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

Twelfth Meeting
Montreal, 28-30 March 1994

COUNTRY PROGRAMME: SUDAN

This document consists of:

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

SUDAN COUNTRY PROGRAMME EVALUATION SHEET

National Implementing Agency: Ozone Office, Higher Council for Environment and Natural Resources

Status of ratification of the Vienna Convention and the Montreal Protocol

	Signature	Ratification	Entry Force
Vienna Convention (1985)		29/Jan/93	29/Apr/93
Montreal Protocol (1987)		29/Jan/93	29/Apr/93
London Amendment (1990)			
Copenhagen Amendment (1992)			

Production of controlled substances: 0 metric tonnes (mt)

Consumption of controlled substances (1991): 604.0 metric tonnes
606.2 weighted tonnes (ODP)

Substance (ton)	CFC						Halon			Solvents			M-Br
	11	12	113	114	115	Total	1211	1301	Total	CTC	MCF	Total	
ODS	88.5	507.0		5.5		601.0	1.0		1.0	2.0		2.0	
ODP	88.5	507.0		5.5		601.0	3.0		3.0	2.2		2.2	

Source: Country Programme (1994)

Distribution of ODP by substance:

CFC: 99.1 % Halon: 0.5 % CTC, MCF: 0.4 %

Distribution of ODP by sector:

Sector:	Aerosol	Foam	Halon	Other	Refrig.	Solvent
Consumption (tonnes):	281.5	16.0	3.0		303.5	2.2
Percent of total:	46.4 %	2.6 %	0.5 %		50.1 %	0.4 %

Country Programme

Duration of country programme: 5 years (1994-1998)

ODS phase-out target:

Step-wise phase-out of ODS between 1995 and 2007, when all ODS will be phased-out

Phase-out priority area:

Aerosol and refrigeration sectors

Cost of activities in country programme: \$1,318,300

Strategy:

The implementation of the action plan will lead to complete ODS phase-out in 2007. Reduction in consumption starts in 1996. The CPG relies partially on the active support of local industry. The Govt. involvement is envisioned to support the minor industries and servicing sector and to impose bans and other direct measures to counterbalance possible adverse development.

COMMENTS AND RECOMMENDATIONS OF THE FUND SECRETARIAT

COMMENTS

1. The Country Programme provides adequate information for defining actions for phasing out ODS in Sudan. It provides data on consumption based on a field survey. Data show that ODS consumed in Sudan are almost exclusively CFCs used mainly in aerosol and refrigeration. Import of ODS is limited to a small number of companies. One issue that would deserve closer attention and monitoring during the implementation of the Country Programme is the trade in ODS through intermediaries in the Middle East and the Mediterranean area.
2. ODS-using industries have been identified. This would facilitate project preparation at a later stage. Major industrial activities are refrigeration servicing, limited production of refrigerators using glass wool as insulating material and production of cosmetic and insecticide aerosols. One large company accounts for the consumption in the aerosol sector.

Projects in the Country Programme for which Approval is Requested

3. The Government of Sudan requests approval of the following projects:
 - Institutional Strengthening (US \$168,300)
 - Training on refrigeration and air conditioning (US \$200,000)
 - Aerosols, new blowing agents (US \$600,000)
 - Refrigeration, new compressors (US \$150,000)
 - Foam blowing, new blowing agents/technology (US \$200,000)
4. Proposal for the request for institutional strengthening has been prepared and presented with the Country Programme.
5. The project has been reviewed by the Fund Secretariat and funding agreed.
6. However, no project proposals have been prepared for the other four projects.

RECOMMENDATIONS

The Fund Secretariat recommends as follows:

1. To approve the Country Programme of Sudan. Approval of the Country Programme does not denote approval of the projects therein or their funding levels.
2. To approve the amount of US \$168,300 and US \$27,880 support costs for institutional strengthening to be included in the UNEP 1994 Work Programme.
3. To request UNEP to cooperate with the Government of Sudan to identify appropriate implementing agencies to assist the Government to prepare project proposals for the projects identified.

بسم الله الرحمن الرحيم
جمهورية السودان
REPUBLIC OF THE SUDAN

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AND NATURAL RESOURCES
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١٥
تلكم

GENERAL SECRETARIAT

الإمانة العامة

REF: K.1.J.1.5.6.....
DATE: 23.02.94.....

الرقم
التاريخ:

Transmittal Letter

The Chief officer
Secretariat of the Multilateral Fund
for the Implementation of the Montreal Protocol
1800 McGill College Ave, 27th floor,
Montreal, Canada H3A 3J6.

Sir,

I have the honour to submit herewith the Country Programme of Sudan for the consideration and approval of the Multilateral Fund for the Implementation of the Montreal Protocol.

Sudan adhered to the Protocol on 29 January 1993 and became a party thereto on 29 April 1993. It is provisionally classified as operating under paragraph 1 of Article 5 of the Protocol.

I would like to place on record the appreciation of the Government of Sudan of the assistance extended to it by or through the UNEP IE/PAC Ozone Action Programme for the preparation of the Country Programme which started during the early half of last year. I am pleased to say that the Government is committed to the implementation of the actions contained in the Country Programme. The decision to that effect was made by the Higher Council member, the Minister of Industry and Commerce on 23/2/1994.

I further assert that it is the Government's intention to monitor compliance with the Protocol. If necessary further and different action from those specified in the Country Programme will be taken, and the Country Programme will be updated and submitted to the executive committee of the Multilateral Fund.

I hope that the executive committee will approve the request for assistance made in respect of the following;

- (a) Institutional Strengthening.
- (b) Training on Refrigeration and air Conditioning.

- (c) Aerosols, New blowing agents.
- (d) Refrigeration, New compressors.
- (e) Foam blowing, New blowing agents/ Technology.

Please accept, sir, the assurances of my highest considerations.

Yours faithfully



(Mohamed A. Ali)
Secretary General.

COUNTRY PROGRAMME COVER SHEET

Country : Sudan

Lead National Agency : Ozone Office

Participating Implementing Agencies : UNEP

1. Phase-out schedule

substance	Current consumption (1991) (ton x ODP)	Planned cumulative consumption until phase-out (ton x ODP)		Planned year of phase-out
		Article 5 schedule	Accelerated schedule	
CFC 11	88.5	1988		2007
CFC 12	507	14483	7558	2007
CFC 114	5.5	168		2007
Halon 1211	3	104	50.1	2007
CTC	2.2	50	24	2005
Total	606.2	16793	7632.1	

2. Government actions plan :

Projects and elements	Brief description	Commencement	Use Sector
Government actions			
Regulation	Adoption of legislation to control the consumption of ODS and to encourage the introduction of substituants	Mid 1994	All
Project	Institutional strengthening	August 1994	All
Industry Actions	Training programme on refrigeration and Air-Conditioning	September 1994	Refrigeration and air-conditioning
	Conversion of aerosols industries to use LPG	September 1994	Aerosols
	Introduction of new compressors	3rd quarter of 1994	Refrigeration
	Substitution of CFC's as blowing agents	1st quarter of 1995	Foam

3. Project Summary Table

Project no.	Title	Intended Effect	Sector	Estimated Cost (US \$)			
				1994	1995	1996	Total
1.	Institutional Strengthening/Ozone Office	Co-ordination, control, technical support, monitor	All	62,700	52,800	52,800	168,300
2.	Training on Refrigeration and Air Conditioning	Training	Refrigeration and air-conditioning				200,000
3.	Substitution of LPG for CFCs in Aerosol Production	Investissment project	Aerosols				600,000
4.	New Refrigerator Compressors	Investissment project	Refrigeration				150,000
5.	Foams, new blowing agent, technology	Investissment project	Foam				200,000
Total Cost							1,318,300

The Republic of Sudan

**Higher Council for Environment and Natural Resources
National Committee for the Implementation of the Montreal Protocol**

COUNTRY PROGRAMME

Phasing out the Ozone Depleting Substances in Sudan

JANUARY 1994

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Executive Summary

Background

Sudan has an area of approx. 2.5 mill sqkm, and is (by area) the largest country in Africa, with a population of 25 mill, the population density being approx. 10 persons per sqkm. Agriculture accounts for approx. one third and manufacturing industry less than one fifth of the gross domestic product. The services sector accounts for approx. 50 %.

Regarding ozone depleting substances, Sudan depends completely on imports, but does, however, manufacture some refrigeration and air-conditioning equipment containing ODSs.

Sudan ratified the Montreal Protocol in January 1993. A National Committee for the Implementation of the Montreal Protocol was established in early 1993. This committee has overviewed the preparation of this Country Programme.

Current Situation

Currently Sudan is using approx. **606 ODP tonnes** of different kinds of ODSs annually, **0.025 kg per capita..** The substances used are **CFC11, CFC12, CFC114, Halon 1211 and Carbon Tetrachloride.** One half of the ODSs is used in refrigeration and air conditioning equipment, the other half being used in foam and aerosol production. Other uses are negligible. In addition to the substances in Annex A and B of the Protocol Sudan is a user of methyl bromide, of which approx. 50-100 tonnes are used for fumigation of crops in the port of Port Sudan.

There are several importers and agents the imports pattern being very scattered regarding origins and manufacturers. The main industrial users are importing themselves the substances needed in their production process.

In Sudan there are three manufacturers of refrigeration and air-conditioning equipment, one large aerosol manufacturer and one flexible foam manufacturer. These businesses are quite well aware of the forthcoming restrictions etc. regarding the use of ODSs. The textile industry is using CFCs in the production process and may face some difficulties in supply and in the conversion to non-CFCs. The maintenance of the domestic refrigeration equipment is a big problem.

The total consumption of ODSs (excluding methyl bromide) has increased approx. 70 % in 1986-1991. It is forecast that the consumption will increase from the current level (606 tonnes in 1991-92) to approx. 965 tonnes in the year 2000 (60 %) and further to approx. 1630 tonnes in the year 2010 unless any restrictions, supply constraints and other measures are applied.

Table 2.1. Imports and Consumption of the Ozone Depleting Substances in Sudan in 1991

Substance/Source	Imports = Metric Tonnes	Consumption	ODP	Consumption in ODP tonnes
Annex A Group 1				
CFC11		88.5	1.0	88.5
CFC12		507.0	1.0	507.0
CFC113		-	-	-
CFC114		5.5	1.0	5.5
CFC115		-	-	-
Subtotal		601.0		601.0
Annex A Group 2				
Halon 1211		1.0	3.0	3.0
Halon 1301				
Halon 2402				
Subtotal		1.0		3.0
Annex B Group 1				
CFC13		-	-	-
CFC111		-	-	-
CFC112		-	-	-
CFC211		-	-	-
CFC212		-	-	-
CFC213		-	-	-
CFC214		-	-	-
CFC215		-	-	-
CFC216		-	-	-
CFC217		-	-	-
Subtotal		-	-	-
Annex B Group 2				
Carbon Tetrachloride		2.0	1.1	2.2
Annex B Group 3				
1,1,1- trichloroethane		-		-
Total		604.0		606.2

Table 2.2. Consumption in 1991 Broken down by Use and Application

User Sector/Use	Substance	Application	Consumption in Metric tonnes	Consumption in ODP tonnes
Domestic Refrigeration	CFC 12	Used in locally manufactured products	10.0	10.0
Domestic refrigeration	CFC 12	Used in recharging	234.0	234.0
Cold Stores and Industrial refrigeration	CFC 12	Used in recharging	52.0	52.0
Industrial Chillers	CFC 12	Used in recharging	5.0	5.0
Refrigeration total			301.0	301.0
Air Conditioning	CFC 11	Used in recharging	0.5	0.5
Air Conditioning	CFC 12	Used in recharging	2.0	2.0
Air Conditioning total			2.5	2.5
Flexible foam production	CFC 11	Blowing agent	16.0	16.0
Aerosols, Insecticides	CFC 11	Cans	72.0	72.0
Aerosols, Insecticides	CFC 12	Cans	168.0	168.0
Aerosols, Cosmetics	CFC 12	Cans	36.0	36.0
Aerosols, Cosmetics	CFC 114	Cans	5.5	5.5
Aerosols, total			281.5	281.5
Fire fighting	Halon 1211	Portable Units	1.0	3.0
Cleaning	Carbon Tetrachloride	Laboratory & experimental use	2.0	2.2
TOTAL			604.0	606.2

Forecast Consumption

Table 2.3. Forecast Consumption 1991-2010 by substance, ODP tonnes

Substance	1986	1991	1995	1997	2000	2005	2010
CFC 11	35.0	88.5	81.6	86.7	95.0	111.0	129.0
CFC 12	300.0	507.0	647.9	722.9	855.1	1130.3	1476.3
CFC 113	5.0	-	-	-	-	-	-
CFC 114	-	5.5	6.7	7.4	8.6	11.8	15.0
Subtotal	340.0	601.0	736.2	809.6	958.7	1253.1	1620.3
Halon 1211	15.0	3.0	4.5	4.8	5.1	5.7	6.6
Halon 1301	10.0	-	-	-	-	-	-
Carbon Tetrachloride	2.2	2.2	2.5	2.6	2.9	3.3	3.8
1,1,1-trichloroethane	0.3	-	-	-	-	-	-
Total	367.5	606.2	743.2	824.4	966.7	1262.1	1630.7

Table 2.4. Forecast Consumption 1991-2010 by use, ODP tonnes

Use	1991	1995	1997	2000	2005	2010
Refrigeration and air-conditioning	303.5	396.2	452.0	552.7	768.1	1024.3
Aerosols	281.5	320.0	341.0	378.0	445.0	540.0
Foams	16.0	21.0	24.0	28.0	40.0	56.0
Fire fighting	3.0	4.5	4.8	5.1	5.7	6.6
Laboratory & Experimental use	2.2	2.5	2.6	2.9	3.3	3.8
Total	606.2	743.2	824.4	966.7	1262.1	1630.7

Implementing Phase-Out

Even though Sudan's contribution to the depletion of the ozone layer is quite modest in global terms, the government clearly understands its responsibility as a party in the Montreal Protocol and is committed to contribute to the reduction and phase-out of ODSs.

This country programme relies partially on the active support of local industry when reducing the use of ODSs, but due to the scattered consumption pattern, especially in the refrigeration and air-conditioning sector, active government involvement is envisioned to support the minor industries and servicing sector. Also the government is prepared to impose bans and other direct measures to counterbalance possible adverse development.

To enhance the phase-out, support from the Multilateral Fund is sought to implement five concrete phase-out projects as follows:

1. Institutional strengthening to enhance the government's capacity to monitor and implement the proposed measures, establishing an Ozone Office,
2. Training of refrigeration and air-conditioning equipment operatives
3. Substitution of butane gas (LPG) and finger/trigger pumps for CFCs as propellants in aerosols production
4. Introduction of new domestic refrigerator and water cooler compressors, suitable for non-CFC coolants
5. Replacing CFC as a blowing agent and/or introducing alternative technologies in flexible foam production

Financial support of USD 1,318,300 is sought from the Fund in order to execute the aforementioned projects during the period 1994-1998.

When applying the active phase out measures it is assumed that the total consumption of CFCs starts to decrease in the year 1996 . The consumption continues decreasing rapidly up to the year 2000. **All ODSs will be phased out by the year 2007.**

Project Summary Table

Project no.	Title	Costs in USD
1.	Institutional Strengthening/Ozone Office	168,300
2.	Training on Refrigeration and Air Conditioning	200,000
3.	Substitution of LPG for CFCs in Aerosol Production	600,000
4.	New Refrigerator Compressors	150,000
5.	Foams, new blowing agent, technology	200,000
Total Cost		1,318,300

1. INTRODUCTION

1.1. Purpose

This report reflects the commitment of the government of Sudan to achieve compliance with the Montreal Protocol and its amendments. The government is supported in its efforts by Sudanese industries and other private sector companies, which have been involved in the compilation of the programme through close co-operation, negotiations and consultations.

The description includes data, information and analysis as a basis for the Action Plan to phase-out the use of ODSs.

Also described is the administrative and institutional framework within which implementation of the Montreal Protocol in Sudan will take place, as soon as the requested assistance from the Fund will be available. Regarding the support and assistance for specific projects and actions the framework will be adapted and refined according to specific needs.

This Country Programme also specifies the follow-up procedure to monitor the effectiveness of the actions.

1.2. Status

The government of Sudan ratified the Montreal Protocol on January 29, 1993 and this ratification entered into force on April 29, 1993. Sudan is operating under the article 5, paragraph 1, of the Protocol.

This document has been prepared under the auspices and guidance of the Higher Council for Environment and Natural Resources, supported by the National Committee for Implementing the Montreal Protocol (later "National Committee"). The practical work was dealt with by the Department of the Standards and Quality Control of the Ministry of Industry.

The Higher Council for Environment and Natural Resources has approved this Country Programme and agreed to its implementation.

The costs incurred by the government in preparing this country programme are as follows:

- * the Department of the Standards and Quality Control in the Ministry of Industry has used approximately 8 professional man months for the survey and action plan. The support staff of the Ministry has used approximately 20 man months, the members of

the National Committee, representing the other branches of the government, have used approximately 7 professional and several support staff man months. The members of the National Committee representing non-governmental organisations have also spent approximately 4-5 professional man months in the survey work, data collection and committee meetings during February-June 1993.

* the direct costs representing travel, accommodation etc. during the survey work are not negligible. Other direct costs representing the international communication with the UNEP IE/PAC, the consultant, the Ozone Secretariat and other bodies are also substantial

The Government of Sudan has not compiled a separate study on the ozone depleting substances, but the results and original data of the survey is retained at the Standards and Quality Control Department in the Ministry of Industry, and will be used to establish a base for the forthcoming follow-up and monitoring arrangements.

1.3. Assistance Received

The government of Sudan has received financial and technical support from UNEP IE/PAC to assist in compiling this Country Programme. Other direct assistance has not been received, but the in-kind support from other organisations (chapter 1.2.) has been most essential.

UNEP IE/PAC has earlier invited representatives of the government to participate in workshops and seminars dealing with the ODSs. Also UNEP IE/PAC has assisted the programme compilation by sending a consultant to work in Sudan for two weeks.

The National Committee for the Implementation of the Montreal Protocol is responsible for the financial assistance received.

2. CURRENT SITUATION

2.1. Current and Forecast Consumption of ODSs

2.1.1. Current Consumption

The field survey was undertaken to establish a sound base for the Country Programme. The year 1991 was chosen to ensure the availability of comprehensive data at the user and importer levels.

The field survey undertaken was conducted by Mr. Hussein Qindeel and Dr. Abdelghani A. Hassan, who were supported by several members of the National Committee. The companies mentioned later by name in chapter 2.2 (Industry Structure) were contacted. Some 20 minor repair workshops were visited in the greater Khartoum area. Regarding the use of halons the representative of the Civil Defence/Fire Protection Authority provided the background data. Carbon tetrachloride figures were mainly received from the representatives of the National Chemical Laboratories, and the National Council for Research in the National Committee. The Customs Department was also consulted as described later.

There is no production of the controlled substances in Sudan.

Also, according to the survey there was no indication of exports from Sudan.

Table 2.1. below indicates the distribution of ODS by substance, and Table 2.2. by use.

The figures indicated in the tables 2.1 - 2.2. are based on the field survey, contacts and interviews with the equipment manufacturers, main operators of large cold stores, industrial operators and service operators. Since the imports of ODSs are scattered over tens of individual companies and traders, a cross-check was made from the customs records. The Customs Department went through practically all the import bills and documents covering the chemical substances imported. It was discovered that the results of the field survey were consistent with the amounts indicated in the import bills. It may be noted that the Sudanese Custom Department is starting to adopt the Harmonised System in classification.

Substance wise the CFC 12 accounts for approx. 84 % of the total use, CFC 11 14 %, CFC 114 approx. 1 %, halon 1211 and carbon tetrachloride less than 1 %.

User wise the refrigeration sector (domestic and industrial) accounts for 50 % of the total use, the aerosol sector being almost the same. The other uses are quite negligible in volume except foam blowing.

In total almost half of the current applications of ODSs in Sudan are in servicing and recharging of the existing equipment.

A survey made at the Ministry of Agriculture indicated that methyl bromide is currently used to fumigate export products in Port Sudan. The country is using 50-100 tonnes of methyl bromide annually. Current stocks are 150 tonnes.

Table 2.1. Imports and Consumption of the Ozone Depleting Substances in Sudan in 1991

Substance/Source	Imports = Metric Tonnes	Consumption	ODP	Consumption in ODP tonnes
Annex A Group 1				
CFC11		88.5	1.0	88.5
CFC12		507.0	1.0	507.0
CFC113		-	-	-
CFC114		5.5	1.0	5.5
CFC115		-	-	-
Subtotal		601.0		601.0
Annex A Group 2				
Halon 1211				
1.0 3.0 3.0				
Halon 1301				
Halon 2402				
Subtotal		1.0		3.0
Annex B Group 1				
CFC13		-	-	-
CFC111		-	-	-
CFC112		-	-	-
CFC211		-	-	-
CFC212		-	-	-
CFC213		-	-	-
CFC214		-	-	-
CFC215		-	-	-
CFC216		-	-	-
CFC217		-	-	-
Subtotal		-	-	-
Annex B Group 2				
Carbon Tetrachloride		2.0	1.1	2.2
Annex B Group 3				
1.1.1- trichloroethane		-		-
Total		604.0		606.2

Table 2.2. Consumption in 1991 Broken down by Use and Application

User Sector/Use	Substance	Application	Consumption in Metric tonnes	Consumption in ODP tonnes
Domestic Refrigeration	CFC 12	Used in locally manufactured products	10.0	10.0
Domestic refrigeration	CFC 12	Used in recharging	234.0	234.0
Cold Stores and Industrial refrigeration	CFC 12	Used in recharging	52.0	52.0
Industrial Chillers	CFC 12	Used in recharging	5.0	5.0
Refrigeration total			301.0	301.0
Air Conditioning	CFC 11	Used in recharging	0.5	0.5
Air Conditioning	CFC 12	Used in recharging	2.0	2.0
Air Conditioning total			2.5	2.5
Flexible foam production	CFC 11	Blowing agent	16.0	16.0
Aerosols, Insecticides	CFC 11	Cans	72.0	72.0
Aerosols, Insecticides	CFC 12	Cans	168.0	168.0
Aerosols, Cosmetics	CFC 12	Cans	36.0	36.0
Aerosols, Cosmetics	CFC 114	Cans	5.5	5.5
Aerosols, total			281.5	281.5
Fire fighting	Halon 1211	Portable Units	1.0	3.0
Cleaning	Carbon Tetrachloride	Laboratory & experimental use	2.0	2.2
TOTAL			604.0	606.2

2.1.2. Forecast Consumption 1991 - 2010

In the Sudan ODS consumption is still in its infancy. The country's industrial base is still developing and there could be a large increase in the future use of ODSs if no restrictions are applied.

The consumption forecast has as a framework the current state of the industry and the macro objectives for industrial development of the country. These have been formulated and expressed in the government's ten year **Comprehensive National Strategy** covering the period of 1992-2003. In the short and medium term the government aims at increasing the capacity utilisation of the existing industries. The main emphasis will be placed on textile, food processing, drugs and pharmaceutical industry as well as chemical products. In the long run the government aims at establishing new industries such as agricultural machinery and electronic products, insecticides and petrochemicals.

In several sectors there is a need for more products and services containing ODSs. It is likely that the demand for refrigeration and air-conditioning equipment will increase. The manufacturing sector is in need of replacing and upgrading ODS related equipment.

The forecast covers the substances currently used, (i.e. assuming that no new controlled substances are entering into the market). The realism of this assumption is based on the fact that public awareness is growing and relevant legislation will be enacted.

Regarding the use of the substances already on the market, the forecast assumes that no attempts are made to comply with the Protocol and that unlimited quantities of the controlled substances will be available at the current prices.

When forecasting the consumption figures, the major aerosol and foam manufacturers were interviewed, and the data was based on this. The forecast consumption figures of CFC 12 (used mainly in refrigeration and air-conditioning) are based on the assumption that the number of urban households and the population within the reach of the electricity will increase by 5 % p.a. up to the 2000. The disposable income is assumed to slightly increase enabling the population to maintain the current stock of refrigeration and air-conditioning equipment in a proper way, and also enabling them to purchase more units per household. Moreover, it is anticipated that the need of the commercial refrigeration regarding agricultural products will increase.

The forecast consumption of ODSs up to year 2010 is indicated in table 2.3. by substances and in table 2.4 by uses.

Table 2.3. Forecast Consumption 1991-2010 by substance, ODP tonnes

Substance	1986	1991	1995	1997	2000	2005	2010
CFC 11	35.0	88.5	81.6	86.7	95.0	111.0	129.0
CFC 12	300.0	507.0	647.9	722.9	855.1	1130.3	1476.3
CFC 113	5.0	-	-	-	-	-	-
CFC 114	-	5.5	6.7	7.4	8.6	11.8	15.0
Subtotal	340.0	601.0	736.2	809.6	958.7	1253.1	1620.3
Halon 1211	15.0	3.0	4.5	4.8	5.1	5.7	6.6
Halon 1301	10.0	-	-	-	-	-	-
Carbon Tetrachloride	2.2	2.2	2.5	2.6	2.9	3.3	3.8
1,1,1-trichloroethane	0.3	-	-	-	-	-	-
Total	367.5	606.2	743.2	824.4	966.7	1262.1	1630.7

The 1986 consumption figures in the table 2.3 are the best possible estimates. The survey didn't reveal for e.g. why the use of CFC 113, halon 1301 and 1,1,1 trichloroethane has ceased.

The total growth of ODS use in 1986-92 has been approx. 72 %. It is highly probable that growth started to level off in the late 1980's when the industrial and manufacturing sector started to face problems with the availability of energy and imported raw materials. The drop in 1986-92 in the use of halon 1211 may be due to the consumption change between the civilian and military use. It was not possible to reconstruct a detailed user structure of the year 1986.

The decrease in CFC 11 consumption in 1992-97 is due to the technical restructuring (lowering the production temporarily) of the main aerosol manufacturer.

The relatively steep increase of 50 %, (only 500 kg) in the consumption of halons 1211 in 1992-95 is based on the detailed information received from the civil defence authorities.

Table 2.4. Forecast Consumption 1991-2010 by use, ODP tonnes

Use	1991	1995	1997	2000	2005	2010
Refrigeratio n and air- conditionin g	303.5	396.2	452.0	552.7	768.1	1024.3
Aerosols	281.5	320.0	341.0	378.0	445.0	540.0
Foams	16.0	21.0	24.0	28.0	40.0	56.0
Fire fighting	3.0	4.5	4.8	5.1	5.7	6.6
Laboratory & Experiment al use	2.2	2.5	2.6	2.9	3.3	3.8
Total	606.2	743.2	824.4	966.7	1262.1	1630.7

2.2. Industry Structure

Production

There is no production of the controlled substances in Sudan.

Importers

The imports of ODSs to Sudan are very scattered. There are 2-3 major importers and local distributors who account for less than one tenth of the total imports of ODS. It seems that the major western producers have only one established agency in the country. Also most of the imports are not directly from the producers but through wholesalers and intermediaries in the Middle East, and Mediterranean area. Some of the imports may be through barter arrangements.

* The Sudanese Liquid Air Company is the main general import agency and an agent of the French Air Liquide Group. The average annual imports of this company have been less than 50 tonnes. A more detailed classification of the imported substances was not made available. The company has six regional stores in Sudan. Refrigeration workshops are the main clients.

* The major refrigeration, aerosol and foam manufacturers import directly the ODSs that they need in their production. Also companies using ODS for CO2 and oxygen production import directly.

* The Sudanese Cosmetics and Household Co. Ltd. is importing approx. 280 tonnes of ODS for use in its own aerosol production (see later in this chapter). The imported substances are CFC 11, CFC 12 and CFC 114, 72, 204 and 5.5. tons respectively. The main origin is in the United Kingdom.

* The Patra Foam company is importing approx. 16 tonnes of CFC 11 from the United Kingdom.

Several servicing agencies in the refrigeration and air conditioning sector, import directly for their own needs and for those of minor operators. The imports vary from small amounts of tens of kilos to up tens of tonnes. There exists no clear picture regarding the country of origin or supplier. Currently the ODSs are originating from various sources.

It may be noted that the national shipping line as well as the national airline are servicing their own ODS using equipment outside of Sudan. This may also apply the other aircraft.

There is an import duty for CFCs, which adds approx. 60 % to the importing price. This duty is purely fiscal in nature.

Also there is an import duty of 5 % for refrigerator compressors when used in locally manufactured products, and a duty of 25 % when used as spare parts.

Users

Production of Domestic Refrigeration Equipment

10 tonnes of CFC 12 is currently used by three companies in manufactured products

*Coldair Engineering Company,	5000	refrig.	units	p.a.
*Sheet Metal Industries Co.	4500	"	"	"
*Modern Refrigeration Factory	3500	"	"	"

All companies are privately owned.

The annual production of domestic refrigerators is currently approx. 13000 units. Also there are imports of very fluctuating quantities and of various sources. In addition to the refrigeration units the companies produce unspecified amounts of domestic water coolers and cold stores. The initial charging of the non-domestic equipment is included in the above mentioned 10 ton use of CFC 12. Glass wool is used as insulation material.

Domestic refrigerators are also imported, but exact figures were not available. Recently the imports may have been 2-3000 units p.a.

The existing manufacturing facilities are in a reasonably good state of repair and represent capital investment to be preserved.

The companies are also running service and maintenance operations mainly as warranty arrangements.

Maintenance of Domestic and Commercial Refrigeration Equipment

Approx. 232 tonnes of CFC 12 is used annually in servicing domestic and commercial refrigeration units.

There are currently 870 workshops licensed to service refrigerators, air conditioning units and similar equipment.

Out of these some 550 are located in the Greater Khartoum Area, 110 in Port Sudan Area, 95 in Kosti area, 75 in Wadi Madani. The total no. of household refrigeration units might be approx. 1 mill.

The service operations are usually run by 3-4 persons per workshop. The operators have little

technical training but have learned their skills with practical experience. The workshops are poorly equipped. There are no testing devices or recovery equipment. One manufacturer, Sheet Metal Industries Co. is running a larger workshop with a staff of 20 persons, and services equipment other than that produced by the company itself.

Some checks made during the survey work indicated, that the refrigerant consumption is almost one kilogram per serviced unit. This means that some two thirds of the refrigerant is lost in servicing operations, representing roughly one third of the total annual consumption. The total no. of domestic and commercial refrigeration units in Sudan is 1.0 - 1.5 mill. The use of the equipment is irregular.

The average life time of a unit is rather short, partially due to the infrequent electricity supply. Refrigerators are maintained irregularly.

Air Conditioning

Approx. 2 tonnes of CFC 12 and 0.5 tonnes of CFC 11 are used in the recharging of domestic and central air-conditioning units.

A CFC based unit is still quite uncommon in Sudanese households. The wall mounted type of air cooler is the standard equipment in an urban household. Some larger hotels and embassies etc. tend to arrange the maintenance of their equipment through their own organisations and also import directly minor amounts of CFC. The maintenance of the small domestic CFC based units is usually done by the same workshops as the maintenance of refrigerators.

The number of cars equipped with air-conditioning units is negligible.

Cold Stores and Industrial Refrigeration

Approx. 52 tonnes of CFC 12 is currently used in recharging cold stores and industrial types of units. Sudan has approximately 330 large cold stores, of which 300 are used for the preserving of vegetables, and fruits and 30 for other food products. The two main operators of cold stores are

- *Arab Authority for Agricultural Investments and Development, semi-governmental
- *Food Security -organisation, governmental

The ownership of other units is divided among a large number of operators. Approximately 120 units are located in the Khartoum area, 70 in Port Sudan area, and the remaining being distributed among the larger settlements throughout the country

In addition to the above mentioned large stores there are a large number of smaller cold stores scattered in minor towns and villages.

There are some 50 trucks in Sudan equipped with cooling/freezing equipment.

Approx. 5 tonnes of CFC 12 is used in recharging of industrial chillers in the plastic and textile (spinning) industries.

There are ten plastic factories in Sudan. The three major ones are as follows:

- *Blue Nile Plastic Co.
- *Caso Co.
- *United Plastic Co.

The aforementioned three companies are in private ownership. The main products are pipes and packaging materials (bottles, barrels etc.).

The current annual use of CFC 12 varies between 95 - 220 kgs. The average (for all plastic factories) is approx. 150 kgs.

The existing production facilities represent a capital investment which is worth keeping in operation.

The textile industry in Sudan is large, and of vital importance as a domestic supplier and foreign exchange earner.

The four following textile manufacturers are the largest and dependant upon chilling facilities:

- *Haj Abdullah Spinning Mill

- *Fine Spinning Mill

- *Jumeira Textile Mill

- *Cotton Textile Mill

The first two are in government ownership, and the last two in private ownership.

The current annual use of CFC 12 as a refrigerant in each of the above mentioned four plants is approx. 250-300 kgs.

The production facilities date from different periods and present a variety of technologies.

Aerosol Production

Approx. 72 tonnes of CFC 11, 204 tonnes of CFC 12, and 5.5. tonnes of CFC 114 are used as propellants in aerosol cans by one company, the Sudanese Cosmetics and Household Co. Ltd.

The company is in private ownership having licensing arrangements with foreign companies. Out of the total amount of 281 tonnes consumed annually some 40 tonnes are for cosmetics (corresponding to approx. 1.6 million cans) and 240 for insecticide aerosols (corresponding to approx. 1.7 million cans).

The company has fairly modern production facilities (three filling lines, equipment from the United Kingdom) in Khartoum and has initiated a project to construct a new factory with filling lines suitable for using LPG as propellant.

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Foam Production

Approx. 16 tonnes of CFC 11 are consumed in blowing flexible slabs of foam by Patra Foam Co.

The company is in private ownership.

The company has modern production facilities, both in terms of buildings and machinery, and is located in El Bagir, 40 km south of Khartoum. The products consist of cushions, bedding and underlays. The company is exporting products to the neighbouring countries.

Fire Extinguishers

Approx. 3 tonnes of halon 1211 is used for **refilling portable fire extinguishers**. The operation is run by the Civil Defence Department of the Ministry of Interior.

Other Uses

2 tonnes of carbon tetrachloride is used for various purposes in laboratories and scientific institutes etc.

2.3 Institutional Framework

In 1992 Sudan established a **Higher Council for Environment and Natural Resources**. According to the Higher Council for Environment and Natural Resources Act (1991) the council is pursuing the following issues:

- * The co-ordination of environmental and natural resources, and related activities, carried out at the various levels - national , regional and international.
- * The preparation of a long term and environmentally sound development plan.
- * The provision of means for creating a public awareness campaign on matters of environment and natural resources, both nationally and internationally.
- * The establishment of technical committees or councils to assist the Higher Council for Environment and Natural Resources in managing environmental problems.
- * Obtaining of funds from the government and from local and international organisations to support the effective running of the council.

In February 1993 the Higher Council established a specific committee to deal with the issues related to ODSs and the Montreal Protocol, i.e. the **National Committee for the Implementation of the Montreal Protocol**. This committee is intended to be a permanent one in so far the ODS issue is concerned. The committee is chaired by the high executive of the Ministry of Industry (currently the first under-secretary).

The membership of this committee consists of the following governmental agencies:

- *Ministry of Industry
- *Ministry of Labour and Social Affairs/Vocational Training Dept.
- *Ministry of Health/National Chemical Laboratories
- *Ministry of Finance/Customs and Excise Duties Dept.
- *Ministry of Interior/Civil Defence Dept.
- *Sudan University of Science and Technology
- *The National Council for Research
- *Sudanese Meteorological Agency

The non-governmental or semi-governmental organisations are represented as follows:

- *Sudanese Industries Association
- *Association of Refrigeration Manufacturers/Coldair Engineering Co.
- *The Sudanese Liquid Air Company Ltd.
- *The Modern Acetylene and Oxygen Company Ltd.

The role of the National Committee is to be the main consultative body in all ODS and Montreal Protocol related issues in Sudan. It is responsible for preparing all governmental and publicly supported measures to phase-out the ODSs in Sudan. It may be noted that the National Committee deals with the mainly the practical aspects of the phase-out.

During the formulation of the Country Programme the National Committee has created a working relationship with the Sudanese Society for Environment Protection. This organisation could be mobilised to participate in different publicity campaigns.

In Sudan several UN related organisations are in operation (e.g. UNDP, UNIDO and WHO). These organisations have been consulted and their staff, contacts and relevant experience may be utilised in the implementation.

2.4. Policy Framework

The policies of the government of Sudan traditionally rely on broad consultation with different interest groups of that society. Command and control policies in areas relevant to the implementation of the Protocol are not generally preferred. Taxation, especially in the form of excise and import duties, is mainly used for revenue collection. In the current constitutional and administrative situation the government is able to quickly issue rules and regulations, if necessary.

All the key players regarding the ODSs are in private ownership in Sudan and no change is expected in this respect.

For the Sudanese society and economy the food processing and textile industry are extremely important. Thus the possible administrative and related measures regarding ODSs should be assessed against this background.

2.5. Government and Industry Responses to the Protocol

The government of Sudan ratified the Montreal Protocol on January 29, 1993 and started to operate as a party on April 29, 1993.

The Higher Council for Environment and Natural Resources has established a special National Committee for the Implementation of the Montreal Protocol.

The government has approached UNEP regarding possible initial assistance and this has been provided by the said implementing agency. The representatives of several ministries, semi-governmental and non-governmental organisations, have been participating, since the beginning of 1990s, in seminars and workshops arranged by the implementing agencies.

The local NGOs, in association with the international NGOs operating in Sudan, have arranged some seminars and meetings regarding the Montreal Protocol and its subsequent implications. The government run media has given publicity to these occasions.

All the major industrial ODS users (refrigeration, aerosol and foam manufacturers) have started to introduce the non-ODSs or substitutes. It is also clear that the new international developments are closely followed through the ODS and equipment suppliers as well as by other channels.

The industrial producers have incurred some costs resulting from experimental equipment and substances, study tours etc. Also some costs have been incurred in lost production time and unsaleable products. The active participation in the work of the National Committee may also be noted. It is not possible to estimate the monetary value of the costs incurred, but they certainly have been substantial.

3. IMPLEMENTING PHASE-OUT

3.1. Strategy Statement by the Government

The government of Sudan has been following the development leading up to the Montreal Protocol since the late 1980s. It is clearly understood that the phase-out of the ozone depleting substances is a necessity and Sudan has to follow the international development. Sudan doesn't contribute much to depletion of the ozone layer and depends largely on materials and technologies developed in the industrial countries. Thus the social and social burden caused by the phase-out should be shared by the countries and economies which have been instrumental in creating the ozone depletion problem.

Despite the reservations mentioned above the government of Sudan firmly believes that a quick phase-out programme will best serve the interests of the society, economy, industries and businesses thus preventing the country suffering from outdated equipment and operations in the future.

Sudan will largely rely on the existing legal framework (with the necessary amendments and modifications) but is prepared to take some administrative steps to enhance the phase-out measures, and is also prepared to enact stricter laws if the scheduled phase-out programme is endangered by adverse developments. Regarding the available support from the Multilateral Fund emphasis is placed on the replacement of CFCs in aerosol and foam production targeting a total phase-out in these industries within the coming five years.

Despite the aforementioned accelerated phase-out it is understood that the demand of products using ODSs must be fulfilled until affordable substitutes are available. This concerns specifically the refrigeration sector, which is vital in climatic conditions like Sudan. Special attention will be paid to balance the phase-out requirements and the need for inexpensive equipment. Therefore the phase-out in refrigeration and air-conditioning sector will be approached both from the supply side (introduction of non-CFC equipment) and from the users' side (training).

The planned phase-out will be also checked against the development needs of the local food, textile and plastic industry. These industries are vital in securing the basic needs and earning foreign exchange.

Since the current and unconstrained consumption of halons and carbon tetrachloride are quite negligible, their phase-out are not considered as strategic issues. The government undertakes to carry out a separate and detailed analysis on these two ODSs.

3.2. Action Plan

3.2.1. Government Actions

The preparation of this Country Programme, and the forthcoming National Seminar, and the involvement of the main users of ODSs in Sudan, have paved the way for the government's involvement in enhancing the phase-out. Also bearing in mind that Sudan is completely dependant on the imports of ODSs and largely dependent on technologies from industrialised countries, it is believed that supply constraints may achieve the planned reduction in consumption. Therefore the government actions are regarded as complementary. It can be seen that the government's role is vital in implementing the quick phase-out through supporting the projects mentioned later in chapter 3.2.2. The government's actions are also needed to counterbalance some adverse issues that may arise.

- *The Government is prepared to ban the use of some new controlled substances (i.e substances that are not presently consumed in Sudan) which might emerge on the market.

- *The Government is prepared to consider increased import duties or taxes on the controlled substances in case the planned (reduced) consumption figures are not reached.

- *The Government is prepared to introduce bans on foreign manufactured refrigeration and air-conditioning equipment, if the products are obsolete or banned in their home markets due to ODS.

- *The Government will be liberal and supportive regarding licences and permits required by manufacturing and service businesses which intend to establish facilities for phasing out ODSs.

- *The Government will introduce a licensing system for refrigeration and air conditioning servicing operators in order to enhance better working practices.

- *The Government will actively support training and publicity campaigns using the public media, and will encourage the different branches of public administration to cooperate.

- *The Government will encourage the participation of voluntary organisations and citizen groups to support the training and awareness campaigns.

- *The Government will draw the attention of international organisations and NGOs to give financial and technical support for the phase-out measures.

- *Taking into consideration the limited number of operators in the ODS consuming

sector the Government is promoting voluntary agreements, consultations, and actions in all issues that may be in need of redress.

*The Government will carry out a detailed survey on halons with the Civil Defence Administration, and on carbon tetrachloride with some laboratories and research institutes with the aim of finding alternatives.

3.2.2. Projects

Based on survey results, discussions with representatives from industrial associations, and participants of the National Team, the following five projects are proposed to be implemented using the support of the Fund and the concerned implementing agency.

Institutional Strengthening

The government of Sudan has clearly expressed its commitment to the phase-out targets of the Montreal Protocol, aiming to reach reduction and total phase-out of the ODSs earlier than those set in the Protocol for countries operating under the article 5. It is proposed that a specific Ozone Office will be established within the Higher Council of Environment and Natural Resources to enhance the government capacity to follow- up, monitor, prepare possible administrative bans and quotas, taxes, training and awareness campaigns and other measures as expressed in chapter 3.2.1.

*The Ozone Office will cover all industry sectors and all uses of ODSs

*The office will be an operational unit with two professionals and support staff to carry out all the necessary functions needed to enhance the implementation of the Country Programme. The office will be provided with necessary equipment such as computers, copy machines, telephone and telecommunication facilities

*Start date: August 1994

*No specific technical input other than the equipment mentioned above, will be required.

*The benefits of the institutional strengthening project will be difficult to estimate, because the effects will be indirect. However, in terms of improved implementation

and by introducing administrative measures and awareness it may be estimated that the institutional strengthening will cut 5 % from the unrestrained forecast consumption of ODSs.

*the incremental costs of the project will be USD 168,300 for the initial period of three years 1994-1996.

*The different ministries, government agencies, Sudanese Industries Association and major private industries as members of the National Team of ODS have been consulted regarding the institutional strengthening.

A separate, more detailed document on the Institutional Strengthening is submitted attached with this Country Programme.

Training Programme on Refrigeration and Air-Conditioning

As described earlier, the substandard maintenance practices of cold storage and industrial refrigeration equipment, and especially bad practices of smaller domestic refrigeration and air-conditioning units in small workshops, are a major source of leaks and waste of money regarding ODSs in Sudan. Most of maintenance workshops are members of the Sudanese Industries Association or other wise related to it on commercial grounds. The maintenance operators are aware of the forthcoming constraints with the CFC use and thus motivated to improve practices and the business results. Therefore the following training and certification scheme is proposed:

*Industry Sector: Refrigeration; Sudanese Industries Association, P.O.Box 2565 Khartoum and Ministry of Labour and Social Security/Vocational Training Department.

*An organisation of regional training workshops to train instructors in good maintenance practices. Providing the vocational training centres with appropriate equipment (pressure testing and recovery) to reduce leaks and assess the feasibility of recovery and recycling of ODSs. Introducing a (voluntary) certification system for maintenance workshops and operators.

*Planned starting date: September 1994

*An expert familiar with the maintenance practices similar to those in Sudan (for approx. 2 man-weeks) is required to design the programme and organise equipment procurement in conjunction with the responsible organisation and governmental agency. As with the technical input the equipment needed will be procured from abroad.

*It can be assumed that on an annual level a reduction of 25 tonnes of ODP (1995) and a cut of 150 tonnes (1998) can be reached, representing roughly 8 % and 40 %, respectively, of the total consumption in recharging.

*The total incremental cost of the project in 1994-1996 will be approximately USD 200,000. The break-down of the costs will be as follows:

preparation of the project	USD 10000
equipment	USD 120000
instructors, fees, expenses	USD 30000
support to the participants	USD 10000
teaching materials, publicity expenses	USD 30000

The possible savings in the coolants' consumption (approx. USD 50000 p.a. in the year 1995) are not reflected in the costs.

*The Sudanese Industries Association as well as the Ministry of Labour and Social Security/Vocational Training Department has been consulted during the work of the National Team regarding the rationale and practical implementation of the project.

The government will prepare a separate, more detailed project document on this issue through UNEP IE/PAC. Outside expertise may be needed for the preparation of the project document.

Substitution of Butane (LPG) and Finger/Trigger Pumps for CFCs as Propellants in Aerosols Production

Sudan has long had aerosol production facilities both for cosmetic and insecticide aerosols. These production facilities are run on long term technical and commercial co-operation with foreign companies. The existing production facilities represent an essential component in Sudan's industrial infrastructure, and are connected to the local market and consumers through a well established distribution network. The continuous production capacity is justified.

*Industry Sector: Aerosols; Sudanese Cosmetics & Household Products Ltd, P.O.Box 2304 Khartoum

*Partial replacement of CFCs as aerosol propellant by purified LPG and/or by mechanical dispensers.

*Procurement of molecular sieves to purify the LPG to be used. Procurement of purified LPG from abroad to ensure the odour free propellant. Procurement of containers/cylinders to transport LPG from abroad. Testing the new chemical formulations possibly required by the new propellant. Training the staff to use the new propellant. Support the company to construct new/modified production facilities taking into consideration the flammability and other properties of LPG.

*Planned starting date: 3rd quarter of 1994

*Outside support is needed in the design of the whole transition project, in the design of the new production facilities. The molecular sieves and mechanical dispensers will be required from abroad. Also outside support in training will be needed.

*On the annual level, when the programme has been implemented (1997), the reduction of approx. ODP will be approximately 340 tonnes.

*Incremental cost USD 600,000, out of which approx. 50 % is needed for relocation of the existing production lines, explosion proof ventilation equipment etc. The costs of redesign and training represent approx. 15 % and the procurement of finger/trigger pumps, cans (or bottles) LPG storage tanks and purification equipment (sieves etc.) the rest. The possible lower price of the CFC replacement (LPG) is not reflected in the incremental cost estimate.

The calculation of the incremental cost is based on " Sourcebook of Benchmark Unit Abatement Costs ", World Bank October 1992.

*The company management has been consulted during several negotiations and plant visits, and the proposal has the support of the management.

The government of Sudan will prepare, in association with the company, a more detailed project proposal.

Introduction of new domestic refrigerator and water cooler compressors, suitable for non-CFC coolants

Sudan has a long history of producing domestic refrigerators, water coolers, cold storage and air-conditioning equipment in close co-operation with the leading foreign manufacturers. It is important that the know-how and skills gained, as well as the operation and maintenance will be supported by continuous, sustainable domestic production.

***Industry Sector: Refrigeration and Air-Conditioning; (represented by Coldair Engineering Company Ltd, P.O.Box 804 Khartoum)**

***Prepare the company to procure and use equipment (compressors and other devices) needed to meet the requirements of non-CFC coolants. Also the retrofitting of the existing larger commercial and industrial units to use alternative coolant will be assessed.**

***Planned starting date: 3rd quarter of 1994**

***Outside support is needed to procure the new domestic refrigerator and water cooler compressors for experimental purposes from the current suppliers of this equipment, who should also provide the company with the necessary technical expertise. The same also concerns larger condensing units used in cold storage room installations.**

***The reduction of ODS reached within a transition period of 4 years will be approx. 4 tonnes per year for manufactured products. The reduction of ODS used in recharging will actually go beyond the year 2000, depending partially on the rate at which the current equipment will be replaced.**

***Incremental costs will consist of the price difference between the old type and the new type of compressors and the current CFC (R12) and the forthcoming non-CFC coolant, over a transition period of 4 years, as well as of staff training expenses.**

The incremental cost will be approx. USD 150,000 if the substituant choiced is R134-a.

The company has been thoroughly consulted about the project and more detailed data prepared by the company itself is included in the working papers of this Country Programme.

The government of Sudan will prepare, in association with the company, a more detailed project proposal.

Replacing CFC as a Blowing Agent and/or Introducing Alternative Technologies in Flexible Foam Production

Sudan has one major producer of flexible foams which has been operational since the 1960s. It has relatively modern production facilities, buildings, and machinery as well as trained staff. The market for soft foam products is stable. Taking into consideration the relatively low price of the product and high transportation cost it is reasonable to support the local production.

*Industry Sector: Foams; Patra Foam Company, Khartoum/El Bagir

*Supporting the company in replacing CFC as a blowing agent through retrofitting the equipment, testing new blowing agents (not yet defined) etc. to reach acceptable quality level of the products

*Start date: 1st quarter of 1995

*Outside expert support is needed to evaluate the characteristics of the existing equipment and its suitability in using non-CFC blowing agents. Also some retrofitting equipment and process design expertise is needed. Financial support to compensate for the price differences of CFC and non- CFC blowing agents, and support to compensate for the loss due to (most probably) substandard production in the testing period will be required.

*The benefits will depend on the alternative choiced. Anyway, the total phase-out will be reached by 1998 maximum.

*The incremental cost of the project will be USD 200,000 for the initial period of 1995-1997. An essential part of the costs consist of expert services and lost (unsaleable) production.

*The company management has been consulted on the technical and financial issues, and plant visits have been made.

The government of Sudan, in association with the company, will produce a more detailed project document. Short term technical expertise support is needed for the project design.

3.3. Roles in Implementing the Strategy

The Higher Council for Environment and Natural Resources will be the leading national agency responsible for the implementation of the Country Programme. The Higher Council is a policy making body supported by the Secretariat and staff directed by the Secretary General. Within the Higher Council a specific Ozone Office will be established. The Ozone Office, programmed to work for an initial period of three years, will be the operational unit to execute all implementation related preparatory and administrative tasks. It is envisioned that the Ozone Office will draw its staff from the group of professionals who have participated in the preparation and compilation of this Country Programme.

The Higher Council and the Ozone Office will be supported by the National Committee for the Implementation of the Montreal Protocol. The concerned governmental agencies and departments are represented in the National Committee, and are as follows:

- *Ministry of Industry
- *Ministry of Finance
- *Ministry of Labour and Social Affairs/Vocational Training Dept.
- *Ministry of Health
- *Ministry of Interior/Civil Defence Dept.

Also the following organisations will have a key advisory role:

- *National Center for Research
- *Sudanese Universities

The Sudanese Industries Association and the Association of Refrigeration Manufacturers will be the main contributors to the implementation of the strategy.

Separate discussions will be carried out regarding the role of the Fund's Implementing agencies. However, taking into consideration the already established co-operation with UNEP IE/PAC the initial approach will be made to that same agency regarding the institutional strengthening and training programmes/projects.

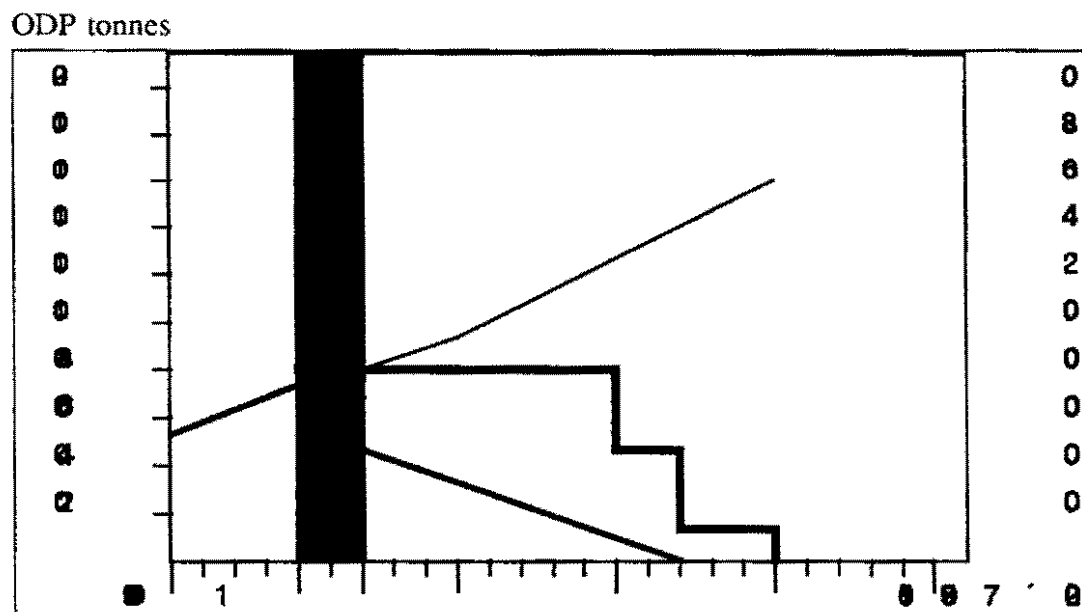
The government will approach some foreign NGOs who are presently operating in Sudan in order to create co-operation and draw funds for training activities and the subsequent certification and licensing schemes.

3.4. Timetable and Consumption Implications

Figures 3.4.1 illustrate the unconstrained, controlled and planned phase-out of CFCs in Annex A, Group 1.

The consumption of the other ODS are not significant.

Figure 3.4.1 Unconstrained Consumption, Protocol Phase Out Profile and Planned Consumption of CFCs in Annex A, Group 1



Regarding CFCs (Annex A, Group 1 substances) it is assumed that the proposed projects and campaigns start to take effect in late 1994, in order that the regulated upper limit of 773 tonnes (the consumption in 1995-1997 in average) will be slightly less than the estimated unconstrained consumption.

In the refrigeration sector, the initial charging of domestic equipment manufactured in Sudan with ODSs will stop by the year 2000. It also is assumed that the imports of equipment using ODS (i.e. dumping) will be banned by that time. This means that the demand for ODS in recharging domestic equipment will be sufficient for equipment now in use, and for equipment purchased within the few coming years. The stock of ODS using equipment will start to diminish around the year 2000. The proposed training will greatly diminish the ODS use. It may be noted that training and better practices will also stop the wastage of expensive non-CFC refrigerants in the future.

In foam production the use of CFC-based blowing agents will stop not later than the year 1998 depending on the alternative choiced.

In aerosols the complete phase-out should take place by the year 1998 representing an annual reduction of approx. 340 tonnes out of the unconstrained consumption.

Beyond the year 2000 CFCs will be needed only in recharging of old refrigeration equipment. The total phase-out will be reached in the year 2007. The phase out of halon 1211 and carbon tetrachloride should be reached in the years 2007 and 2005 respectively.

3.5. Budget and Financing Programme

It is assumed that the current tax and duty structure will prevail, i.e. the government doesn't need to impose the possible actions enumerated above.

It is assumed that all the assistance to the government will be in the form of grants from the Fund.

Financial and technical support may be sought from other sources, but the possible sources are not yet identified.

The table 3.5.1.herebelow covers the net costs incurred by the government for the period 1994-1997.

Table 3.5.1. Net costs of the proposed projects in 1994-1997

Year	Net costs, USD
1994	100,000
1995	850,000
1996	270,000
1997	100,000
Total	1,320,000

The incremental costs for the investissment projects are only indicative costs.

Funding Priorities

Reference is made to chapter 3.2.2. above. To summarise the costs of the projects are as follows:

Table 3.5.2. Cost of the projects by year and project in 1994-1997

Project	Starting Year	Execution period	Assistance from the Fund, USD
Institutional Strengthening	1994	1994-97	168300
training Programme on Refrigeration and Air-Cond.	1994	1994-96	200000
Substitution of LPG for CFCs in Aerosol Prod.	1994	1994-96	600000
New Refrigerator Compressors	1994	1994-96	150000
Foam Blowing	1995	1995-97	200000
Total Cost		1994-97	1318300

The aforementioned order of the projects is also the priority order of implementation.

None of the aforementioned projects have been agreed with any Implementing Agency of the Fund.

In the refrigeration related training programme some bilateral funding may be obtained. This funding will most probably be in kind and will be used to expand the project to rural areas.

3.6. Monitoring Arrangements

Within the forthcoming institutional framework, the government acting through the Higher Council for Environment and Natural Resources, the National Committee for the Implementation of the Montreal Protocol and the Ozone Office, will establish guidelines for reporting the imports, consumption and possible exports of the ODS chemicals, products containing ODSs and manufactured goods. This reporting requires the Customs Department and several importers to check quantities involved. The need to review the existing customs classification will be assessed.

Attention will be paid to monitoring the possible entry of other ODSs, other than those currently imported, on the market.

Also the monitoring of imports and the use of transitional substances will improved.
The monitoring arrangements will be geared to the regular reporting, which is required by the signatories to the Protocol.

Regarding the implementation of the projects indicated in the Action Plan, the government is aiming to impose a separate requirement, that the beneficiary companies/organisations will report the detailed use of ODSs within their facilities.

Regarding training projects in the refrigeration sector, a monitoring scheme will be introduced in a sample group of workshops.

The government's reporting to the Fund will be geared to the reporting requirements of the Ozone Secretariat unless other reporting systems are agreed/needed.

PROJECT PROPOSAL: No.1

COUNTRY: SUDAN

PROJECT TITLE: INSTITUTIONAL STRENGTHENING, CREATION
OF AN OZONE OFFICE

**NATIONAL EXECUTING
AGENCY:** OZONE OFFICE UNDER THE HIGHER COUNCIL
FOR ENVIRONMENT AND NATURAL
RESSOURCES

IMPLEMENTING AGENCY: UNEP

SECTORS COVERED: ALL

**ODS CONSUMPTION BY
SECTORS COVERED:** 606.2 ODP TONS IN 1991

PROJECT DURATION: THREE YEARS

PROJECT IMPACT: *PREPARATION AND MONITORING (DATA AND
INFORMATION COLLECTION) OF PHASE-OUT
ACTIVITIES ACCORDING TO THE ACTION PLAN
INCLUDED IN THE COUNTRY PROGRAMME
*IMPROVED CAPACITY OF THE PUBLIC
ADMINISTRATION RESPONSIBLE FOR ODS USE AND
CONTROL
*CONTRIBUTION BY THE COUNTRY TO THE
PROTECTION OF THE OZONE LAYER

REQUESTED MULTILATERAL FUND CONTRIBUTION : US \$ 168,300

INTRODUCTION

The Action Plan included in the Country Programme will be implemented in cooperation with governmental and semi-governmental institutions as well as with bodies presenting private businesses. It is necessary to create interim structures for the preparation and implementation of specific phase-out projects. The Ozone Unit is one of such structures.

ORGANIZATION OF THE OZONE UNIT

The Ozone Office comes under the Higher Council for Environment and Natural Ressources.

The Ozone Office is supported by the National Committee for the Implementation of the Montreal Protocol. Industry associations will be involved in the implementation and phase-out measures projectwise.

THE OZONE OFFICE TEAM

Technical, administrative and financial support will be provided by the Ozone Office Team, made up of one professional, and 2 support staff.

ACTIVITIES AND SCOPE OF THE PROJECT

If the Ozone Office is to attain the objectives as described in the Country Programme, it will have to undertake several activities, such as follows:

- *Take part in **defining criteria** for setting import bans and/or taxes and duties for substances and products possibly entering on the market, in addition to the substances and products currently used.

- *Establish an effective **cooperation with customs** authorities to **follow-up and monitor the imports of ODSs**, and ODS containing **products**, according to the international harmonized system. Enhance the follow-up of the imports of the **transitional substances and methylbromide**.

- *Prepare an **annual report** to Ozone Secretariat, as required, and set up a **data bank**, covering the imports and use of ODSs and related substances as well as possible **substitutes**.

- *Be responsible for the **preparation and implementation of the training project**, and responsible for the **preparation** of the other projects proposed (aerosols, refrigeration compressors and foam blowing).

***Contact representatives of the public media to distribute information regarding the harmful effects of the extensive ODS use, and information how to reduce and refrain from using ODSs.**

***Contact international agencies and other NGOs operating in Sudan to seek cooperation and support in the implementation of the phase-out.**

The Ozone Office will be responsible for developing an effective **system to monitor and evaluate** the implementation of the projects and other phase-out measures included in the Action Plan. The monitoring and evaluation function will have following components, such as:

***Gathering information** available from the customs authorities and industrial users regarding imports and use and **check these against the planned consumption figures.**

***Gathering data and information** from a large variety of **end users of ODS containing products** and evaluating **impacts (social and market)** of the measures implemented.

***Organise work shops** with the **industrial operators** and businesses involved to assess the **feasibility** of phase-out measures.

***Assess the effectiveness and impacts of the projects to be implemented. Check impacts against the planned consumption figures.**

***Review and adjust** financial and technical support needs for those sectors concerned by the Action Plan.

PROJECT BUDGET

The budget to be provided by the Government of Sudan amounts to USD 200,000 over a period of three years. The budget covers the following costs:

- *Office space and furniture, electricity, maintenance
- *Vehicles and drivers, fuel, maintenance
- *Other local transportation costs
- *Basic salaries for the support staff of the office
- *Honorariums and expenses for specialized Malawi consultants

BUDGET REQUESTED FROM THE MULTILATERAL FUND

This budget, which amounts to USD 168,300, is also intended to cover three years.

	Year 1	Year 2	Year 3	Total
Capital Expenditure				
Personal Computer	4,000			
Modem & Stabilizer	1,000			
Printer	3,000			
Software	2,000			
Fax-machine	1,500			
Typewriter	500			
Subtotal	12,000	-	-	12,000
Recurring Expenses				
Personnel Incentives	9000	9000	9000	
1 Professional Staff				
2 Support Staff	9000	9000	9000	
Subtotal	18,000	18,000	18,000	54,000
Operating costs				
Paper, Printing etc.	8,000	8,000	8,000	
Communications and local transport	7,000	7,000	7,000	
Servicing for Equipment	--	3,000	3,000	
Public awarness	12,000	12,000	12,000	
Subtotal	27,000	30,000	30,000	87,000
Total	57,000	48,000	48,000	153,000
10% Contingency	5,700	4,800	4,800	15,300
GRAND TOTAL	62,700	52,800	52,800	168,300

PROJECT PROPOSAL: No.1

COUNTRY: SUDAN

PROJECT TITLE: INSTITUTIONAL STRENGTHENING, CREATION OF AN OZONE OFFICE

NATIONAL EXECUTING AGENCY: OZONE OFFICE UNDER THE HIGHER COUNCIL FOR ENVIRONMENT AND NATURAL RESSOURCES

IMPLEMENTING AGENCY: UNEP

SECTORS COVERED: ALL

ODS CONSUMPTION BY SECTORS COVERED: 606.2 ODP TONS IN 1991

PROJECT DURATION: THREE YEARS

PROJECT IMPACT: *PREPARATION AND MONITORING (DATA AND INFORMATION COLLECTION) OF PHASE-OUT ACTIVITIES ACCORDING TO THE ACTION PLAN INCLUDED IN THE COUNTRY PROGRAMME
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*CONTRIBUTION BY THE COUNTRY TO THE PROTECTION OF THE OZONE LAYER

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