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Executive Committee of
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PROPOSED THREE-YEAR PLAN AND BUDGET OF THE MULTILATERAL FUND (1994-1996)

(WORKING PAPER)

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(WORKING DRAFT)

INTRODUCTION

1. The Fourth Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer requested ". . . the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol, in the light of its terms of reference, and drawing on the various reports and assessments it has at its disposal, and with the cooperation and assistance of the implementing agencies, and independent advice as appropriate or necessary, to submit to the Open-ended Working Group of the Parties at its next meeting a report comprising:

(a) A report on the operation of the Financial Mechanism since 1 January 1991;

(b) Its three-year plan and budget (as required by paragraph 10 (b) of its terms of reference) based on:

(i) The needs of Parties operating under paragraph 1 of Article 5 of the Protocol;

(ii) The capacity and performance of the implementing agencies; and

(iii) The strategies and projects to be implemented by Parties operating under paragraph 1 of Article 5 of the Protocol . . . ." (UNEP/OzL.Pro.4/15, Decision IV/18, Part II, para. 1, page 20)

2. The Fund Secretariat has prepared a document, addressing part (b) of this decision, as a working draft for the consideration of the Executive Committee at this meeting. The final draft will be submitted at the Tenth Meeting of the Executive Committee for adoption before it is sent to the Ninth Meeting of the Open-ended Working Group.

3. This document derives a budget based on a well-defined strategic plan of action. Its intent is to focus the activities of implementing agencies and the Parties on attainable goals for the elimination of ozone depleting substances (ODS) in Article 5 countries during the period 1994 through 1996.

4. The plan of action is to provide a profile of projects that should be targeted by implementing agencies and Parties for funding during the budget period. These projects are identified by sector and sub-sector. The principal themes of the plan are the identification and implementation of projects which use proven cost-effective technologies that can be easily replicated throughout Article 5 countries; the promotion of good handling practices in ODS use,

recovery and recycling; conversion and reduction of ODS use during the manufacture of intermediate goods; conversion of ODS production facilities to non-ODS technologies; and the elimination of targeted levels of ODS during the budget period.

5. This three-year plan builds upon the sector-based approach presented at the Fifth Meeting of the Executive Committee and the experience gained during the Fund's first two years of operation. The plan will be further articulated in the annual planning process of the Executive Committee which is embodied in the work programmes of the implementing agencies. Finally, the projects included in the plan should be implemented within the context of the approved country programmes of Article 5 Parties. Consequently, the plan requires the rapid completion of outstanding country programmes and the updating of country programmes on a periodic basis.

6. The Fund Secretariat has already prepared an estimate of budgetary requirements for the next budget period entitled, the "Magnitude of the Fund Required for the Next Three-Year Period" (UNEP/OzL.Pro/ExCom/7/27/Rev.1). The document was based on a sectoral analysis which applies a cost factor per quantity of ODS expected to be eliminated during the time period. That document projected budgetary needs in the order of US $480 to 620 million.

7. Other estimates have also been prepared by UNEP and USEPA. All three estimates are of a similar order of magnitude.

8. This report is intended to complement the previous studies by identifying projects as part of an overall strategy for the most expeditious and efficient approach to ODS phase-out in Article 5 countries. Budget figures derived herein represent the needs of the plan, but not necessarily the precise project mix that will be presented to the Executive Committee during the course of the three-year budget period.

9. By propagating this plan, the Committee is giving direction, but it must be emphasized that it is not, in any way, limiting the range of projects that it will consider during the years 1994 through 1996.

BUDGET 1994 THROUGH 1996

10. The plan, as articulated in this document, would lead to the eventual elimination of approximately 46,600 tonnes of ODS in consumption and 18,000 tonnes of ODS in production per year. To accomplish this goal, a budget of US $485 million is estimated for the three-year period. This includes the following amounts for investment projects by sector and other budget items:

Item	Cost (US $)	Annual Consumption Reduction (ODS tonnes)	Annual Production Reduction (ODS tonnes)
Aerosols	20,000,000	12,000	
Rigid polyurethane foam	68,250,000	12,000	
Flexible polyurethane foam	26,000,000	3,700	
Extruded polystyrene and polyolefin foam	20,000,000	2,500	
Domestic refrigeration manufacturing	87,000,000	2,500	
Commercial and industrial refrigeration	26,000,000	4,000	
Mobile air conditioning	20,000,000	1,700	
Chillers	17,000,000	900	
Solvents	60,000,000	5,000	
Halons	10,000,000	2,300	
Production of chemical substitutes	82,000,000		18,000
Sub-total	436,250,000	46,600	18,000
Implementing agency activities	31,500,000		
Institutional strengthening	9,000,000		
Executive Committee and Fund Secretariat	7,800,000		
TOTAL	484,550,000	46,600	18,000

METHODOLOGY

11. Several sources of information were used as the basis for developing the three-year plan and budget. The main sources are the country programmes and country studies of Article 5 countries. These documents were supplemented by the previous work of the Fund Secretariat, UNEP's technical panels, the Ozone Secretariat, and the implementing agencies. Consideration was given to the ODS needs of Article 5 countries during the grace period.

12. Implementing agencies were consulted concerning their capacities and anticipated levels of activity during the budget period.

13. The limiting factors in certain cases were determined by the stated phase-out plans of Article 5 countries, the availability of information about future plans, and the availability of alternative technologies for immediate transfer to Article 5 countries.

14. The strategies and projects for implementation were derived from: stated phase-out plans; projects included in country programmes; follow-up on projects already approved by the Executive Committee; and, projects recommended by the technical options panels and implementing agencies' expert groups. The primary assumptions used in developing the project profiles and the strategies are:

(i) Priority is given to projects that can be implemented as replications of existing proven technologies;

(ii) Strategies of Article 5 Countries for phase-out in the different user sectors; and,

(iii) A period of up to 24 months precedes actual implementation, i.e., most of projects and related activities identified within the time frame under review will be implemented up to the year 2000.

15. Each user sector is introduced in this document with a description of total known consumption and available technology. The amount of consumption is adjusted according to growth and elimination indices as provided. Whenever possible, the number of projects that can be identified within the period under review is given per sector and in some cases per sub-sector. These projects include by necessity, training, demonstration and other aspects of technical assistance.

16. Project costs are developed according to available costs of technology taking into account a wide range of country specific institutional circumstances, involving prices of substitutes, economies of scale, etc. The total costs per sector are aggregated as the sector budget required for meeting the needs.

17. Actual projects may vary both in costs and individual components. For this reason, the projects and their costs mentioned in this document should be considered indicative.

THE AEROSOL SECTOR

Consumption

18. By 1994, annual consumption of chlorofluorocarbons (CFCs) in the aerosol sector in Article 5 countries is estimated to be about 16,000 tonnes.

Investment Projects

19. The majority of aerosol producers in Article 5 countries are likely to choose deodorized hydrocarbons (propane, butane, iso-pentane). Since hydrocarbons are highly flammable, specific safety precautions are required, especially at the filling plant.

20. The USA-based cost of hydrocarbon is about US $0.6/Kg. which is substantially lower than that of the CFC, US $3.3/Kg. Savings arising from the change in propellants are considered while estimating the incremental cost of a project.

21. The cost effectiveness of the projects, determined as the ratio of incremental cost to the estimated annual savings of CFC, varies from US $0.37/Kg. for a large plant to US $3.0/Kg. for small plants.

Sector Costs and ODS Reduction

22. For the budget period 1994 to 1996, roughly 400 medium-sized and small-sized aerosol plants in Article 5 countries could be converted from CFCs to hydrocarbon, at an estimated incremental cost of US $20 million resulting in the elimination of about 12,000 tonnes of CFC per year.

THE RIGID POLYURETHANE FOAM SUB-SECTOR

Consumption

23. CFC-11 is used as a blowing agent in the manufacture of polyurethane insulating foam in the refrigeration industry. The total amount of CFC-11 used for this purpose will be about 16,000 tonnes by 1994.

24. Rigid polyurethane foam is also used in manufacturing boardstock insulating panels, spray foam and pipe insulation. The total consumption of CFC-11 used for these purposes is estimated to be about 10,000 tonnes by 1994.

Investment Projects

25. A three phase approach is being adopted by some Article 5 countries for the complete elimination of CFC-11 in foam blowing operations.

26. Phase I is a 50 per cent CFC reduction using new polyol/water formulations and this technology is now mature. Phase I may also require replacement of capital equipment. The

Executive Committee has already approved foam conversion projects to reduce CFC-11 usage in the refrigeration sector.

27. Phase II will replace 100 per cent of CFCs with a HCFC-based blowing agent. Phase II is being implemented in developed countries. It involves the use of either a binary blend of HCFC-142b and HCFC-22 or HCFC-141b as foam blowing agents.

28. Phase III is based on the introduction of non-ODS as blowing agents; however, this technology is still in the research and development stage.

29. The estimated average cost for a typical Phase I conversion project is about US $300,000. Approximately 80 production lines are expected to implement Phase I conversion in refrigeration foam. About 60 projects are foreseen in construction foam and in pipeline insulation foam. The total cost of Phase I conversion projects is expected to be US $52 million.

30. Phase II conversion will cost an additional US $200,000 per project. Approximately 70 Phase I projects will subsequently undergo complete conversion by implementing Phase II at a total additional cost of $14 million.

31. Approximately 15 projects will be based on HCFC-141b substitute technology. HCFC-141b technology does not require new high pressure equipment. The major cost of conversion will be operational costs, technical assistance, and training. Conversion costs are estimated at US $150,000 per project at a total cost of about US $2.25 million. The ozone depletion potential of HCFC-141b is twice as high than HCFC-142b/HCFC-22 blend, hence the limited number of projects based on HCFC-141b technology.

Sub-sector Costs and ODS Reduction

32. The total requirements for rigid polyurethane foam conversion during the budget period is about US $68.25 million resulting in the elimination of 12,000 tonnes of ODS.

THE FLEXIBLE POLYURETHANE FOAM SUB-SECTOR

Consumption

33. By 1994, the annual consumption of CFC-11 in the flexible polyurethane foam sub-sector in Article 5 countries is estimated to be 4,000 tonnes.

Investment Projects

34. Methylene chloride will be the prime alternative to CFC-11 in the manufacture of slabstock flexible polyurethane foam for conventional applications. Investment will mainly be in new formulation, and the provision or improvement of containment systems for worker health and safety.

35. Conversion from CFC-11 to methylene chloride in the production of polyurethane slabstock foam may not involve substantial incremental costs. From 1994 to 1996, over 50 plants in several Article 5 countries could replace CFC-11 with methylene chloride. The incremental costs of the conversion is estimated at US $10 million leading to a phase-out of 2,500 tonnes of CFC-11.

36. HCFC-123 or HCFC-141b technology could be used to substitute for an estimated 10 per cent of CFC-11 for blowing modified, super-soft foams for special applications. Although HCFC technology may not involve substantial equipment modification, there might be significant incremental operational cost because of the higher cost of HCFCs. 15 projects for the substitution of CFC-11 with HCFCs could be implemented. The estimated cost is US $2 million for an annual phase-out of 200 tonnes of CFC-11.

37. An estimated 20 per cent of the CFC-11 consumption in flexible foam production will be for the production of moulded flexible polyurethane foam for the automobile manufacturing or assembly industries. CFC-11 will be substituted for with carbon dioxide.

38. Average unit incremental cost of phase-out in the moulded foams is assumed to be US $10/Kg. based on projects approved. About 20 projects could be implemented. The estimated cost is approximately US $10 million. These projects would lead to annual elimination of 1,000 tonnes of CFC-11.

39. Demonstration and technical assistance programmes in the flexible foams sector could be provided in Article 5 countries at an estimated cost of US $4 million. This could lead to direct elimination of CFC-11 in a number of plants particularly in small-consuming countries.

Sub-sector Costs and ODS Reduction

40. The total budgetary requirement in the flexible foam sub-sector is approximately US $26 million which includes US $22 million for investment projects and US $4 million for technical assistance and demonstration projects. About 3,700 tonnes of ODS would be eliminated during the budget period.

THE EXTRUDED POLYSTYRENE AND POLYOLEFIN FOAM SUB-SECTOR

Consumption

41. The estimated consumption of extruded polystyrene and polyolefin foams by 1994 is approximately 5,000 tonnes in Article 5 countries consisting mainly of CFC-12.

42. There are two distinct polystyrene foams, foam sheet which is used in disposable food service packaging, and foam boardstock which is used as a building insulation.

43. Polyolefin foams are manufactured into extruded sheets which are commonly used as protective packaging for furniture, electronic devices, or moulded products such as expandable beads.

Investment Projects

44. Many manufacturers of food service and packaging products are converting to hydrocarbons such as butane and pentane. Converting to hydrocarbons requires investment to bring plants in line with environmental and fire safety regulations. Operating costs using hydrocarbons are, however, lower than those for CFCs.

45. The main alternative blowing agents for polystyrene board in the short term are HCFC-22 and HCFC-142b and many polyolefin foam products are now manufactured with HCFC-22, HCFC-142b and hydrocarbons. However, there has been limited conversion to processes using these alternatives in developing countries.

46. Hydrocarbon conversion projects are therefore the recommended project type for conversion in the production of extruded polystyrene sheet, and in some cases, polyolefin foam.

47. Based on the available data, the cost of a hydrocarbon conversion project (including fire safety measures) is US $1 million for projects eliminating more than 100 tonnes of ODS per year and US $500,000 for projects eliminating less than 100 tonnes of ODS per year.

Sub-sector Costs and ODS Reduction

48. For the budget period 1994 to 1996, approximately ten projects costing US $1 million each and 20 projects costing US $500,000 each are foreseen. These projects will result in the elimination of 2,500 tonnes of CFC-12. Total incremental costs for this sub-sector are estimated at US $20 million.

THE DOMESTIC REFRIGERATION MANUFACTURING SUB-SECTOR

Consumption

49. The domestic refrigeration industry is a rapid growth industry, particularly in developing countries. By 1994, it is estimated that about 4,000 tonnes of CFC-12 will be consumed in the production of refrigeration appliances.

Investment Projects

50. HFC-134a appears to be one of the best long term substitute refrigerants in the domestic refrigeration sector.

51. However, the manufacturing of compressors and appliances based on HFC-134a technology implies much higher stringency in the requirements for the quality of the production environment. It is recommended that conversion from CFC-12 to HFC-134a technology should be accomplished in two phases. The first phase should involve testing of the HFC-134a technology in the manufacturing process through a pilot project, and the second phase is a full-scale conversion.

52. HFC-134a technology transfer should be conducted within the framework of working relationships and agreements with technology suppliers established for this purpose.

53. The Executive Committee has already approved four projects for conversion to the HFC-134 based technology in this sub-sector. Two projects relate to the conversion of compressor manufacturing, the others relate to the conversion of domestic refrigeration appliances to incorporate the new technology.

54. The cost of conversion from CFC-12 to HFC-134a technology for compressor manufacturers is estimated to be US $1.5 million per plant. The total costs of about 10 projects is expected to be approximately US $15 million.

55. The cost of conversion from CFC-12 to HFC-134a technology for refrigerator manufacturers is estimated to be around US $1 million per plant. This cost includes capital cost of equipment for assembly line related to the new lubricant and refrigerant and technical assistance. On the assumption that about 40 projects would be submitted from Article 5 countries, the total costs of these projects is estimated at approximately US $40 million.

56. Coupled with these projects, recovery and recycling programmes within the refrigerator manufacturing plants will be implemented at a total estimated cost of US $2 million.

57. Refrigerator manufacturers in Article 5 countries which do not produce HFC-134a compressors will incur an incremental cost of about US $10 per imported new compressor. It is expected that about US $3 million refrigerators will be fitted with such compressors at a total cost of US $30 million.

Sub-sector Costs and ODS Reduction

58. In summary, the domestic refrigeration sub-sector will require about US $87 million during the next budget period leading to the elimination of about 2,500 tonnes of ODS.

THE COMMERCIAL AND INDUSTRIAL REFRIGERATION SUB-SECTOR

Consumption

59. Commercial refrigeration systems are used by retailers to display and store fresh and frozen food and to cool food and drinks in vending machines. Commercial food processing and storage includes a variety of applications, with storage temperatures above freezing (0°C to 10°C) or below (-18°C to -50°C). Industrial refrigeration covers a wide range of uses within the chemical and pharmaceutical industries, the oil and gas industry, the metallurgical industry, civil engineering, etc. About 18,000 tonnes of CFC-12 is used in commercial and industrial refrigeration in Article 5 countries. The commercial refrigeration sub-sector represents about 17,000 tonnes and the rest is used in industrial refrigeration.

Investment Projects

60. Large industrial refrigeration equipment can be replaced with new equipment using ammonia or HCFCs. Some industrial equipment based on CFC-12 refrigerant can be retrofitted with HCFC-22 using relatively inexpensive technical modifications. New HCFC-22 and ammonia compressors and related equipment can replace CFC-12 equipment.

61. Commercial systems are prone to leakage because the equipment design usually incorporates a large amount of jointed piping and all systems contain a large amount of refrigerant. Therefore, the emphasis of phase out activity in the commercial refrigeration sector will be on better maintenance and recycling.

62. The Executive Committee has already approved several improved servicing and maintenance training projects relating to commercial refrigeration for Article 5 countries.

63. A maintenance and recycling project would contain a training programme for servicing technicians in the commercial refrigeration sector and the purchase of recovery and recycling machines. It is estimated that about ten projects from small- to medium-consuming countries and ten from large-consuming countries are foreseen during the budget period.

64. The total cost of a maintenance and recycling programme in commercial refrigeration will be US $5 million which would lead to the elimination of approximately 1,000 tonnes of CFCs.

65. HCFC-22 or ammonia is the most important substitute refrigerant in commercial refrigeration. Projects for the conversion of CFC-12 compressor manufacturing facilities to HCFC-22 technology are expected during the budget period.

66. It is estimated that the conversion of ten CFC-12 compressor assembly lines to produce HCFC-22 compressors will occur during the budget period. The conversions are foreseen in five countries at a total cost of US $10 million.

67. The availability of HCFC-22 and ammonia compressors will lead to speedy conversion of commercial refrigerator manufacturing plants to the new technology. The estimated cost of such a conversion would be about US $500,000 per plant. Twenty plants are expected to be converted in ten Article 5 countries at a total cost of US $10 million. This would lead to elimination of approximately 3,000 tonnes of CFCs annually.

68. Some large CFC-12 based systems for cold storage, food processing and industrial applications may have remaining service lives of 20 to 30 years. System retrofitting to use alternative refrigerants like HCFC-22, ammonia or hydrocarbons may therefore be attractive from an economic point of view, provided that the required modifications are not too expensive.

69. The cost of retrofitting including leak-tight, leak detection systems would be US $100,000 per system. It is estimated that ten projects converting from CFC refrigerant to HCFC-22 or ammonia may be submitted during the budget period at a cost of US $1 million. A possible CFC elimination would be about 50 tonnes.

Sub-sector Costs and ODS Reduction

70. In summary, approximately US $26 million is foreseen for this sub-sector which includes: US $5 million for recovery, recycling, and maintenance; US $10 million for semi-hermetic compressor conversion to HCFC-22; US $12 million for commercial refrigerator conversion to HCFC-22; and, US $1 million for cold storage conversion to ammonia. These projects will lead to the phase-out of 4,000 tonnes of CFCs.

THE MOBILE AIR CONDITIONING SUB-SECTOR

Consumption

71. It is estimated that approximately 20,000 tonnes of CFC-12 will be used in the manufacture and servicing of mobile air conditioners (MACs) in developing countries by 1994. About 4,000 tonnes are used for the filling of new MACs. The remaining 16,000 tonnes is used during refilling and servicing.

Investment Projects

72. Refrigeration experts generally agree that the best short term measure for saving CFC-12 refrigerant used in MACs can be achieved through better handling and recycling during servicing. With fully implemented recycling, improved handling, and better refrigerant containment, it is estimated that the usage rate will drop from 0.4 Kg. to 0.24/Kg. per vehicle per year. Another source estimates savings of 0.61/Kg. per vehicle serviced.

73. Recovery and recycling projects have been included in the country programmes of several countries. The Executive Committee has already approved two investment projects in MAC recycling which are projected to result in the elimination of about 300 annual tonnes of CFC-12 each at a cost of approximately US $900,000 each. Demonstration projects and training projects have also been approved. The Committee also approved a global MAC project which aims to develop projects in 13 Article 5 countries and includes management and implementation arrangements, training programmes, project appraisal, and implementation of pilot recycling projects.

74. A typical recycling project might contain about 50 MAC service shops per country in 15 countries. It would also include training and workshops on equipment utilization and improved servicing techniques.

75. A service shop would contain three MAC machines and perform around 3,700 MAC servicings per year. Capital costs are estimated at US $13,000 and about US $2,000 is required in annual operational costs.

Sub-sector Costs and ODS Reduction

76. Based on these assumptions, it is estimated that each project could cost about US $1 million. The larger, more dispersed countries would have more facilities. Including this adjustment, it is estimated that projects in 15 countries would require approximately US$20 million over the budget period which would lead to the elimination of approximately 1,700 tonnes of CFCs.

THE CHILLER SUB-SECTOR

Consumption

77. In 1991, approximately 4,000 tonnes of CFC-11 and CFC-12 were used as coolant for chillers. At that time, an estimated 28,700 chillers were in operation in developing countries. An estimate of the amount of chillers in 1994 is not avoidable.

Investment Projects

78. Only a few Article 5 countries have taken measures to eliminate the use of CFCs in chillers, by retrofitting CFC-12 units with HFC-134a. Retrofitting the existing number of chillers in Article 5 countries would cost over one billion dollars. During the budget period, requests from approximately 20 Article 5 countries to retrofit existing chillers are foreseen.

79. Conservation, recovery and recycling projects and improved service and maintenance programmes in the refrigeration sector, have been implemented in several Article 5 countries.

80. The servicing of chillers should also be considered where good practices could lead to savings in the use of refrigerant. CFC recovery machines available in the market will minimize the amount vented to the atmosphere. Nearly two tonnes of CFC can be recovered from each machine per year. The cost of a recovery and recycling machine with training is estimated at US $7,000 to 10,000.

81. The cost effectiveness of the projects, determined as the ratio of incremental cost to the estimated annual savings of CFC, is US $5.0/Kg. for the recovery of CFCs used in chillers.

Sub-sector Costs and ODS Reduction

82. For the budget period, recovery projects for CFCs in chillers could be implemented in 16 Article 5 countries. Each programme would include 15 recovery machines and training. The incremental cost is estimated at about US $2 million. Almost 500 tonnes of CFC per year could be recovered from these projects. Retrofitting projects in 20 Article 5 countries will be implemented at an estimated cost of US $15 million resulting in the phase-out of about 400 tonnes of CFC.

83. In summary, the total cost of projects in this sub-sector will cost about $17 million leading to the elimination of 900 tonnes of CFCs.

THE SOLVENT SECTOR

Consumption

84. The projected 1994 consumption of Article 5 countries in the solvent sector is estimated at 58,500 tonnes of ODS. This consists of 9,900 tonnes of CFC-113, 47,700 tonnes of methylchloroform, and 900 tonnes of carbon-tetrachloride.

85. Three countries consume over 10,000 tonnes each, and four countries consume over 1,000 tonnes each. These top seven consuming countries account for more than 90 per cent of solvent consumption in Article 5 countries. The rest of Article 5 countries are low consumers of solvents; their consumption ranges from virtually zero to 500 tonnes.

86. In some of the high consumption Article 5 countries, subsidiaries of transnational corporations are the largest consumers.

87. The electronics cleaning, precision cleaning and metal cleaning are the three major end-users. The dry cleaning and adhesives, coatings and aerosols are minor users. Generally speaking, the electronics industry is the highest consumer of solvents. However, consumption per end-user is generally low; the range being less than 5 to 20 tonnes per year.

Investment Projects

88. Given the fact that many of the end-users are small consumers, the best options, in the short term, for reduction in ODS use are improved conservation and handling practices, improved cleaning equipment, and recovery and recycling. When implemented effectively, these measures could collectively lead to a reduction of as much as 75 per cent of solvent consumption per user. Thus, such activities should be implemented immediately in Article 5 countries, coupled with demonstration and training.

89. The cost of a conservation project including training could range from US $60,000 for a low ODS-consuming company (5 ODS tonnes per year) to about $400,000 for a medium-sized company (50 ODS tonnes per year).

90. During 1994-1996, it is expected that 10 medium-sized and 100 small-sized solvent conservation projects will be implemented, leading to the elimination of 800 tonnes.

91. Although the volume of direct elimination of ODS by project is small, the ripple effect of these demonstration projects might result in a few thousand tonnes of ODS reduction.

92. There are also several non-ODS technologies in the solvent sector including the use of: halogenated solvents, HCFC solvents, alcohols, aqueous (water), semi-aqueous solvents,

no-clean fluxes, and controlled atmosphere soldering. The cost of a project using non-ODS technologies, including supplemental costs such as environment protection, ranges from US $500,000 to $800,000, which will result in the annual elimination of 10 to 100 tonnes per project.

93. Although non-ODS technology projects may not be cost effective compared to conservation projects, these projects would also be implemented in Article 5 countries, since they can eliminate ODS totally. It is estimated that 70 non-ODS technology projects will be implemented, leading to the elimination of 4,200 tonnes of ODS.

94. The Executive Committee has approved a global solvent project. The strategy of implementation of conservation projects and non-ODS technology projects should be established in the global solvent project formulation.

Sector Costs and ODS Reduction

95. In summary, approximately 180 projects (this number represents all small- and medium-sized projects contained within large projects) are foreseen during the budget period, costing about US $60 million. These projects will lead to the direct elimination of 5,000 tonnes of ODS per year.

96. In addition, almost 10,000 tonnes of ODS would be phased out by subsidiaries of transnational corporations located in Article 5 countries during the period 1994 to 1996 at no cost or at a much reduced cost to the Fund.

THE HALON SECTOR

Consumption

97. Unabated consumption of halons could reach a level of approximately 8,000 tonnes by the year 1994. Some Article 5 countries have, however, stated their intention to eliminate about half of this amount by 1996. Thus far, the Executive Committee has approved projects that will lead to the elimination of 1,700 tonnes by 1996 leaving an estimated target elimination of around 2,300 tonnes for the next budget period.

Investment Projects

98. According to halon sector experts, the preferred strategy is to convert to alternative fire extinguishing technologies as soon as practicable while concurrently providing training in good

conservation and testing practices. The technology already exists for the conversion of most halon uses to alternatives.

99. Halon recycling and conservation will entail training, the purchase of halon recycling machines and the establishment of reclamation centres. The Executive Committee has already approved a halon project for one Article 5 country. The Committee also approved a global halon project which will develop specific projects in seven countries and include the establishment of halon control systems (management of testing, servicing and recycling), the development of regulations and insurance requirements for non-halon use, the establishment of a halon bank management system, and workshops in non-halon technologies.

100. For most consuming countries, a national project for halons might include a number of halon 1211 recycling machines and one 1301 machine, with a training programme, and a reclamation centre at a cost of US $400,000 per project. For large consuming countries, the cost would be higher.

101. Projects in at least 12 countries might be anticipated during the next budget period at a cost of US $6.8 million. Assuming that each project will eliminate on average 100 tonnes per year, approximately 1700 tonnes of halons would be preserved from recycling and recovery at cost effectiveness measurement of less than US $4.0/Kg. ODP.

102. Demonstration projects for production shutdown, transformation, and water-based extinguishers costing almost US $3.2 million and for the elimination of 600 tonnes are expected.

Sector Costs and ODS Reduction

103. In summary, the targeted elimination figure for the halon sector is 2,300 tonnes with the largest activity in recovery, recycling, and reclamation. The estimated cost for this sub-sector is US $10 million.

PRODUCTION OF CHEMICAL SUBSTITUTES SECTOR

Production Facilities

104. There are six Article 5 countries producing controlled substances. The total production in 1991 was 91,000 tonnes. The total production capacity installed in Article 5 countries was about 156,000 tonnes. The total production of CFC-11/CFC-12 in 1991 is 71,000 tonnes.

105. In some countries, CFC-11/CFC-12 plants cannot be easily converted to produce HCFC-22, therefore CFC-11/CFC-12 plants will have to be replaced with new plants producing HCFC-22. In others, CFC-11/CFC-12 plants (swing type design production plants) can be switched to produce HCFC-22 with low incremental cost, which is mainly operational cost.

Investment Projects

106. HCFC-22 is an important short and medium term alternative substitute. The demand for HCFC-22 will increase in the 1994-1996 period due the substitution of CFC-11/CFC-12 with HCFC-22 in foam and refrigeration sectors. Two Article 5 countries indicated their intention to replace CFC-11/CFC-12 production plants with HCFC-22. The cost of one HCFC-22 plant with a capacity of 5,000 tonnes will be US $10 million. Two projects are expected during the budget period with capacity of 5,000 tonnes each at a total cost of US $20 million.

107. One Article 5 country indicated its intention to carry out research and development activities to adapt new substitute production technologies to local circumstances for HFC-152a, HCFC-123/124/ HFC-125, HFC-23 and HCFC-141b/142b production processes. It is assumed that about US $500,000 will be required per one process. The total cost is estimated to be US $2 million.

108. It is estimated that HFC-134a plants with capacity of 4,000 tonnes/year each will be established in two Article 5 countries during the budget period. The cost of anticipated projects cover capital investment and operational costs. The total cost of these two plants will be about US $60 million and taking into consideration a transnational corporation ownership.

Sector Costs and ODS Reduction

109. The total cost of projects involving production of chemical substitutes will be US $82 million resulting in an elimination of 18,000 tonnes of CFC per year.

110. Other substitutes are not included in this plan. However, proposals for the production of such products could materialize during the next budget period. If this is the case, an additional one-hundred million dollars would be required.

OTHER BUDGET ITEMS

111. Other budget items include implementing agency work programmes, institutional strengthening for Article 5 countries, and the cost of Executive Committee meetings and the Fund Secretariat.

Implementing Agencies

112. Implementing agency work programme activities include project preparation, technical assistance, preparation and updating of country programmes, training projects, information exchange, and administrative overhead. Estimated annual budgets for the implementing agencies

for these activities are as follows: World Bank and UNDP, US $3 million per year; UNIDO, US $2.5 million per year; and, UNEP, US $2 million per year. A budget of US $31.5 million is estimated.

Institutional Strengthening

113. Institutional strengthening is provided to enable the existing capacities of Article 5 countries to better manage their participation in the preparation, monitoring and promotion of the activities of the Multilateral Fund. A budget of US $9 million is foreseen to cover the participation of several Article 5 countries.

Executive Committee and Fund Secretariat

114. The three-year budget includes the costs for Executive Committee meetings, document distribution, and the Fund Secretariat. The level of funding required for the first three years of operation will be maintained for the next budget period. It is expected that the amount will total US $7.8 million.