.34 g/mL.

4. SUMMARY

Table 7 summarizes the situation for each of the ozone depleting substances listed in the Montreal Protocol and its amendment. The amount imported in 1991, and the very approximate amount in Fiji at the present time (mid-1992) is listed. The purpose of the table is to give an overview of the controlled substances in Fiji, and where the likely problems will occur on phase-out.

TABLE 7: SUMMARY OF ODS USE IN FIJI

Chemical	ODP	Imported in 91	Estimated stock, 92	Use in Fiji
CFC-11	1.0	12,237	19,000	Refrigerant, foam manufacture
CFC-12	1.0	32,472	61,996	Refrigerant
CFC-113	0.8	0	0	
CFC-114	1.0	0	0	
CFC-115	0.6	2,920	7,500	Refrigerant
HALON-1211	3.0	1,321	4,814	Fire extinguishers
HALON-1301	10.0	0	100	Fire extinguishers
HALON-2401	6.0	0	0	
CFC-13	1.0	0	0	
CFC-111	1.0	0	0	
CFC-112	1.0	0	0	
CFC-211	1.0	0	0	
CFC-212	1.0	0	0	
CFC-213	1.0	0	0	
CFC-214	1.0	0	0	
CFC-215	1.0	0	0	
CFC-216	1.0	0	0	
CFC-217	1.0	0	0	
Carbon tetrachloride	1.1	203	50	Laboratory solvent
Trichloroethane	0.1	6,241	3,000	Cleaning solvent

5. CONCLUSIONS

Table 8 reorganizes the information in Table 7 according to the prevalence of the controlled substances in Fiji. Estimated stocks calculations are made in Appendix A.

TABLE 8: RANKING OF OZONE DEPLETING SUBSTANCES IN ORDER OF THEIR PREVALENCE IN FIJI

	Rank	Value \$F/kg	IMPORTS IN 91 (kg)	STOCK, 92 (kg)	USE
CFC-12	1	\$7.60	37,472	61,996	refrigerant
CFC-11	2	\$2.94	12,237	19,000	refrig/foam
CFC-115	3	\$10.90	2,920	7,500	refrigerant
HALON-1211	4	\$7.89	1,321	4,814	fire extinguishers
Trichloroethane	5	\$2.68	6,241	3,000	cleaning solvent
HALON-1301	6	\$10.00	0	100	fire extinguishers
Carbon tetrachloride	7	\$1.64	203	50	lab solvent

The most prevalent compound by far is the refrigerant CFC-12. This compound is entering the country in all car airconditioners, and most domestic and commercial refrigerators and freezers. Substantial bulk imports are made to service the existing installations in Fiji, which are estimated at about 87,000 domestic units and 6,500 commercial units. Most car and refrigeration manufacturers will stop the manufacture of CFC-12 units in 1993, so the importation of CFC-12 in products will dramatically decline. However, the widespread prevalence of existing units in Fiji will require a carefully managed plan of phase-out of the CFC-12 bulk gas so that owners of cars, refrigerators and freezers in Fiji can obtain servicing to the end of the useful life of their units.

The next most common CFC, CFC-11, will pose similar problems for phase-out for its use in refrigeration, but on a smaller scale. For the portion of the gas used in foam manufacture, Manubhai Industries Ltd. in particular will have to adapt to a new technology.

The third most common CFC, CFC-115 enters the country as the refrigerant R-502 (half HCFC-22, which is not restricted, and half CFC-115). R-22 is used in institutional cold-temperature freezers operating in the range of -10 C to -40 C. Examples are ice cream freezers, open-topped freezers in supermarkets, cold-freezers for meat. At this time there is no ozone-benign replacement for R-22.

Fourth in the list in Table 8 is Halon 1211. This CFC is used in fire extinguishers. Recycling of the halon is expected to be a satisfactory solution to maintaining the existing halon fire extinguishers to the end of their useful life.

Trichloroethane is imported primarily as a specialty cleaning fluid for the garment industry, for electronics, for gas lines, and for miscellaneous other cleaning applications such as printers. Its phase-out will require finding alternative solvents for these various applications.

The remaining two restricted substances, Halon-1301 and carbon tetrachloride, are imported in such small quantities that phase-out would have a negligible effect.

6. SOURCES OF INFORMATION

The following sources of information were used in this survey:

Mr. Steven Cleverley, Kooline Ltd.

Information on the refrigeration service industry

Mr. Steven Hay, Fire Control Fiji

Information and data on halons in Fiji

Mr. Bill Agnew, Carpenters Motors

Information on airconditioning units in cars

Mechanical Services Ltd

Data on amount of refrigerant in various refrigeration and airconditioning units.

Mr. Daniel Singh, CIG,

Overview of main importers of CFCs into Fiji

Fiji Bureau of Statistics

Fiji Trade and Investment Board

Alan Heslop, Industrial Chemist, Reckitt & Coleman, 550 Rosebank Rd, Avondale, Auckland, NZ

Phillip Fleming, Executive Officer, Aerosol Association of New Zealand, Wellington, NZ

Questionnaires were completed by the following companies:

CIG Fiji Ltd, Vetaia St, Lami, Phone: 361011

ICI Fiji Ltd, PO Box 3255, Lami

Corrie and Co., Mr Ramesh Prasad, Carpenter SE. Raiwai, Phone: 386777

Kooline Refrigeration Ltd. Mr Steve Cleverley, 4 Matua St, Walu Bay, Suva, Phone: 313277/314635

Manubhai Industries Ltd., Nabeka St, Ba. (Dinesh Patel, phone 670-163)

Rainbow Textiles Ltd., Namaka Industrial Sub-Div., Nadi, Phone: 723200/723295

MH Retail, 78 Thomson St., Head Office, Suva, Phone: 311811 (Ms H. Hussain, Buyer)

Carlton Brewery (Fiji) Ltd. Mr W. Southwell, 122 Foster Rd., Walu Bay, Suva, Phone: 315811

Mechanical Services Ltd., 18 Matua St., Walu Bay, Suva, Phone: 314933

Sheraton Fiji Resort, Denarau Beach, Nadi, Phone: 701777, Fax: 71818

Fire Control of Fiji, Hume St. Lami, Phone: 361455

University of South Pacific, Chemistry Department and Institute of Natural Resources.

War Memorial Hospital, Phone: 313444, Suva

Fiji Chemicals Ltd., Mr Michael B. (Chemist), Waterfront Rd, Veitari, Lautoka, PO Box 329, Phone: 660548

Interchem (Fiji) Ltd., 141 Foster Rd, Walu Bay, Mrs Karen Montu, Phone: 303422

Gremm Chemicals Ltd., PO Box 794, Suva, Mr S.K. Sharma, Phone: 387777

Gibson Chemicals (Fiji) Ltd, PO Box 3265, Lami, Phone: 361744/361660

Shell Fiji Ltd, GPO Box 168, Regional Office, Rona St, Walu Bay, Suva, Phone: 313933

Mobil Oil Fiji, 4th Floor, Dominion House, Thomson St, Suva, Phone: 314977, Fax: 301875

Choy Wong Ltd (see Gremm Chemicals)

Ranjit Garments Ltd., Lot 7 Jai Hanuman Road, Suva, Phone: 385088

Classic Apparel (MFG) Fiji, 1st Floor, The Hub Bldg, Edinburgh Drive, Suva, Phone: 302544

United Chemical (Fiji), 168 Foster Rd, Walu Bay, Phone 301977

Agchem Ltd, Wailada Industrial Estate, Lami, Phone 361499

Rup Investments Limited, Lot 66 Vatuwaqa Industrial Sub-Div, Suva, Phone: 385399, Fax: 385722

Fiji Marine Shipyard, Walu Bay, Suva, Phone: 315266

Makan's Drug and Pharmaceutical Supplies, 5 Holland St, Suva, Fiji, Phone: 301759

Berger Paints, Nukuwatu St., Lami

Asian Paints, Ruve Pl., Tavakubu, Lautoka

Taubmans Paints, 45 Freeston Rd., Walu Bay, Suva

Resence Paints, Wailada Rd., Lami

Mean Products, 28 Dabea Rd., Kalabo Industrial Sub-division, Suva

Agchem Ltd., Wailada Industrial Sub-division, Lami

APPENDIX A: CALCULATION OF STOCK OF OZONE-DEPLETING SUBSTANCES IN FIJI AS OF APRIL, 1992

Estimation of CFC-11 Stock in Fiji

1. In institutional refrigeration systems:
Estimate 4,000 kg
2. In bulk
Assume half of 1991 imports: 6000 kg
3. In foam
9000 kg per year are used in making foam mattresses in Fiji. The amount which resides in the foam in 1992 is beyond our technical ability to estimate. Assume one year's supply of mattresses still contain CFC-11 as bubbles in the foam: 9000 kg

TOTAL: 19,000 kg

Estimation of CFC-12 Stock in Fiji

1. In car airconditioners:
Assume all cars imported from 1986-1991 are still functional, each with 0.9 kg of CFC-12:

90 kg in	1986
500 (est)	1987
1000 (est)	1988
1566	1989
1691	1990
2074	1991
800	estimate to 1 May, 1992

Estimated amount in car airconditioners: 7721 kg

2. In domestic refrigerators and freezers:

Assume all units imported from 1976 to present are still functional and each contain 0.2 kg of CFC-12:

Year	Imports of Domestic Frig/Freezers	CFC-12 in these imports (kg)
1976	3376	
1977	4089	
1978	4306	
1979	4685	
1980	4730	
1981	6112	
1982	4526	
1983	5414	
1984	6997	
1985	6932	
1986	3631	
1987	3172	
1988	4439	
1989	6079	
1990	7318	
1991	8981	
1992 (est to 1 May)	3000	
Total	87,787	17,557

Estimated amount in domestic refrigerators and freezers: 17,557 kg

3. In commercial refrigeration systems:

Assume all imports since 1976 are still operational, and that each unit contains 2 kg of CFC-12:

Year	Imports of Commercial Frig/Freezers	CFC-12 Content of these imports
1976	548	
1977	0	
1978	261	
1979	634	
1980	360	
1981	318	
1982	465	
1983	475	
1984	564	
1985	343	
1986	168	
1987	662	
1988	1128	
1989	29	
1990	58	
1991	236	
1992 (est to 1 May)	100	
Total	6,349	12,698

Estimated total in commercial refrigeration, chillers, freezers, etc: 12,698 kg

4. In large commercial and institutional refrigerators, chillers, etc.
10,000 kg

5. In bulk
Assume half of 1991 imports are in stock: 14,000 kg

TOTAL CFC-12 STOCK in FIJI in 1992: 61,996 kg

Estimation of Halon 1211 Stock in Fiji**1. 22 kg Portable Units**

20 units x 22 kg each = 440 kg

2. Fixed Systems

17 units at 22 kg = 374 kg

3. Portable Units

1000 units x 3 kg/unit = 3000 kg

4. Bulk Halon 1211

1000 kg

TOTAL 4814 KG

Estimation of CFC-115 Stock in Fiji

All that we know about the stock of CFC-115 in Fiji is the amount of CFC-115 imported to service existing installations. 2,920 kg were imported in 1991. Assuming that servicing of installations occurs once every two years, the amount in refrigerant systems in Fiji would be approximately 6,000 kg. The bulk CFC-115 in Fiji at any one time could be assumed to half of the yearly import figure, or about 1,500 kilograms.

The estimate for the total CFC-115 in Fiji in April, 1992, is therefore 7,500 kg.

APPENDIX B: HCFC-22 IMPORTS INTO FIJI (in kilograms)

	1986	1989	1990	1991
Wall air conditioners	550	1,246	1,436	1,358
Other air conditioners	1,960	9,750	5,325	6,860
Corrie and Co.	0	11,438	5,993	11,982
CIG	10,604	7,043	18,706	25,603
Kooline	1,500	1,500	1,500	1,500
TOTAL	14,614	30,977	32,960	47,303

Notes:

1. Chemical name: chlorodifluoromethane
ODP: 0.05

HCFC-22 is not a restricted chemical under the Montreal Protocol, but it may be added to the list in the future.

2. Wall airconditioners are assumed to average 1 kg of HCFC-22 per unit
3. Other airconditioners are assumed to average 5 kg of HCFC-22 per unit
4. IKA uses HCFC-22 in its fishing vessels. Each boat has about 1,600 kg of HCFC-22, and the company buys about 2000 kg a year to service their vessels.

APPENDIX C: AMOUNT OF CFCs IN AEROSOL CANS IN FIJI

The CFCs imported into Fiji as propellants in aerosol cans were estimated as follows:

From Bureau of Statistics: Value of shaving cream imported into Fiji

year	import value	\$/can	# cans	sales (rel to 1991)
1986	\$ 55,171	\$2.00/can	28,000	0.298
1989	\$ 200,946	\$2.60/can	77,000	0.819
1990	\$ 222,956	\$2.80/can	80,000	0.851
1991	\$ 281,057	\$3.00/can	94,000	1.000

From Morris Hedstrom: (Number of cans sold per year)

antiperspirant	21,816 cans/yr
deodorants	15,348 cans/yr
hair spray	4,260 cans/yr
shave foam	12,120 cans/yr

From Reckitt & Coleman, New Zealand: (CFC content in personal care products)

		average can size (gm net)	CFCs/ can (gm)
antiperspirants	80%	150	120
deodorants	50%	75	35
hair spray	90%	200	180
shave foam	7%	200	14

CALCULATIONS

Assume: -MH market share is the same for all personal care products
 -Ratio of sales of the different personal care products at MH is the same as the ratio for all imports into Fiji

Market share of Morris Hedstrom:

$$12,120/94,000 \text{ cans shave foam} = 13\%$$

Ratio of personal care product sales to that of shave foam at MH:

antiperspirant:	$21,816/12,120 = 1.8000$
deodorants:	$15,348/12,120 = 1.2667$
hair spray:	$4,260/12,120 = 0.3515$

PERSONAL PRODUCT AEROSOL CAN SALES IN FIJI

PRODUCT	MH SALES 1991	1991 FIJI SALES (7.7 X MH)	1986 FIJI SALES (.298 X 1991)	1989 FIJI SALES (.819 X 1991)
ANTIPERSPIRANT	21,816	168,000	50,000	138,000
DEODORANT	15,348	118,000	35,000	97,000
HAIR SPRAY	4,260	33,000	9,000	27,000
SHAVE FOAM	12,120	94,000	28,000	77,000

CFCs IMPORTED INTO FIJI AS AEROSOL CAN PROPELLANTS IN 1986 AND 1989

PRODUCT	CFC/CAN (Kg)	#CANS (1986)	CFC 1986 (Kg)	#CANS (1989)	CFC 1989 (Kg)
ANTIPERSPIRANT	0.120	50,000	6,000	138,000	16,560
DEODORANT	0.035	35,000	1,225	97,000	3,395
HAIR SPRAY	0.180	9,800	1,764	27,000	4,860
SHAVE FOAM	0.014	28,000	392	77,000	1,078
TOTAL			9,400		26,000

APPENDIX D

PRODUCT IMPORTS INTO FIJI CONTAINING CONTROLLED SUBSTANCES

(Data from Fiji Bureau of Statistics and Steven Hay, Fire Control Fiji Ltd)

IMPORTS	1986	1988	1990	1991
Domestic refrigerators, electrical	3173	5000	6238	7779
Deep freezers, household	468	1332	1080	1193
Commercial refrigerators/freezers	168	29	58	236
Total refrigerators and freezers	3809	6361	7376	9208
Window and wall air-conditioners	550	1246	1436	1358
Other air-conditioners	392	1950	1065	1372
Total airconditioners	942	3196	2501	2730
Cars (may or may not have air-conditioning)	663	3866	3417	3073
Halon fire extinguishers	234	177	104	35

Notes

1. Domestic refrigerators and freezers contain 140-200g of CFC-12 per unit. At present, most are imported from New Zealand. Average lifetime of a domestic refrigerator is 10-15 years.
2. Air-conditioners contain from 700-1,500g of R-22 per unit. R-22 is not a controlled substance as yet, but the data is included for completeness.
3. Car air-conditioners contain 680-1,360g of R-12 per unit.
4. Halon fire-extinguishers contain 3 kg Halon-1211, except for about 4% which contain 22 kg Halon-1211.

APPENDIX E

VALUE OF CONTROLLED SUBSTANCES ENTERING FIJI

The following table gives the approximate value of the controlled substances entering Fiji in 1992.

	Import Cost	Selling Cost
CFC-11		\$2.94/kg
CFC-12		\$7.60/kg
CFC-502		\$10.90/kg
Halon 1201	\$7.89/kg	
Halon 1301	\$10.00/kg	
Trichloroethane	\$2.14/kg	\$2.68/kg
Carbon tetrachloride	\$1.49/kg	\$1.64/kg

Notes:

1. Prices are in Fiji dollars.