United Nations Environment Programme

Distr.
GENERAL
UNEP/OzL.Pro/ExCom/7/27/Rev.1
25 June 1992

ORIGINAL: ENGLISH

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

Seventh Meeting
Montreal, 23-26 June 1992

THE MAGNITUDE OF THE FUND REQUIRED

FOR THE NEXT THREE-YEAR PERIOD

INTRODUCTION

1. In accordance with the decision of the Parties to the Montreal Protocol at their London meeting in 1990 the magnitude of the Interim Multilateral Fund was established at the level of US $160 million for the three-year period (1991-1993) to be increased to US $240 million if China and India signed the Protocol. The Secretariat was entrusted by the Executive Committee at its Sixth Meeting to prepare an estimate of the magnitude of the Fund for the period 1994-1996. The present paper estimates that the requirements for the Fund for the next three year period 1994-1996 will amount to approximately US $480-620 million.

2. The estimates include:

i) costs of non-investment project activities: Fund Secretariat budget; Information Exchange System Maintenance, Workshops and Training Activities; Preparation and Updating of Country Programmes; Costs of Work Programmes; Institutional Strengthening Costs; and

ii) costs of investment projects.

ASSUMPTIONS

3. The costs of non-investment project activities were calculated on the basis of 1992 work programmes of the implementing agencies, an indicative budget of the Fund Secretariat, and costs incurred for institutional support. The latter is discussed elsewhere.

4. The costs of implementation of investment projects were calculated using the sector and sub-sector approach. The methodology for the calculation is given in the Annex to this paper. For each sector/sub-sector, the costs were obtained by multiplying the estimated unit cost ($/kg ODSs phased-out) by the volume of ODSs expected to be eliminated by the end of 1996. Every unit cost was calculated as an average value for each ODS's alternative technologies currently available, or would be available in the short to medium term for different sub-sectors. To this effect all available country studies/programmes and project proposals have been analyzed.

5. An average value based on available consumption data for the period 1989-1991 was arbitrarily chosen as the base figure which represents the current ODSs consumption. This figure includes India's consumption. To arrive at a plausible figure for consumption at the beginning of the new funding period (1994-1996), two scenarios were followed as depicted in Case I and Case II in the Annex. Case I assumes that no net reduction in consumption would be attained until the end of the present funding period, i.e. the base figure remains unchanged. Alternatively, Case II assumes that net reduction in consumption would be achieved at the end of the present funding period.

6. The most likely reduction in ODSs consumption at the end of 1996 was calculated on the basis of availability and viability of substitutes and technologies to effect this reduction. However, the reduction was adjusted according to the pertinent annual rate of growth.

7. In calculating the CFC phase-out costs in the production sector, it was estimated that two or three plants (each with an average capacity of 5,000 tonnes/year) could be converted to HCFCs at an approximate cost of US $9 million each, and preliminary works for one new HFC-134a facility at an approximate cost of US $10 million. As additional plants are identified, this portion of the fund will require more resources.

8. The rather wide range of estimates of the magnitude of the Fund is inevitable given the shortage, and, in some cases the inadequacy of information. It is also due to some uncertainties and limitations, e.g. consumption growth rate for the period 1994 to 1996; availability and prices of alternatives to the ODSs; divergence in costs of phasing-out per unit; the absorptive capacity of implementing agencies and pace of implementation; alternative technology options [should developing countries first switch over to transitional substitutes (HCFC) and later on go through another switch over to HFC?]; and lack of explicit quantification of "transitional period".

9. In order to narrow this range of estimates, it is further assumed that net reductions in ODSs would be achieved at the end of the present funding period (1991-1993), and that the probable annual growth rate would be 5-10%.

CONCLUSION

10. On the basis of the foregoing assumptions, it is estimated that the amount of the Fund for the period 1994-1996 would be between US $480 to 620 millions. A break down of this amount is provided in Table 1.

Table 1: Summary of Estimates of Future Amount of the Fund for 1994-1996

	(US$ Millions)
Fund's Secretariat	7.6
Implementing Agencies Work Programmes Information Exchange System Training and Workshops Country Programmes (preparation and updating) **Sub-Total**	 5.0 4.0 2.5 11.5
Institutional Strengthening	8.8
Investment Projects (technical assistance and pre-investment projects)	454 ~ 588
TOTAL	**482 ~ 616**

11. The above estimates were based on data obtained from various sources including: country studies/programmes, UNEP reports, and the countries themselves. These data cover Article 5 countries and India, which is expected to join the Montreal Protocol in the near future.

However, more than 50 countries have not yet ratified the Montreal Protocol. If these countries join the Montreal Protocol within 2-3 years, it is estimated that the requirements of the Fund will be increased by 10 ~ 20 percent.

ANNEX

METHODOLOGY FOR THE CALCULATION OF THE COSTS OF PHASE-OUT FOR THE PERIOD 1994-1996

I. Approach

The following formula is proposed:

(1) $P = \sum (X_1 \times Y_1)$,

where,

P represents total costs of phase-out per sector/sub-sector.

X_1 represents volume of ODSs that can be eliminated by the end of 1996 by sector and sub-sector expressed in kg ODSs; and

Y_1 represents unit cost of phase-out expressed in US$/kg ODSs phased-out.

X_1 is calculated by the following formula:

(2) $X_1 = C_1 \times (1 + r) \times \alpha$,

where,

C_1 represents consumption by sector/sub-sector at the beginning of the new funding period 1994-1996.

r represents consumption growth rate for the period 1994-1996 based on various annual growth rates: 0%; 2%; 5%; and 10%

α represents the projected percentage of the most likely reduction in consumption by the end of 1996.

II. Calculation of phase-out costs

Two scenarios are proposed to determine the value of C_1 as described by the following cases:

Case I:

C_1 equals the average consumption in the period 1989-1991 (it is assumed that the amount eliminated until 1993 equals the amount consumed to meet the growth demand for the same period of time).

Case II:

C_1 equals the average consumption in the period 1989-1991 minus the amount expected to be phased-out by the end of 1993 assuming the following reductions:

aerosol sector	50%
solvent sector	50%
foam sector	10%
other sectors	0%

Tables 2 and 3, respectively, summarize the three year (1994-1996) growth in consumption of ODSs at various rates of growth assuming two different starting (base) figures as described in Case I and Case II.

Tables 4 and 5 represent calculations of costs based on the most likely reduction adjusted to each growth rate for Case I and Case II, respectively.

The scenario represented by Case II is judged to be the most preponderant of the two scenarios due to the following reasons:

1) In the aerosol sector, conversion from CFCs to LPG is profitable and is achieved through conventional technology easily;

2) In the solvent sector, many transnational companies have already declared an early phase-out of CFCs and methyl chloroform; and

3) In the foam sector, up to 50 percent reduction in CFCs can be achieved easily without significant change in production processes.

Furthermore, the most plausible annual growth rate will range from 5-10% based on:

1) Country studies in high ODSs consumption countries (such as China, Mexico, and India) project future growth rates in consumption of around 10 percent and higher. Also these studies indicated that growth rates of ODSs consumption were much higher than GNP growth rates, in general.

2) In newly industrialized Article 5 countries where GNP is expected to continue to grow at high rates, one can expect consumption of ODSs to grow at even higher rates.

It is thus concluded that the estimated costs of phasing-out for the period 1994-1996 are as illustrated in Table 6.

Table 2: (1994-1996) Growth in Consumption of ODSs (Case I)

(Unit: Tonnes)

	Beginning of 1994 (C_1)	(1994-1996) Growth at:			
		r = 0%	r = 2%	r = 5%	r = 10%
Aerosols	22,000	22,000	23,500	25,500	30,000
Solvents					
Electronics Cleaning	10,000	10,000	11,000	12,500	15,500
Metal Cleaning	4,000	4,000	4,500	5,000	6,000
Precision Cleaning	5,000	5,000	5,500	6,000	7,500
Other Uses	2,000	2,000	2,000	2,500	3,000
Sub-Total	21,000	21,000	23,000	26,000	32,000
Foams					
Rigid Polyurethane	22,000	22,000	23,000	25,500	29,000
Flexible Polyurethane	12,000	12,000	12,500	13,000	14,500
Others	6,000	6,000	6,500	7,000	7,500
Sub-Total	40,000	40,000	42,000	45,500	51,000
Refrigeration					
MAC	19,000	19,000	20,000	22,000	25,500
Commercial	13,000	13,000	13,500	14,000	15,000
Industrial	1,000	1,000	1,000	1,000	1,000
Domestic Refrigeration	3,000	3,000	3,500	4,000	4,500
Chiller (CFC-11)	1,000	1,000	1,000	1,000	1,000
Sub-Total	37,000	37,000	39,000	42,000	47,000
T o t a l	120,000	120,000	127,500	139,000	160,000
Halons	6,000	6,000	6,500	7,000	8,000

Table 3: (1994-1996) Growth in Consumption of ODSs (Case II)

(Unit: Tonnes)

	Beginning of 1994 (C_1)	(1994-1996) Growth at:			
		r = 0%	r = 2%	r = 5%	r = 10%
Aerosols	12,000	12,000	12,500	13,500	16,000
Solvents					
Electronics Cleaning	3,500	3,500	4,000	4,500	5,500
Metal Cleaning	3,500	3,500	4,000	4,500	5,500
Precision Cleaning	3,500	3,500	3,500	4,500	5,500
Other Uses	1,500	1,500	1,500	2,000	2,500
Sub-Total	12,000	12,000	13,000	15,500	19,000
Foams					
Rigid Polyurethane	20,000	20,000	21,000	22,500	26,000
Flexible Polyurethane	10,000	10,000	10,500	11,000	12,000
Others	5,000	5,000	5,000	5,500	6,000
Sub-Total	35,000	35,000	36,500	39,000	44,000
Refrigeration					
MAC	19,000	19,000	20,000	22,000	25,500
Commercial	13,000	13,000	13,500	14,000	15,000
Industrial	1,000	1,000	1,000	1,000	1,000
Domestic Refrigeration	3,000	3,000	3,500	4,000	4,500
Chiller (CFC-11)	1,000	1,000	1,000	1,000	1,000
Sub-Total	37,000	37,000	39,000	42,000	47,000
T o t a l	96,000	96,000	101,000	110,000	126,000
Halons	6,000	6,000	6,500	7,000	8,000

Table 4: Magnitude of the Fund for the period 1994 - 1996 in million US $ (Case I)

	Consumption (Tonnes ODSs) at the beginning of 1994 (C_i)	Most likely Reduction % (α)	US$/kg ODSs Phased-out (unit cost) (Y_i)	Costs of most likely reduction adjusted to growth rate			
				0% growth	2% growth	5% growth	10% growth
Aerosols	22,000	80 – 90	0.6	10.6 – 11.9	11.3 – 12.7	**12.2 – 13.8**	**14.4 – 16.2**
Solvents							
Electronic Cleaning	10,000	70 – 80	30	210.0 – 240.0	231.0 – 264.0	**262.5 – 300.0**	**325.5 – 372.0**
Metal Cleaning	4,000	30 – 40	10	12.0 – 16.0	13.5 – 18.0	**15.0 – 20.0**	**18.0 – 24.0**
Precision Cleaning	5,000	40 – 50	40	80.0 – 100.0	88.0 – 110.0	**96.0 – 120.0**	**120.0 – 150.0**
Other Uses	2,000	10 – 20	10	2.0 – 4.0	2.0 – 4.0	**2.5 – 5.0**	**3.0 – 6.0**
Recycling		5	6.3	6.6	7.2	**8.2**	**10.1**
Sub-Total	21,000			310.6 – 366.6	341.7 – 403.2	**384.2 – 453.2**	**476.6 – 562.1**
Foams							
Rigid Polyurethane	22,000	50	7	77.0	80.5	**89.2**	**101.5**
Flex. Polyurethane	12,000	80	6	57.6	60.0	**62.4**	**69.5**
Others	6,000	80	5	24.0	25.9	**20.0**	**20.0**
Sub-Total	40,000			158.6	166.4	**179.6**	**201.0**
Refrigeration							
MAC	19,000	20 – 25	10	9.5	14.4	**19.4**	**28.1**
			7.0	18.8	19.5	**21.1**	**23.8**
Commercial	13,000	10	9	11.7	12.1	**12.6**	**13.5**
Industrial	1,000	30	9	2.7	2.7	**2.7**	**2.7**
Domestic	3,000	10 – 15	14	4.2	4.9	**8.4**	**9.5**
Chiller (CFC-11)	1,000	20	9	1.8	1.8	**1.8**	**1.8**
Sub-Total	37,000			48.7	55.4	**65.9**	**79.4**
T O T A L	120,000	50 – 55		528.5 – 585.8	574.8 – 637.7	**641.9 – 712.5**	**771.4 – 858.7**
Halons	6,000	30 – 40	6.4	11.4 – 15.4	12.6 – 16.6	**13.5 – 18.0**	**15.3 – 20.4**
Production Plant Conversion				28.0 – 37.0	28.0 – 37.0	**28.0 – 37.0**	**28.0 – 37.0**
T O T A L				569 – 639	615 – 692	**683 – 768**	**815 – 916**

Table 5: Magnitude of the Fund for the Period 1994 - 1996 in million US $ (Case II)

	Consumption (Tonnes ODSs) at the beginning of 1994 (C_1)	Most likely Reduction % (α)	US$/kg ODSs Phased-out (unit cost) (Y_1)	Cost of most likely reduction adjusted to growth rate			
				0% growth	2% growth	5% growth	10% growth
Aerosols	12,000	80 – 90	0.6	5.8 – 6.5	6.0 – 6.8	**6.5 – 7.3**	**7.7 – 8.6**
Solvents							
Electronic Cleaning	3,500	70 – 80	30	73.5 – 84.0	84.0 – 96.0	**94.5 – 108.0**	**115.5 – 132.0**
Metal Cleaning	3,500	30 – 40	10	10.5 – 14.0	12.0 – 16.0	**13.5 – 18.0**	**16.5 – 22.0**
Precision Cleaning	3,500	40 – 50	40	56.0 – 70.0	56.0 – 70.0	**72 – 90**	**88 – 110.0**
Other Uses	1,500	10 – 20	10	1.5 – 3.0	1.5 – 3.0	**2.0 – 4.0**	**2.5 – 5.0**
Recycling		5	6.3	3.8	4.1	**4.0**	**6.0**
Sub-Total	12,000			145.3 – 174.8	157.6 – 189.1	**186.9 – 224.9**	**228.5 – 270**
Foams							
Rigid Polyurethane	20,000	50	7	70.0	73.5	**78.8**	**91.0**
Flex. Polyurethane	10,000	80	6	48.0	50.4	**52.8**	**57.6**
Others	5,000	80	5	20.0	20.0	**22.0**	**24.0**
Sub-Total	35,000			138.0	143.9	**153.6**	**172.6**
Refrigeration							
MAC	19,000	20 – 25	10	9.5	14.4	**19.4**	**28.1**
			7.0	18.8	19.5	**21.0**	**23.8**
Commercial	13,000	10	9	11.7	12.1	**12.6**	**13.5**
Industrial	1,000	30	9	2.7	2.7	**2.7**	**2.7**
Domestic	3,000	10 – 15	14	4.2	8.4	**8.4**	**9.5**
Chiller (CFC-11)	1,000	20	9	1.8	1.8	**1.8**	**1.8**
Sub-Total	37,000			48.7	55.4	**65.9**	**79.4**
T O T A L	95,000	45 – 50		337.8 – 368.0	362.9 – 395.2	**412.9 – 451.7**	**488.2 – 530.6**
Halons	6,000	30 – 40	6.4	11.4 – 15.4	12.6 – 16.6	**13.5 – 18.0**	**15.3 – 20.4**
Production Plant Conversion				28.0 – 37.0	28.0 – 37.0	**28.0 – 37.0**	**28.0 – 37.0**
T O T A L				378 – 421	403 – 449	**454 – 507**	**531 – 588**

Table 6: Costs of phasing-out for the period 1994-1996

Sectors	Project Cost (US $ Million)
Aerosols	7 ~ 9
Solvents	187 ~ 270
Foams	154 ~ 173
Refrigeration	66 ~ 79
Halons	14 ~ 20
Production Plant Conversion	28 ~ 37
TOTAL	454 ~ 588