

**MONTREAL PROTOCOL
ON SUBSTANCES THAT DEplete
THE OZONE LAYER**



UNEP

**REPORT OF THE
TECHNOLOGY AND ECONOMIC ASSESSMENT PANEL**

MAY 2008

VOLUME 2

**ASSESSMENT OF THE FUNDING REQUIREMENT FOR THE
REPLENISHMENT OF THE MULTILATERAL FUND FOR
THE PERIOD 2009-2011**

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The text of this report is composed in Times New Roman.

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Secretariat

Reproduction: UNON Nairobi

Date: May 2008

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UNITED NATIONS ENVIRONMENT PROGRAMME
Ozone Secretariat, P.O. Box 30552, Nairobi, Kenya

Normally from SMI Distribution Service Ltd., Stevenage, Hertfordshire, UK,
fax: + 44 1438 748844

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Printed in Nairobi, Kenya, 2008.

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ACKNOWLEDGEMENT

The UNEP Technology and Economic Assessment Panel and the Replenishment Task Force co-chairs and members wish to express thanks to all who contributed from governments, both Article 5 and non-Article 5, furthermore in particular to the Multilateral Fund Secretariat and to the Ozone Secretariat, to all Implementing Agencies, as well as to a large number of individuals involved in Protocol issues, without whose involvement this assessment would not have been possible.

The opinions expressed are those of the Panel and its Task Force and do not necessarily reflect the reviews of any sponsoring or supporting organisation.

The TEAP and its Replenishment Task Force thank UNIDO in Vienna, Austria, for hosting the meeting, 21-25 April 2008, where this report was discussed, adopted and finalised for a last review by email circulation.

Foreword

The May 2008 TEAP Report

The May 2008 TEAP Report consists of three volumes:

Volume 1: May 2008 TEAP Progress Report

Volume 2: May 2008 TEAP Replenishment Task Force Report

Volume 3: May 2008 TEAP CTC Emissions Report

Volume 1

Volume 1 contains the essential use report, progress reports, consideration on the climate issue related to Decision XIX/6, the HCFC alternatives for high ambient temperature preliminary report, the MB CUN report, TEAP organisation issues and TEAP member biographies.

Volume 2

Volume 2 is the Assessment Report of the TEAP Replenishment Task Force of the Funding Requirement for the Replenishment of the Multilateral Fund during 2009-2011, in response to Decision XIX/10 (this report).

Volume 3

Volume 3 is the CTC Emissions Report by the TEAP CTC Task Force.

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Executive Summary

ES.a Overview

Pursuant to Decision XIX/10, the Replenishment Task Force has estimated the total funding requirement for the period 2009-2011 to enable the Article 5 Parties to comply with all relevant control schedules under the Montreal Protocol to be between **US \$342.8 and US \$639.8 million**. This estimate can be broken down into non-HCFC activities and HCFC activities. The broad range reflects uncertainties in the funding for phasing out HCFCs.

It is expected that in the near future both the Executive Committee and the Meeting of the Parties can narrow down this broad range to estimates that are more precise by taking the relevant decisions. As has been the case in past replenishment studies, the Task Force will take on board any additional guidance from Parties with a view to further reducing uncertainties.

The non-HCFC funding estimate includes

- forward commitments for already approved multi-year agreements in the consumption and production sectors (some US \$45 million);
- the standard recurring costs, such as Institutional Strengthening, UNEP's Compliance Assistance Programme, the budget of the MLF Secretariat and Executive Committee meetings, the Treasurer's fees and the Implementing Agencies core funding (some US \$92 million)
- new activities, including a number taken from the approved Multilateral Fund Consolidated Business Plan, including phase-out activities in the MDI sector (at a total of about US \$38.7 million), and
- waste disposal and destruction as estimated by the Task Force (about US \$27 million); this is an area that is a bit more unclear due to the current lack of Executive Committee guidance.

Funding for these non-HCFC activities totals some US \$202.7 million.

The estimated required funding for HCFC activities includes preparing of HPMP plans and a number of demonstration projects. The Task Force estimated the cost to be between US \$140.1 and 437.1 million.

This broad range results from uncertainty about the cost effectiveness of HCFC projects (the cost per kg of HCFC phased out), which varies by scale and application, and the total quantities to be phased out. The lower value assumes high cost effectiveness and modest quantities phased out during the triennium (baseline funding). The higher value assumes low cost

effectiveness and larger quantities to be phased out (2012 consumption level funding).

Using mid-range assumptions for both consumption level funding cases puts the estimate for all HCFC activities at US \$227.9 to US \$313.4 million.

Based on the mid-range assumption for funding the HCFC consumption phase-out, the total estimated funding required for the triennium 2009-2011 is between *US \$430.6 and US \$516.1 million*.

ES.b Mandate and Consultations

The Nineteenth Meeting of the Parties requested the TEAP to prepare a replenishment report and present it to the Open-ended Working Group at its Twenty-eighth Meeting to enable the Parties to decide at their Twentieth Meeting on the appropriate level of the 2009-2011 replenishment of the Multilateral Fund (Decision XIX/10). The TEAP constituted a Replenishment Task Force comprising of TEAP and TOC members from China, Colombia, Denmark, India, The Netherlands, and the Bolivarian Republic of Venezuela. The Task Force consulted a wide range of financial and technical experts. Questionnaires were sent to all Parties, Implementing Agencies and Network Co-ordinators, and the responses were analysed carefully. Interviews related to HCFC funding levels were conducted during the Meeting of the Executive Committee held in Montreal in April 2008. The Task Force consulted the MLF Secretariat, the Ozone Secretariat and the Implementing Agencies. The report was drafted in several rounds during the period February-April 2008 and reviewed by a number of experts, in consultation with the TEAP. The final review was carried out by the TEAP at its April 2008 meeting.

ES.c Reduction Schedules

The following ODS reduction schedules apply to Article 5 Parties:

- CFC, halons and CTC: phase-out by 1 January 2010;
- TCA and MB: complete phase-out by 1 January 2015;
- HCFC: freeze by 1 January 2013, followed by 10% reduction by 1 January 2015, 35% reduction by 2020, further steps by 2025 and 2030 and complete phase-out by 2040.

ES.d Funding Needed for Non-HCFC Phase-out Projects

The Task Force on Replenishment based its assessment for non-HCFC requirements on the Compliance Oriented Model (COM), which was developed and used by the Multilateral Fund to produce funding estimates during the last six years. The COM includes:

- all ODS reduction targets and phase-out schedules of the Montreal Protocol,

- the latest reported level of the consumption of all types of ODS (excluding HCFCs) in all Article 5 Parties,
- all phase-out investment projects that have been approved by the Executive Committee, as well as their forward financial and ODP phase-out commitments,
- the remaining consumption levels of the different ODS considered eligible for funding, and
- the average timeframe for project implementation.

In addition to the factors from the COM model, the Task Force considered:

- the total reduction in ODS consumption needed to achieve compliance and, where relevant, cost effectiveness values,
- financial commitments for activities already approved for the next triennium totalling US \$44.97 million,
- new activities (activities not approved yet but required for compliance) at US \$38.7 million (this includes an estimated US \$25.75 million for funding tranches for a small number of yet to be approved MDI projects), and
- agency support costs of about US \$7.2 million which are included in the above amounts.

On the basis of these factors, the Task Force estimates the total funding requirement for the phase-out of all non-HCFC controlled substances for the triennium 2009-2011 to be some **US \$83.67 million**.

ES.e Funding for Supporting Activities

These include UNEP's Compliance Assistance Programme (CAP), Institutional Strengthening funding, Core Unit funding for the Implementing Agencies, costs for the Treasurer, the funding for the operation of the Multilateral Fund Secretariat, and costs for holding meetings of the Executive Committee. Funding for Institutional Strengthening continues at the levels of previous years, and funding for technical assistance has been added at US \$2 million per year (including agency support costs). Most funding lines increase because of inflation at a rate of 3% per year. The total funding amount for supporting activities for the triennium 2009-2011 is estimated at **US \$92.00 million**.

ES.f Funding for HCFC Related Activities

The cost for HCFC phase-out constitutes the most significant component of the funding requirement for the upcoming triennium and the most uncertain. This is due, in part, to the fact that Executive Committee rules and guidelines for the funding of HCFC activities have not yet been established. As a result, the Task Force produced its best estimate by developing key assumptions and compiling them into specific funding scenarios. The assumptions made and the scenarios developed now provide Parties with estimates on the funding

requirement for HCFCs needed under a series of theoretically possible conditions. This means that the range of the funding requirement for the triennium 2009-2011 is extremely broad.

ES.g Assumptions and Scenarios (1)

The major assumptions used by the Task Force fall into three main categories, (1) overarching funding principles, (2) cost factors or cost effectiveness factors, and (3) structural assumptions.

The first principle was to link funding to the control measures in the Protocol. This required estimating the quantity of reductions needed to meet the requirements of Decision XIX/6. The Task Force extrapolated trends from HCFC data through 2006 submitted under Article 7 to the Ozone Secretariat by all Article 5 Parties. How much of this quantity is eligible for funding depends on the “reference” point in time from which reductions are assumed to begin. In the absence of guidance yet to be developed, the Task Force developed two scenarios. The first scenario assumes that only HCFC reductions from the baseline consumption level are eligible for funding for all Article 5 Parties. Since this level is likely to be lower than the countries peak consumption (which could well occur after 2010, ultimately in 2012), this scenario represents the lower-end estimate. The second scenario assumes funding of reductions from the estimated 2012 consumption level for all Article 5 Parties. As this level is likely to be from 5 to 10% higher than the baseline level, it will yield a higher funding estimate. The Task Force expects the actual estimate will lie between the two boundary values, i.e., somewhere between the funding requirement determined for the baseline funding scenario and for the 2012 funding scenario.

ES.h Assumptions and Scenarios (2)

In addition to the above-mentioned funding principle, assumptions were made about the likely cost of HCFC reductions. Uncertainty exists regarding whether only the capital cost of conversion will be funded, whether both capital costs and differential operating costs will be funded, or whether the decision will be made on a case-by-case basis, i.e., it will vary by sub-sector (such as foams, refrigeration and air conditioning).

Consideration of the duration of funding of operating costs is important, since, in the past, some Multilateral Fund projects covered only the capital cost of conversion to the ODS alternative (such as MAC and compressor projects), while other projects covered, in addition to the capital costs, the difference in the cost of production faced by the company involved before and after the conversion project (from 6 months to 4 years of operating costs for various foam and refrigeration sub-sectors).

The Task Force ran two scenarios to limit the uncertainty pending further guidance from the Executive Committee. The scenarios were:

- (1) the Fund pays no operational costs, and
- (2) the Fund pays for two years of differential operating costs.

The duration of the recoverable operating costs has a significant effect on total project costs.

ES.i Cost-effectiveness, Servicing Sector and Other Issues

The Task Force derived some cost estimates for specific types of activities that may be required to phase out HCFCs, known as cost effectiveness factors. These are expressed in USD per kg of substance. They are not expressed in USD per ODP kg, as has been the case for CFCs and other (non-HCFC) ODS, due to the fact that the cost effectiveness of HCFCs cannot be compared to cost effectiveness of other ODS on an ODP-weighted basis. This is because the cost of phasing out an HCFC quantity should not be appreciably different to phasing out an equal quantity of another ODS, but, where the ODP of the HCFC is only a fraction of that of other ODS, an ODP-weighted comparison would make it appear that the cost effectiveness of an HCFC was many times higher than that of other ODS.

As a result, no cost effectiveness thresholds have been applied to HCFC conversion projects, but cost effectiveness factors were calculated. At this point, the Task Force has only considered three HCFCs (HCFC-22, -141b and -142b), which are by far the most important HCFCs consumed by Article 5 Parties.

Cost effectiveness factors for these three HCFCs were based on additional assumptions, such as which technologies would be applied (for example, a certain percentage in the total of low GWP technologies in the foam and the air conditioning sectors). This provides an initial basis for the Executive Committee “to prioritise cost effective projects and programmes, which focus, inter alia, on substitutes and alternatives that minimise other impacts on the environment, including climate....”, as required by Decision XIX/6.

There are two important assumptions the Task Force did not address: (1) the date after which capacity installed would not be funded (the Fund currently uses a “cut-off date” of 25 July 1995), and (2) potential funding for the conversion of plants that have already been converted from CFCs to HCFCs with financial assistance from the Fund. This is because “second conversions” are not permitted under the current Multilateral Fund guidelines. Decision XIX/6 called for the Executive Committee to review these matters, but it has not yet provided any guidance.

Regarding the servicing sector, the Task Force made no assumptions in terms of cost effectiveness, but based the estimates on a structural approach. This means that reductions are assumed to be addressed through the approval of plans that are similar in both substance and cost to the refrigerant management plans (RMPs) and terminal phase-out management plans (TPMPs) for the ODS (non-HCFC) phase-out. For the triennium 2009-2011 the Task Force assumed that funding of US \$63 million would be needed for the servicing sectors for *all* Article 5 Parties in order to achieve certain HCFC reductions in consumption after the upcoming triennium to meet the 2013 freeze and the 10% reduction by 2015.

ES.j Aggregation of Country Information

Regarding aggregation of country information, the Task Force undertook the same type of effort for HCFCs that has been undertaken for other ODS chemicals in past replenishment studies. By this method, Article 5 Parties have been grouped on the basis of their HCFC consumption (as reported under Article 7 to UNEP's Ozone Secretariat) as follows:

Group 1: China, which accounts for nearly 75% of the total Article 5 HCFC consumption (reported or estimated for 2006-2010);

Group 2: 17 larger Article 5 Parties with consumption of 120 - 1200 ODP tonnes (2000-14000 ODS tonnes);

Group 3: 34 Article 5 Parties with a consumption of 6-100 tonnes ODP (100-1000 ODS tonnes). The Parties in this group accounted for less than 5% of the total HCFC consumption in Article 5 Parties in 2006;

Group 4: 83 Article 5 Parties with consumption up to 6 ODP tonnes (where the only HCFC consumed is HCFC-22, used only for servicing). The aggregate consumption of these 83 Parties constituted less than 1% of the total HCFC consumption in Article 5 Parties in 2006.

ES.k Funding Requirement for HCFC-Consumption

Based on these assumptions, the estimated costs for achieving the required HCFC consumption reductions during the upcoming triennium range from US \$67.9 million to US \$364.9 million, excluding any funding required for servicing. If a medium "scenario year" were chosen (2010/2011), the funding requirement range determined for HCFC non-servicing projects for the 2009-2011 triennium would be between US \$151.1 and 241.2 million. The variation in the funding is, under the stated condition, only caused by the difference in the cost effectiveness factors assumed.

In addition to the funding costs noted above, US \$3.5 million (excluding agency support) was allocated for 2009 for the development of any HCFC Phase-out Management Plans (HPMPs) not funded during 2008. Another US

\$5 million was considered to be required for demonstration projects during 2009-2011.

ES.l Funding Requirement for HCFC-Production

In addition to the funding needed to phase out HCFC consumption, the Task Force has considered the funds that might be necessary to enable the phase-out in the production sector. It is important to note that HCFC consumption projects funded during 2009-2011 will likely not be implemented until after 2011. This is because the Fund is experiencing an implementation lag of some 3 years for all types of projects (the same is also expected for HCFCs). As a result, no funding is estimated for the production sector in the 2009-2011 triennium. Expenditures to address the production sector will have to be included in the funding for the trienniums thereafter. If eligible Article 5 Parties are willing to cap or reduce HCFC production amounts at a very early stage, this might require certain funding from the Multilateral Fund. Pending adoption of Executive Committee guidelines for the sector, the Task Force cannot give any funding estimate for this early phase-out at present.

ES.m Funding for Destruction Activities

Information from NOUs and Implementing Agencies, as well as information from a report on this subject prepared for the 45th Meeting of the Executive Committee, gives some insight into the quantities of ODS that may be available for destruction in the 2009-2011 triennium. At an average cost of US \$6 per kg for collection, transport and disposal, the Task Force calculated a possible funding requirement of US \$9 million per year, or US \$27 million for the triennium 2009-2011, including agency support costs. The Task Force notes that, to date, there has been limited Executive Committee experience in funding this type of activity; however, the Task Force expects that this experience will rapidly increase in the upcoming triennium. In this context, Parties may wish to consider the climate relevance of the ODP emission reductions and their abatement costs in comparison to the current market prices for CO₂ emissions trading.

ES.n Summarising Funding Requirement Table for the Triennium 2009-2011

The Replenishment Task Force has estimated the total funding required for the period 2009-2011 to enable all Article 5 Parties to comply with all relevant control schedules under the Montreal Protocol to be between the amounts of **US \$342.8 and US \$639.8 million**. The table below sets out all components of this estimate (in millions of US dollars).

Funding requirement	2009-2011	2009-2011 agency support
ALL ODS RELATED ACTIVITIES		
ODS (NON-HCFC) CONSUMPTION		
<i>ODS Phase-out plans, approved</i>	10.731	1.025
<i>ODS Phase-out plans, new</i>	1.750	0.131
<i>TPMPs, new</i>	4.896	0.595
<i>MDI</i>	23.950	1.796
<i>MB, approved</i>	5.926	0.500
<i>MB, new</i>	6.280	0.544
CTC AND HALONS		
<i>CTC, approved</i>	3.212	0.241
<i>Process Agents, approved</i>	2.500	0.182
<i>CTC, TCA, assistance</i>	0.220	0.020
<i>Halons, assistance</i>	0.075	0.006
ODS (NON_HCFC) PRODUCTION		
<i>CFC production phase-out (incl. accelerated phase-out)</i>	15.800	1.158
<i>MB production phase-out</i>	2.000	0.150
HCFC RELATED ACTIVITIES		
<i>HPMP preparation</i>	3.500	0.360
<i>HCFC Demo-projects</i>	5.000	0.400
HCFC PHASE-OUT ACTIVITIES		
<i>HCFC phase-out, non-servicing</i>	67.88-364.88	(included)
<i>HCFC phase-out, servicing</i>	63.000	(included)
<i>HCFC, production phase-out</i>	0.000	(included)
DESTRUCTION, DISPOSAL	25.116	1.884
SUPPORTING ACTIVITIES		
<i>ExCom, Secretariat</i>	20.257	
<i>Treasurer</i>	1.500	
<i>Core Unit costs</i>	16.624	
<i>CAP</i>	29.192	
<i>Institutional Strengthening</i>	21.560	0.862
<i>Technical Assistance</i>	1.820	0.180
TOTAL	332.8-629.8	10.03

As mentioned above in section ES.g, it could be assumed that the HCFC non-servicing funding requirement would lie in the middle of the requirements for the two funding scenarios, i.e., between the baseline and 2012 HCFC consumption funding. This estimate yields a more narrow range for the 2009-2011 HCFC funding requirement (based upon two cost effectiveness factor combinations) of between US \$151.1 million and US \$241.2 million.

If carried forward to the total, this mid-range estimate would yield a range for the total 2009-2011 funding requirement of between **US \$430.6 million and US \$516.1 million.**

ES.o Climate Aspects

The choice of particular alternatives and substitutes that minimise impact on the environment including climate (as explicitly mentioned in Decision XIX/6) has been considered to varying degrees in calculating the cost effectiveness factors. Quantifying and comparing the climate effects and costs of various alternatives to certain applications, however, is highly dependent on the choice of specific alternatives and substitutes. With the submission of HPMPs, the Task Force expects that several specific climate aspects can be quantified further, also given the practical conditions outlined in the HPMPs and the necessary support of Article 5 Parties for the funding of certain technologies. It should be noted here that technological developments anticipated for the next two to three years, particularly in certain foam, refrigeration and air conditioning products might give more insight in the cost of achieving climate benefits. Furthermore, several bodies under the Montreal Protocol, such as the TEAP and its TOCs, can and will continue collecting data on the costs and effects on the climate of alternatives as they are developed, in a constant effort to collect to assess accurate information for the use by all Parties.

ES.p Funding Requirement for Trienniums after 2009-2011

Decision XIX/10 asks the Task Force to analyse potential funding requirements for the trienniums 2012-2014 and 2015-2017.

The amount and types of supporting activities have been kept the same, but growing by 3% annually for most activities. This produces a funding estimate of US \$100.1 million and US \$104.8 million for 2012-2014 and 2015-2017, respectively.

For the 2012-2014 triennium, assuming the “baseline funding” scenario, the total funding requirement would be between US \$420.6 million and US \$542.1 million. Assuming funding using the “2012 funding” scenario, it would be between US \$513.7 million and US \$635.2 million. In this case the uncertainty in both consumption and production funding estimates plays a role.

A mid-range funding requirement estimate was derived for the 2009-2011 triennium, and this could also be done for the triennium thereafter. An indicative 2012-2014 mid-range funding estimate has been determined to be between **US \$467.2 million and US \$588.7 million.**

Dependent on the cost effectiveness factor scenario considered, the funding requirements determined for the separate years 2012, 2013 and 2014 vary between US \$115 and US \$145 million as minimum values per year, and US \$180 and US \$210 million as maximum values per year. For each of the years 2012, 2013 or 2014, the average is in the US \$160-165 million range.

Experience from reviewing and approving HCFC Management Plans will reduce funding uncertainty in future.

If agency support costs are included, the total indicative funding requirement for the period 2015-2017 is estimated at between **US \$536.4 million and US \$657.9 million**. The higher amount of funding compared to the earlier triennium (2012-2014) results from an increase in production phase-out funding.

ES.q Overview of Funding Requirements for Three Trienniums

The Table below sets out the estimated funding requirements for the Multilateral Fund for the trienniums 2009-2011, 2012-2014 and 2015-2017. These consist of all funding elements for ODS (non-HCFC) phase-out plans and HCFC phase-out plans (in US \$ million), for two different HCFC cost effectiveness factor combinations, included in two scenarios with the first one based on zero years funding of operating costs, the second one on two years funding of operating costs.

The values for the trienniums 2009-2011 and 2012-2014 are also averaged from the two funding cases studied (the baseline and 2012 funding scenarios), so that two values (ranges) remain for the different trienniums that are only related to the two cost effectiveness factor scenarios (this then refers to the lower two rows in the table).

Funding requirement Triennium/Assumptions	2009-2011 (US \$ million)	2012-2014 (US \$ million)	2015-2017 (US \$ million)
Baseline funding, low cost	342.8	420.6	536.4
Baseline funding, high cost	392.3	542.1	657.9
2012 funding, low cost	518.3	513.7	536.4
2012 funding, high cost	639.8	635.2	657.9
Average of baseline and 2012 HCFC consumption funding	2009-2011 (US \$ million)	2012-2014 (US \$ million)	2015-2017 (US \$ million)
Low cost	430.6	467.2	536.4
High cost	516.1	588.7	657.9

Note

The Task Force understands that Parties may wish to have further elaboration on the approaches and assumptions made, as well as on the resulting funding requirement ranges. This could be provided in a future supplement to this report.

1 Introduction

1.1 Terms of Reference

Decision XIX/10 of the Nineteenth Meeting of the Parties requests, in its paragraph 1, the Technology and Economic Assessment Panel (TEAP) to prepare a report for submission to the Twentieth Meeting of the Parties (Doha, November 2008), and present it through the Open-ended Working Group at its 28th meeting (Bangkok, 7-11 July 2008), to enable the Twentieth Meeting of the Parties to take a decision on the appropriate level of the 2009-2011 Replenishment of the Multilateral Fund.

1.2 Scope and Coverage

Decision XIX/10 directs the Panel, in preparing its report, to take into account, among other things:

(a) All control measures and relevant decisions agreed by the Parties to the Montreal Protocol and the Executive Committee, including decisions agreed by the Nineteenth Meeting of the Parties and the Executive Committee at its fifty-third and fifty-fourth meetings insofar as those decisions will necessitate expenditure by the Multilateral Fund during the period 2009–2011, including scenarios which indicate eligible incremental costs and cost-efficiencies associated with implementation by Parties operating under paragraph 1 of Article 5 of the adjustments and decisions relating to HCFCs, and, in addition, the Panel should provide indicative figures for the periods 2012–2014 and 2015–2017 in order to provide information to support a stable level of funding that would be updated prior to figures for those periods being finalized;

(b) The need to allocate resources to enable all Parties operating under paragraph 1 of Article 5 to maintain compliance with Articles 2A–2I of the Montreal Protocol and possible new agreed compliance measures relevant to the period 2009–2011 under the Montreal Protocol;

(c) Rules and guidelines agreed by the Executive Committee, up to and including its fifty-fourth meeting, for determining eligibility for funding of investment projects (including those in the production sector), non-investment projects and sectoral or national phase-out plans;

(d) Approved country programmes;

(e) Financial commitments in 2009–2011 relating to national or sectoral phase-out plans agreed by the Executive Committee;

(f) The provision of funds for accelerating phase-out and maintaining momentum, taking into account the time lag in project implementation;

(g) Experience to date, including limitations and successes of the phase-out of ozone-depleting substances achieved with the resources already allocated, as well as the performance of the Multilateral Fund and its implementing agencies;

(h) The impact that the international market, ozone-depleting substance control measures and country phase-out activities are likely to have on the supply and demand for ozone-depleting substances, the corresponding effects on the price of ozone-depleting substances and the resulting incremental costs of investment projects during the period under review;

(i) Administrative costs of the implementing agencies and the cost of financing the secretariat services of the Multilateral Fund, including the holding of meetings.

It also directs the Technology and Economic Assessment Panel, in undertaking this task, to consult widely with relevant persons and institutions and other relevant sources of information deemed useful.

Furthermore, it requests the Panel to provide additional information on the levels of funding required for replenishment in each of the years 2012, 2013 and 2014 and to study the financial and other implications of a possible longer replenishment period, in particular whether such a measure would provide for more stable levels of contributions.

The Decision XIX/10 is linked to Decision XIX/6 on Adjustments for Annex C, Group I substances (HCFCs), which mentions in several of its paragraphs:

“The Parties agree to accelerate the phase-out of production and consumption of hydrochlorofluorocarbons (HCFCs), by way of an adjustment in accordance with paragraph 9 of Article 2 of the Montreal Protocol and as contained in the annex to the present decision, on the basis of the following:

- *For Parties operating under paragraph 1 of Article 5 of the Protocol (Article 5 Parties), to choose as the baseline the average of the 2009 and 2010 levels of, respectively, consumption and production; and*
- *To freeze, at that baseline level, consumption and production in 2013;*
- *For Parties operating under Article 2 of the Protocol (Article 2 Parties) to have completed the accelerated phase-out of production and consumption in 2020, on the basis of the following reduction steps:*
 - (a) By 2010 of 75 per cent;*
 - (b) By 2015 of 90 per cent;*
 - (c) While allowing 0.5 per cent for servicing the period 2020–2030;*

- *For Article 5 Parties to have completed the accelerated phase-out of production and consumption in 2030, on the basis of the following reduction steps:*
 - (a) *By 2015 of 10 per cent;*
 - (b) *By 2020 of 35 per cent;*
 - (c) *By 2025 of 67.5 per cent;*
 - (d) *While allowing for servicing an annual average of 2.5 per cent during the period 2030–2040;*

- *To agree that the funding available through the Multilateral Fund for the Implementation of the Montreal Protocol in the upcoming replenishments shall be stable and sufficient to meet all agreed incremental costs to enable Article 5 Parties to comply with the accelerated phase-out schedule both for production and consumption sectors as set out above, and based on that understanding, to also direct the Executive Committee of the Multilateral Fund to make the necessary changes to the eligibility criteria related to the post-1995 facilities and second conversions;*

- *To direct the Executive Committee, in providing technical and financial assistance, to pay particular attention to Article 5 Parties with low volume and very low volume consumption of HCFCs;*
- *To direct the Executive Committee to assist Parties in preparing their phase-out management plans for an accelerated HCFC phase-out;*
- *To encourage Parties to promote the selection of alternatives to HCFCs that minimize environmental impacts, in particular impacts on climate, as well as meeting other health, safety and economic considerations;*

- *To agree that the Executive Committee, when developing and applying funding criteria for projects and programmes, and taking into account paragraph 6, give priority to cost-effective projects and programmes which focus on, inter alia:*
 - (i) *Phasing-out first those HCFCs with higher ozone-depleting potential, taking into account national circumstances;*
 - (ii) *Substitutes and alternatives that minimize other impacts on the environment, including on the climate, taking into account global-warming potential, energy use and other relevant factors;*
 - (iii) *Small and medium-size enterprises.....”.*

Decision XIX/10 also asks the Panel and its Task Force to strive to complete its report in time to be distributed to all Parties two months before the 28th Meeting of the Open-ended Working Group (Bangkok, 7-11 July 2008).

The report was prepared on the basis of the Terms of Reference cited above.

The first and the second draft of the report were discussed via e-mail contacts; a third draft report was subsequently composed for discussions during the (annual) TEAP meeting in April 2008.

1.3 Composition of the Task Force

To fulfil its instructions from Decision XIX/10, the TEAP established a Replenishment Task Force (RTF) consisting of:

- ❑ Lambert Kuijpers (The Netherlands, co-chair TEAP, co-chair RTOC);
- ❑ Erik Pedersen (Denmark, consultant, member HTOC);
- ❑ Marta Pizano (Colombia, co-chair MBTOC);
- ❑ Jose Pons Pons (Bolivarian Republic of Venezuela, co-chair TEAP, co-chair MTOC);
- ❑ Madhava Sarma (India, senior expert member TEAP)
- ❑ Shiqiu Zhang (China, senior expert member TEAP).

The Replenishment Task Force was co-chaired by Lambert Kuijpers and Shiqiu Zhang.

An external review of the draft reports to ensure accuracy and consistency of approach and data was conducted by:

- ❑ Marco Gonzalez (Executive Secretary of the Ozone Secretariat), and
- ❑ Maria Nolan (Chief Officer of the MLF Secretariat).

1.4 Consultation Process

The consultation process began in January 2008 with a meeting between representatives of the RTF and the Chief Officer and staff of the MLF Secretariat. The meeting addressed current assumptions in the Secretariat's compliance oriented model (COM) and the validity of assumptions to be used to estimate funding requirements for the HCFC phase-out as decided in Decision XIX/6.

In January 2008, the RTF sent a questionnaire to all Article 5 and non-Article 5 Parties, as well as to UNEP CAP Regional Network Co-ordinators and to the Implementing Agencies. The RTF was pleased with the number of responses, which are summarised in Annex 1 to this report.

In February 2008, an informal meeting was held with UNIDO staff at the UNIDO HQ in Vienna, following the UNIDO HCFC Workshop. Topics discussed included the status of approved phase-out activities and the capacity of the Implementing Agencies and Article 5 Parties to meet the applicable Protocol compliance targets.

At the 54th meeting of the Executive Committee in April 2008, several Parties, representing both Article 5 and Non-Article 5 Parties, were

interviewed by Lambert Kuijpers as the representative of the RTF, in order to get clarification on several issues related to HCFC phase-out strategies.

Following external review by the Ozone Secretariat and the Multilateral Fund, a final draft of the report was produced and adopted during the TEAP meeting held April 21-25, 2008 in Vienna, Austria; this draft was once more circulated to all RTF members for last comments.

1.5 The Structure of the 2009-2011 Replenishment Report

The structure of the 2008 TEAP Replenishment Task Force Report is as follows:

Chapter 1, “Introduction”, presents the Terms of Reference, establishment of the Task Force and the consultative processes used to prepare this report.

Chapter 2, “Overview”, describes the establishment of the Multilateral Fund, the previous replenishments of the Multilateral Fund, and a brief account of the contribution of the Multilateral Fund to the efforts of the Article 5 Parties to comply with the control schedules of the Montreal Protocol. It also gives an overview of the historic ODS consumption and production in Article 5 Parties.

Chapter 3, “Validity of Assumptions”, looks back at the assumptions made in the 2006-2008 replenishment report, and compares these with the projects and phase-out plans that were approved or are still pending approval.

Chapter 4, “Methodology”, presents the assumptions and the method used to calculate the funding requirement for the 2009-2011 replenishment. For ODS excluding HCFCs the Compliance Oriented Model (COM) was used as a guide. It is based on ODS compliance commitments for Article 5 Parties, but does not include HCFC phase-out plans or projects. Lack of experience in HCFC projects introduces large uncertainties when forecasting future costs.

Chapter 5 presents the ODS (non-HCFC) estimated funding requirement for the 2009-2011 Replenishment. It includes the consumption sector projects, including pre-commitments by the Executive Committee for sectoral plans, NPPs and TPMPs. It also estimates the funding required for the existing multi-year production agreements and for agreements for new plans, which have been taken from the Consolidated Business Plan /CBP08/; these plans are expected to be approved in the year 2008, and will have consequences for the 2009-2011 funding requirement via funding tranches, which will be made available in the 2009-2011 triennium.

Chapter 6 describes HCFC consumption and production data for all Article 5 Parties and presents extrapolation methods for calculating data as of 2007 up

to the year 2012. After the year 2012 the consumption levels are dictated by the percentages of the baseline level as mentioned in Decision XIX/6.

Chapter 7 presents a number of funding issues related to HCFCs. It describes the role of HCFC Phase-out Management Plans; implementation lags between project approval and implementation; and examines the relevance of other factors, such as the cut-off date for funding eligibility and “second stage conversions” where HCFC conversions paid by the fund would be converted again to a lower GWP solution at the fund’s expense.

Chapter 8 provides calculations to support the funding requirement established for HCFC consumption and production phase-out as defined in Decision XIX/6 for the years 2009 through 2017. This time frame encompasses three replenishment periods of three years each. The funding requirement includes (1) conversion of equipment that uses HCFCs or manufactures products containing HCFCs (consumption sector), (2) phase-out of HCFC in the servicing sector, and (3) conversion or closure of HCFC production facilities (production sector). Two key factors have a significant effect on the total funding requirement for 2009-2011: (a) the cost effectiveness for HCFC projects and (b) whether funding eligibility can be related to the baseline consumption level or to the extrapolated 2012 HCFC consumption peak level for all Article 5 Parties.

Chapter 9 elaborates on the funding requirement for projects for ODS waste disposal and destruction during the 2009-2011 triennium.

Chapter 10 presents the funding requirement for non-investment supporting activities, including funding for Institutional Strengthening, for Core Unit operation of the Implementing Agencies, as well as the costs for the CAP program, the Executive Committee and the Multilateral Fund Secretariat

Chapter 11, “Total Funding Requirement”, presents the funding requirement and all its elements for the three different trienniums from 2009 to 2017; the results are mainly set out in a number of tables.

Chapter 12, “Concluding Remarks”, presents comments and qualifications on the methodologies, assumptions, data and other factors used to develop the funding requirement for the 2009-2011 replenishment, and for the years beyond. It also analyses the trends in the funding requirement for the trienniums beyond 2011 and elaborates on how to take into account climate aspects in the HCFC phase-out process as decided in Decision XIX/6.

2 Overview

2.1 Achievements to date

The Multilateral Fund has been replenished four times since its initial capitalisation of US \$200 million for the period 1991-1993. The replenishments were as follows:

- 1994-1996 US \$455 million;
- 1997-1999 US \$466 million;
- 2000-2002 US \$440 million;
- 2003-2005 US \$474 million;
- 2006-2008 US \$470 million.

Since its inception, the Multilateral Fund has supported some 145 Article 5 Parties by providing US \$2.24 billion in project funding and capacity building to phase-out of 247,004 ODP tonnes in consumption and 174,206 ODP tonnes in production of ODSs.

Additionally, the Executive Committee has committed US \$103.6 million in future funding for the total phase-out of 50,933 ODP tonnes in consumption and production of ODSs. Of the US \$103.6 million, US \$61.7 million will be committed in 2008 representing 24,998 ODP tonnes of the 50,933 tonnes approved for the period 2008-2015.

The Montreal Protocol has witnessed unparalleled participation as evidenced by the fact that almost all UN member states are parties to it, and to several of its amendments. The Multilateral Fund has played a major role in securing Article 5 participation and aiding their success. Both non-Article 5 and Article 5 Parties have actively participated to realise the Fund's objectives. The total income of the Fund stands at US \$2.368 billion as of April 2008.

The most salient achievements are:

- 95% of ODS production and consumption (excluding HCFCs) have been funded for phase-out;
- the contributions to the Multilateral Fund amount to about 95% of pledges, up to the pledged contributions for 2007;
- all decisions by the Executive Committee were taken by consensus;
- 145 Article 5 Parties have received financial assistance;
- 140 National Ozone Units have been established and are receiving funding;
- 10 Regional / Sub-regional Networks encompassing all Article 5 Parties have been established;

- 57 Multi-year agreements covering the phase-out of production and/or consumption of ODSs in 37 Article 5 Parties have been approved and are under implementation (excluding methyl bromide);
- An additional 79 TPMPs have been approved and are under implementation to enable 79 LVC Article 5 Parties to meet the 85% and 100% reduction of CFC consumption;
- about 70% of the MB baseline consumption (8808 ODP tonnes) has been funded for phase-out, well in advance of the 2015 phase-out date. Less than 1000 ODP tonnes remain to be funded for Article 5 Parties;
- many of the Parties have been members or co-opted members of the Executive Committee;
- the four Implementing Agencies established their own Montreal Protocol Units that required changes in the operating environment of these agencies;
- in addition to the activities of the four Implementing Agencies, many projects have been carried out via bilateral projects with certain national Implementing Agencies.

The success of the Multilateral Fund is evidenced by the fact that only about 4,700 ODP tonnes remain to be funded for phase out. Of this, 1,552 ODP tonnes are being funded using US \$138 million during 2008 (the current triennium). According to the December 2007 consumption data reported by Article 5 Parties under Article 7 to the Ozone Secretariat, over 50,013 ODP tonnes are in the process of being phased out through the ongoing implementation of approved projects and plans.

2.2 ODS (non-HCFC) Consumption in Article 5 Parties

The total CFC consumption baseline for all Article 5 Parties is 163,589 ODP tonnes (the average of the 1995-1997 consumption). According to UNEP Article 7 reported data (through 2006) the consumption of all Article 5 Parties declined from 115,976 ODP tonnes in 2000 to 33,812 ODP tonnes in 2006. This is a decrease of about 71% from the 2000 baseline, and a 21% decrease from the 2006 baseline.

Plans are in place for virtually all non-LVC Parties. Plans for the remaining two Parties are expected to be approved in 2008; which should lead to a complete phase-out by non-LVC Parties by 2010.

On the basis of extrapolations, 6 non-LVC Parties (all having NPPs) out of 44, may have difficulties achieving the phase-out by 2010. Extrapolations also show that 13 LVC Parties may have difficulties achieving the phase-out by 2010. While it is premature to suggest problems, Implementing Agencies, the Fund and the Parties may wish to monitor progress carefully.

LVC Parties have a baseline of 7,436 ODP tonnes. In 2000, the LVC consumption constituted about 75% of the baseline, but in 2006 it had decreased to only about 22% of the baseline. Many TPMPs for these Parties had not been approved by 2006, but 32 TPMPs are expected to be approved in 2008 (including the ones approved at the 54th Executive Committee meeting). This makes a complete phase-out for all LVC Parties possible by 2010.

Funding for CTC consumption phase out by 2010 has been provided for several Parties (aggregated 1,886 ODP tonnes in 2006). Article 5 data reported under Article 7 to the Ozone Secretariat reveals that TCA may well be phased out by 2010, well in advance of the deadline of 2015. However, it is difficult to analyse since a number of Parties have low enough levels of consumption that they report zero and assistance has been received for the phase-out of 53 ODP tonnes. 13 Parties have not asked for funding, but do have stopped report consumption.

Total halon consumption reported in 2006 by Article 5 Parties was 309 ODP tonnes. Most Article 5 Parties that reported halon consumption in 2006, plus some that reported zero, have been approved for halon banking and / or phase-out projects. Three Parties might need further assistance based on results of the COM model.

With a baseline of 9,309.6 ODP tonnes for methyl bromide, total Article 5 consumption was reduced from 75% of the baseline in 2003 to about 45.3% of the baseline in 2006. Total consumption as currently reported is 4,213 ODP tonnes.

Most Article 5 Parties have achieved considerable MB reductions at national level. With respect to compliance, the vast majority of Article 5 Parties achieved the 20% reduction as scheduled in 2005. In fact, many Parties achieved this several years earlier than required. About 68% of Article 5 Parties reported zero consumption in 2006. Only 11 Parties still report consumption between 50 and 300 ODP tonnes and only five Parties remain in the usage category above 300 ODP tonnes.

2.3 ODS (non-HCFC) Production in Article 5 Parties

With a baseline of 108,541 ODP tonnes, the production of CFCs went down from 80,686 ODP tonnes to 29,072 ODP tonnes between 2000 and 2006, i.e., from 74% to 27% of the baseline (this includes the production in the Republic of Korea, an Article 5 Party, which has not received assistance from the Multilateral Fund). The number of producing Parties was reduced from six to two by the end of 2007. The production in 2008 (with the stop in production in Venezuela (December 2006), the phase-out in China (mid-2007) except for certain amounts of CFCs for pharmaceutical/MDI applications, and the phase-out in Argentina) is expected to be in the order of 5% of the baseline. It is expected that a CFC phase-out will take place before 2010, since seven Parties have approved multi-year agreements and the Republic of Korea is expected to comply with the Montreal Protocol (and funding for an accelerated phase-out was decided for one Article 5 Party in April 2008).

With a production baseline for methyl bromide of 806 ODP tonnes, Article 5 Parties have reduced their production for controlled uses from a peak of 1,438 ODP tonnes in 2000 to about 581 tonnes in 2006 (although this latter figure represents an increase from the levels in 2004 and 2005), which represents approximately 70% of the baseline. At present, the production of MB (for controlled uses in Article 5 Parties only) takes entirely place in China and a multi-year project to phase-out this production activity has been approved and is underway.

2.4 Situation since the 2005 replenishment report

For the few Parties that so far have no NPPs or sectoral phase-out plans, a straightforward approach can be applied, based upon experience obtained during the last years. In 2005, the Task Force estimated the funding requirement for all LVC TPMPs. Since not all these TPMPs were approved in the period 2006-2008, this issue is again considered in this report.

The Task Force is of the opinion that it is good to check the validity of the approach and the assumptions made in the 2005 report /RTF05/, and check this against the reality, i.e., against the (multi-year and other) projects approved and under implementation. This check can be found in chapter 3.

It is mainly for the reason of consistency that the Task Force decided to follow the approach from the Compliance Oriented Model for all ODS (except HCFCs) as developed at the MLF Secretariat /COM04, COM07/; this approach is briefly explained in chapter 4.

It should be emphasised that the need for phasing out HCFCs in Article 5 Parties (with a freeze in 2013) has created a complete new element in this study. In particular when it is combined with the fact that Parties requested the study to investigate the funding requirement beyond the next triennium, i.e. for the years 2012-2017.

In the HCFC funding requirement calculation a spreadsheet analysis is required to determine consumption data for the future. More importantly, a spreadsheet analysis and a modelling approach are needed to determine the funding requirement for specific HCFC phase-out activities in certain years during the period 2009-2017. Combined with assumptions on the funding disbursement (in certain tranches) and on the cost effectiveness factors for HCFC conversion projects this leads to annual funding estimates for the HCFC consumption (in the non-servicing sector). Costs for the HCFC production sector phase-out are estimated on the basis of the reductions in the HCFC consumption non-servicing sector. The servicing sector is approached via more lumped modelling where it concerns the costs for a reducing the HCFC dependency during the period 2009-2017.

3 Validity of Assumptions Used in the 2006-2008 Replenishment Report

3.1 Introduction

This chapter presents the estimates given for the funding requirement in the 2005 Replenishment Task Force report /RTF05/ and compares them with the actual funding of projects and phase-out plans during 2006-2007, and the funding expected in 2008. In virtually all cases the amounts that are compared include agency support costs. This will clearly show why differences were caused and how the approach for the present report, which, as one of the important elements, calculates the funding requirement for the period 2009- 2011, should be looked at.

This does not apply to HCFCs of which the production and consumption is considered in this report in detail for the first time. It also implies that the report looks at HCFC data reported to UNEP following Article 7 in the same manner as the CFC and other ODS data were analysed for the determination of the funding requirement in the years 1996 and 1999, for the trienniums 1997-1999 and 2000-2002.

3.2 Estimating Procedures in the 2005 Report

The estimating procedures in the 2005 report /RTF05/ were, in principle, built on those used in the preparation of previous replenishment reports. For determining the funding requirement for the CFC phase-out, funding requirements for agreed multi-year projects (for non-LVC and LVC Parties) were taken into account and supplied with (new) information from the Business Plans of the Implementing Agencies for the year 2005.

Funding was determined on the basis of cost effectiveness factors for separate projects in the period 1996-2002; this was still an important parameter in the 2002 Replenishment Report /RTF02/. However, in the 2005 RTF report /RTF05/, the funding for the future ODS phase-out was to a large degree calculated on the basis of commitments for multi-year multi-substance plans for Parties, agreed during the 2002-2005 period. Cost effectiveness factors became a result of ODS amounts to be phased out within the framework of National Phase-out Plans. For the Parties for which a TPMP approach was still lacking, certain funding estimates for certain years for all the Parties were assumed, on the basis that all Parties would go to the TPMP approach.

For determining the funding requirement for MB, a spreadsheet analysis was applied and cost effectiveness factors studied. In the case of CTC, TCA and halons, lumped estimating procedures were applied, based on existing and expected agreements for phase-out on a country-by-country basis.

3.3 Funding during 2006-2008 for the different ODSs

Consumption Sector

CFCs

In the 2005 RTF report, the funding requirement for CFCs for non LVC Parties (consumption sector) was calculated at US \$68.3 million (which included agency support costs). This was based on an estimate for the funding of a certain number of multi-year NPPs and on the expectation that a number of new NPPs would be approved.

According to information obtained from 2005-2006 Executive Committee reports and the 2008 Consolidated Business Plan /CBP08/, the amount to be approved for the CFC consumption sector in the period 2006-2008 is expected at US \$65.81 million (US \$49.45 million approved in 2006-2007; US \$16.36 million expected to be approved in 2008). The difference (US \$2.5 million) is due to the fact that not all new plans for LVCs that were expected to be approved in the period 2006-2008, will be approved. Furthermore, there could be small delays in the funding of the tranches for the various NPPs that were agreed.

For TPMPs (existing and new ones) for LVC Parties an amount of US \$35 million was derived in 2005. The larger part of this amount (US \$33.6 million) was expected for new TPMPs. However, the expenditure for TPMPs during the period 2006-2008 is expected to be US \$22.66 million, a substantial difference. This is due to the fact that several TPMPs have not been submitted for approval during 2006-2007 (and will probably be submitted and approved during 2008 with only first tranches in the year 2008); in other cases, tranches of funding for existing TPMPs were requested with delays. This could not be foreseen in the 2005 report, and it implies that a US \$12.5 million lower amount has been disbursed.

MDIs

Funding for the phase-out of the MDI sector was calculated on the basis of estimates for (virtually all) new MDI phase-out plans, eligible for funding, at a certain cost-effectiveness (about US \$30-35). The important question in 2005 was the calculation of the costs on the basis of the consumption of companies (or rather, on the basis of the production of MDI units); costs were estimated at US \$21.43 million. The amount that was approved during 2006-2007 was US \$22.4 million. The total amount that is expected to be approved during the 2006-2008 period is US \$48.74 million (excluding non-investment projects such as MDI transition strategies), which is about US \$ 25 million more than predicted. This is due to higher costs for the plans and to more MDI plants that are now considered to be eligible for funding than was foreseen in the year 2005.

CTC

For the CTC phase-out in the consumption sector, the RTF calculated about US \$63.5 million, which included a contingency (including agency support costs). However, CTC activities were funded at US \$86.5 million (of which US \$67.34 million was approved in 2006-2007), which implies that the expenditure was US \$23 million larger than expected. This was due to the fact that all CTC activities (related to both production and consumption) were considered in one package. This implies that CTC cannot be found under the production sector mentioned below. To a small degree it was also due to a higher funding level of the plans that were expected to be approved in 2005.

TCA and halons

The amount calculated in 2005 for TCA, halons and halon banking was about US \$3 million. During 2006-2008 the only activity that will have been funded is halon banking at a level of US \$0.52 million, a difference of about US \$2.5 million.

MB

The funding estimates that were derived in 2005 for existing and new MB activities were at some US \$26 million. The approved funding for the entire period 2006-2008 period is expected to be US \$22.1 million (of which US \$10.23 million was approved in 2006-2007) due to the fact that a number of Parties will not be addressed in 2006-2008 period (compared to what was expected in 2005), or that the funding for new plans was lower than anticipated.

Overall

Overall, the 2005 estimate for the funding of the consumption sector was US \$216 million, compared to expected expenditures of US \$244.27 million, (US \$28.27 million higher), mainly due to higher funding in the MDI and the combined CTC production and consumption sectors.

Production Sector

The 2005 estimate for the production sector amounted to US \$113 million, all from approved multi-year agreements and from a new plan that envisaged the closure of CTC plants at US \$18 million.

The funding expected to be approved during 2006-2008 is expected to be US \$87.33 million (of which US \$66.48 million was approved in 2006-2007), US \$25.7 million lower than foreseen. This is due to the fact that the closure of

CTC plants has not been considered, and that the disbursement of tranches for the closure of CFC/ODS plants proved to be about US \$7.5 million cheaper than expected.

It can be expected that funding will be approved for the acceleration of the phase-out in India at a level of US \$1.77 million in 2008 (with a second tranche in 2009), based upon a Decision by the Executive Committee in April 2008.

There is no reason to assume that this kind of estimating procedure done in 2005 will have any impact on the adequacy of the calculations for the period 2009-2011.

Non-investment, Supporting Activities

Estimates for these activities (which include CAP, Institutional Strengthening, MB non-investment, MDI transition strategies, TAS and preparation funds) given in the 2005 RTF report were about US \$59 million, where the expected funding will be US \$56.1 million (of which US \$34.28 million was approved in 2006-2007). The difference is due to a lower amount of funding for Institutional Strengthening (US \$3.5 million), and to a lower amount for technical assistance (about US \$2.5 million).

Multilateral Fund ExCom and Secretariat, Treasurer and Core Unit Costs

The funding calculated in 2005 for the above activities was about US \$28 million. The funding during the triennium 2006-2008 is expected to be US \$35.56 million. This is due to higher costs for the Executive Committee and the MLF Secretariat (where in 2005 a certain amount of agreed funding at a level of about US \$4.5 million was, by mistake, not taken into consideration), and to more funding for the Agencies Core Unit costs, due to annual adjustments of the amounts, which effect was not taken into account in 2005.

3.4 Concluding Observations

The estimates given in the 2005 report have overestimated certain funding amounts due to the fact that multi-year plans did not require the funding as expected and that plant closure required less funding. Costs for MDI conversion projects and costs for Executive Committee and Secretariat and Core Units were higher than calculated in 2005.

This is not related to any implicit assumption in calculations regarding cost-effectiveness etc. It is simply due to the fact that the activities funded were of somewhat different nature and composition than expected.

Compared to the funding requirement estimated in 2005 at US \$419.4 million, the total expenditures for the activities during 2006-2008 are

expected to be US \$427.05 million. This amount has some uncertainty because of the fact that the 2008 approvals still need to occur; figures above are largely based on the Consolidated Business Plan /CBP08/ estimates.

<i>Activity</i>	<i>2006-08 report</i>	<i>2006-08 expected</i>
CFC-LVC	68.3	65.81
ODS-TPMP	35.0	22.66
MDI	21.3	48.74
CTC	63.5	86.5
MB	26.0	22.1
Production phase-out	113.0	87.33
Accelerated production phase-out		1.77
Supporting activities	59.0	56.08
ExCom, Secretariat, Core Units	28.0	35.56
Other	5.3	0.52
TOTAL	419.4	427.05

Table 3-1 Comparison of the 2005 funding estimate and the expected funding requirement for the period 2006-2008

The agreement is striking, but one should bear in mind that it is a result of a large number of plus and minus factors. Nevertheless, it needs to be mentioned that future estimates for the funding requirement for ODS (non-HCFC) activities will give a good picture for the total funding requirement for the period 2009-2011.

This will be particularly so because the amount of multi-year plans that has been approved will be more certain, the estimates for the remaining funding of TPMPs will be quite reliable, the production sector multi-year agreements will become less important, and all supporting activities can be well estimated, given the experience of the last 3-5 years.

Where the total amount of funding for all the activities referred to above will go down to about US \$160 million for the 2009-2011 replenishment period (see further below in this report), the uncertainty in that funding estimate is believed to be lower than 5%. This, of course, on the basis that the funding for all supporting activities and other funding requirements (Executive Committee and MLF Secretariat, Core Unit costs, UNEP CAP and Institutional Strengthening) will continue in the same manner as during the years 2006-2007 and as expected for the year 2008.

Concluding, with the level of funding approved in the period 2006-2008, phase-out activities needed to achieve compliance with the 2010 control measures in all Article 5 Parties could be funded. Moreover, funding was also approved for phasing out methyl bromide in Article 5 Parties earlier than the 2015 compliance date.

4 Methodology

4.1 Introduction

This chapter presents the methodology used to estimate the funding requirement for the 2009-2011 replenishment of the Multilateral Fund, taking into consideration the fact that the phase-out of the remaining consumption of CFC, halon and CTC will need to be addressed during this triennium in order to achieve compliance on 1 January 2010. The estimate also considers funding during the triennium for the total phase-out of TCA and MB in 2015.

Attention is also given to the HCFC phase-out strategy, which is addressed in more detail in chapters 6 and 7.

4.2 Estimating the Funding Requirement for 2009-2011

The estimation procedure used in the current study is based primarily on the amount of ODSs needed to achieve the required compliance and, where relevant, on cost effectiveness values, and agreed or assumed magnitudes for the costs of supporting activities and all other activities than the ones directly related to the phase-out of ODSs.

The following has been taken into consideration or assumed by the Task Force in determining the funding requirement for the period 2009-2011.

- All relevant decisions of the Executive Committee, inclusive of those taken up to the 54rd meeting (e.g. decisions relating to remaining eligible CFC consumption of non-LVCs, Institutional Strengthening, post-2007 RMPs, halon banking, HCFCs etc.), as well as decisions of the Parties to the Montreal Protocol inclusive of those taken at the 19th Meeting (in particular Decision XIX/10 on replenishment requesting the calculation of funding requirements for three subsequent trienniums).
- Decisions of the Meetings of the Parties relating to non-compliance by some Article 5 Parties with specific control measures, and those relating to methyl bromide, process agents, etc.
- Control Schedules for all ODSs (including HCFCs) for Article 5 Parties (a consolidated list of the Montreal Protocol control schedules, as they apply to the Article 5 Parties, is provided in Table A3.1 (Annex 3)).
- Decision 38/66, whereby the Executive Committee adopted, for the first time ever, a model three year phase-out plan for the Multilateral Fund for the 2003-2005 triennium.
- The 2008-2010 Business Plans of the Implementing Agencies and of the Bilateral Agencies, and the Multilateral Fund's Consolidated 2008-2010 Business Plan.

- Funding for the activities of UNDP, UNIDO and the World Bank as per Decision 38/68, whereby the Executive Committee adopted a new administrative cost regime consisting of Core Unit funding (Core Unit costs are adjusted per year for the agencies).
- Funds approved in principle by the Executive Committee for disbursement during the triennium, for the implementation of multi-year sectoral and national phase-out plans in both the consumption and production sector.
- The most recent data reported under Article 7 by Article 5 Parties to UNEP's Ozone Secretariat, for all ODSs, including HCFCs.
- Extrapolated data for HCFC consumption and production for the period 2007-2012, based upon extrapolation methods selected by the Task Force.
- HCFC Management Plans that should lead to a strategy in all Article 5 Parties to comply with the HCFC phase-out strategy (for this the ExCom paper 54/53 was consulted and the relevant Decision studied). However, only preparation for a certain amount of plans will be approved in the course of 2008, and the rest will be approved in 2009. The submission of the plans (for approval of the strategy outlined in the plans) will not be until 2009, if not later. It is for this reason that, where it concerns HCFC consumption and expected growth up to the year 2015, several existing data sources were consulted and compared.
- The ExCom paper 54/54 (which has not been discussed by the Executive Committee in April 2008) where costs for the conversion away from HCFCs are elaborated upon. This paper, however, does not contain cost effectiveness factors or strategies for the HCFC phase-out other than the elements given in Decision XIX/6. Cost effectiveness factors have been derived by the Task Force from the information in the Executive Committee paper, using certain assumptions.
- Discussions with the staff of the Multilateral Fund and Ozone Secretariats, with Implementing Agencies, and interviews with some members of the Executive Committee, conducted at the 54th Executive Committee meeting.
- Responses from questionnaires sent to all Article 5 and non-Article 5 Parties, Implementing Agencies and Network Co-ordinators.

For the determination of the funding requirement, the following assumptions remain valid:

- Article 7 reported data are considered accurate, and are assumed to not show increase in ODS production and consumption in the periods between the years for which certain control levels have been agreed upon;

this does not apply to HCFCs where control schedules have so far not become effective (freeze in year 2013);

- for non-LVCs, only the remaining aggregate CFC consumption, calculated according to Decision 35/57, will be funded;
- all low level remaining consumption of CTC, TCA and MB would be funded in the 2009-2011 time frame (in most cases lower than 20 tonnes); however, for some large consumption projects (which will in fact be MB projects) tranches will continue after the year 2011;
- amounts of ODSs included in the 2008 business plans of the Implementing Agencies that would be realised in project submissions and subsequently funded during the course of 2008 in phase-out projects and plans, would not have consequences for the funding requirement during the triennium 2009-2011; in fact, this would concern one-off activities;
- funding for subsequent phases of Institutional Strengthening projects would remain at the current annual levels during 2009-2011 and beyond;
- CAP funding, Core Unit funding and the costs for the Multilateral Fund Secretariat (including the Executive Committee, the Monitoring and Evaluation etc.) would increase by 3% per year;
- the frequency of Executive Committee meetings would be maintained at three meetings per year.

4.4 Profile of the Remaining ODS Consumption According to the MLF Secretariat's Compliance Oriented Model

The concept of a Compliance Oriented Model arose from the need to maximise the use of the limited resources of the Multilateral Fund to assist Article 5 Parties to comply with the control measures for CFCs, halons, CTC, TCA and methyl bromide.

The model took into consideration

- (1) ODS reduction targets according to the phase-out schedule of the Montreal Protocol and the current level of ODS consumption in Article 5 Parties taking into consideration phase-out investment projects that have been approved by the Executive Committee,
- (2) the remaining CFC consumption eligible for funding in non-LVC Parties (as it was previously decided by the Executive Committee through its decision 35/57), and
- (3) the average timeframe for project implementation.

Since the 38th Meeting of the Executive Committee in November 2002, the Compliance Oriented Model model has been updated at least fifteen times (up to the 54th Executive Committee meeting) taking into account the amounts of ODS to be phased out from projects and phase-out plans that were approved by the Executive Committee /CBP07/.

While certain decisions on HCFC phase-out strategies have been taken by the Executive Committee (in particular within the context of HPMPs, see below), funding principles for HCFCs have not yet been addressed by the Executive Committee. It should actually not be until the approval of HCFC Phase-out Management Plans that basic principles will be known. HCFCs are therefore not yet considered in the Compliance Oriented Model; this is expected to change as a result of progress in one of the next upcoming Executive Committee meetings.

5 The Funding Requirement for the ODS (non-HCFC) Phase-out for the 2009-2011 Replenishment Period and beyond

5.1 ODS Phase-out

This refers to the residual consumption of CFC, MB, CTC, Halons, TCA that will need to be funded during 2009-2011 (and beyond in the case of MB) in order to meet the reduction targets mandated for 2010 and 2015 (MB). It should be noted that in the case of MB, there is no mandated reduction under the Montreal Protocol until 2015 for Article 5 Parties (the phase-out).

This sector also includes the production of ODS and the related phase-out plans, or phase-out agreements.

5.2 CFC Phase-out Plans

During the last replenishment period, a major issue to be considered was the funding of National Phase-out Plans (or ODS Phase-out Plans) and the preparation and/or approval of a large amount of Terminal Phase-out Management Plans (TPMPs). This picture has now changed in so far that most of the NPPs have already been funded and that many TPMPs will receive the last two funding tranches in 2008 and 2009. However, a relatively small number of remaining LVCs still need approval of TPMPs for them.

Approved Plans and Projects

For approved plans and projects, funding will be required in the year 2009 (about 65 different tranches) at a level of US \$9.09 million (where still about 60% is needed for a relatively small amount (10) of tranches for non-LVC Parties). Agency support costs are at US \$874,000.

This amount is now rapidly decreasing per year (for existing approvals the 2008 funding requirement is supposed to be US \$ 16 million).

The amount for existing approved plans in 2010 is assumed at a level of US \$1.220 million (agency support costs at US \$116,900). For 2011 and 2012 (it normally concerns delayed funding) amounts of US \$418,522 and US \$113,000 are supposed to be funded (at agency support costs of US \$34,000 and US \$8,300 respectively).

New Commitments

For assisting three countries (Iraq, Chile and Yemen) funding is expected to be approved in 2008 and/or 2009. For 2009, US \$1.25 million is expected as

a funding requirement here; for 2010 it would be US \$0.5 million (both without agency support costs).

For a number of LVC Parties, (further) assistance is needed in the form of a TPMP. As of the 53rd Executive Committee meeting, 32 LVC Parties needed to be addressed, which number was already brought back to 23 in the 54th Executive Committee meeting. It is expected that the TPMPs for these Parties will all be approved in 2008, so that there will be funding tranches for the years 2008 and 2009. In all cases, standard amounts for the TPMPs have been selected, based upon the baseline consumption of a country (as decided by the Executive Committee).

It has been assumed that all LVC Parties will have TPMPs approved with a first 60% funding tranche in 2008, and the remaining 40% funding tranche in 2009. Total amounts (excluding agency support costs) are US \$205,000, 295,000, 345,000, 520,000 and 565,000 dependent on the baseline consumption of a country. Funding tranches for the year 2008 need no further consideration here. It results in a funding requirement of US \$4,896,000 for the year 2009; agency support costs are estimated at US \$397,000.

MDIs

In 2007, the Parties that were expected to receive funding for MDI production conversion were Argentina, China, India and Indonesia. In the Consolidated Business Plan /CBP08/ the Parties Algeria, Colombia, Jordan, Pakistan, Syria and Venezuela have also been introduced as Parties that have MDI plants where conversion should be eligible. In Decision 54/5, the Executive Committee decided that all MDI projects for the Parties as mentioned in the Consolidated Business Plan should be submitted in 2008; they will also be funded in the year 2008.

It is expected that this will not be the case for two Article 5 Parties with larger MDI consumption. It is assumed that both MDI multi-year plans will be submitted in 2008. The Task Force assumes that there will be further funding tranches in 2009 and 2010 for these Parties.

For the year 2009 a funding requirement of US \$18.95 million is expected by the Task Force, for 2010 this would be US \$5.0 million (at agency support costs of US \$1,421,500 and US \$375,000, respectively).

5.3 CTC, TCA and Halons

One can find a few existing commitments for CTC in the Compliance Oriented Model; however, no real new plans have been introduced in the Consolidated Business Plan.

For an approved plan CTC phase-out plan in India funding will be required in 2009 (US \$3.212 million) as well as for the approved CTC process agents plans (phases I and II) for China (US \$2.5 million in total; this includes both production and consumption). In both cases, agency support costs are not included and are fixed at US \$241,000 and US \$181,500, respectively.

There are a few Parties, which may need technical assistance to phase out CTC completely. A funding requirement of US \$160,000 is expected to be approved here in the year 2009 (US \$14,400 agency support costs).

Low amounts of CTC may continue to be used in several Article 5 Parties for laboratory and analytical uses.

Although most report zero TCA consumption, there are a few Parties with some TCA consumption, which could be addressed via technical assistance to phase out completely. A funding requirement of US \$60,000 is expected to be approved here in the year 2009 (US \$6,000 agency support costs).

This would bring the technical assistance for CTC and TCA to US \$220,000 (with agency support costs of US \$20,400).

Where it concerns halons, it would possibly concern three Parties that could receive technical assistance funding at a total of US \$75,000 (US \$6,000 support).

5.4 Methyl Bromide Phase-out

For the year 2009 and beyond, there are four Parties with approved plans that are entitled to receive funding for the MB phase-out, i.e. China, Honduras, Mexico and Vietnam (for the specific funding see the table below).

There are 14 Article 5 Parties, which have so far no approved projects for a complete MB phase-out. For all these cases plans for a complete phase-out are expected to be submitted and approved in 2008 and 2009. This would include the applications of MB for “fresh dates” in countries such as Algeria and Tunisia, plans that have been postponed for several years for lack of adequate MB alternatives (it should be mentioned that a Technical Assistance project was approved at the 54th Executive Committee meeting).

In three countries, Egypt, Morocco and Sudan, the phase-out is expected to be funded in one tranche in the year 2008 and these countries have not been further considered here.

For the few countries that have not ratified the Copenhagen agreement (but are expected to do this soon), have reported MB consumption, but are not

eligible for support, a contingency of US \$500,000 has been inserted as funding requirement for the year 2009.

The expected funding requirement for the different countries for assisting in the methyl bromide phase-out is given below in Table 5-1.

5.5 Funding Requirement for the ODS Production Sector

Approved agreements for the CFC production sector for the Parties Argentina, China and India have their last tranches in the year 2009 at a value of US \$14,500,000 (with agency support costs at US \$1,059,500).

An accelerated production phase-out agreement (India) was approved at the 54th Executive Committee meeting with so far not precisely defined consequences for the 2009 funding requirement. The Task Force has assumed that certain funding will be disbursed in 2008 (see above in chapter 3) and in 2009 (this second tranche will be released upon the verification of the closure). For the year 2009 the assumption is that it would concern an amount of US \$1.3 million (with US \$98,000 support costs).

Except for methyl bromide no further funding is required for production phase-out agreements after 2009. For methyl bromide in China US \$2 million has been approved in principle for the year 2011, US \$1.79 million for the year 2014 (at agency support costs of US \$150,000 and US \$134,250 respectively).

5.6 Total Funding Requirement for the ODS Phase-out Sector

From the amounts given in the paragraphs above for the years 2009-2011 and for 2012, 2013 and 2014 for the multi-year sectoral phase-out plans, the total funding requirement for these years can be calculated. This would then apply to the NPPs and the TPMPs for LVCs, to the CTC and halon sectors, to the methyl bromide sector, as well as to the production sector. This is summarised in Table 5-2 below where the amounts for existing multi-year agreements and for new projects and new multi-year agreements have been separated.

The total estimated funding requirement for all controlled substances for the triennium 2009-2011 amounts to **US \$77.340 million**. The agency support costs to be added to the total amount are US \$6.348 million.

For the year 2012 it would amount to **US \$3.013 million**, for the year 2013 to **US \$0.980 million** and for the year 2014 to **US \$2.133 million** (with agency support costs of US \$ 267,000, 83,000 and 160,000). For the triennium the total would be **US \$6.126 million** (with agency support costs at US \$510,000).

Country	2009	2009 agency	2010	2010 agency	2011	2011 agency	2012	2012 agency	2013	2013 agency	2014	2014 agency
<i>Approved</i>												
China	1.300	0.098	0.600	0.045	0.500	0.038	0.500	0.038	0.500	0.038	0.303	0.023
Honduras	0.106	0.008										
Mexico			3.300	0.302			2.000	0.191	0.422	0.041		
Vietnam					0.120	0.009			0.058	0.004	0.040	0.003
<i>New/expected</i>												
Algeria			0.050	0.004								
Argentina			0.260	0.021								
Chile			0.800	0.065	0.600	0.045	0.400	0.030				
Congo			0.020	0.002								
Congo, DR			0.020	0.002								
Ecuador	0.300	0.024	0.100	0.008								
Egypt												
Guatemala	3.500	0.280										
Kenya	0.300	0.023										
Morocco												
Nigeria	0.120	0.010										
Sudan												
Swaziland	0.100	0.008										
Yemen	0.150	0.012										
Contingency non-Copenhagen	0.500	0.040										
TOTAL	6.376	0.503	5.150	0.449	0.680	0.092	2.900	0.259	0.980	0.083	0.343	0.026

Table 5-1 Approved funding and funding expected to be approved after ExCom 54 in 2008 for methyl bromide phase-out plans (US \$ million)

Funding requirement ODS INVESTMENT PROJECTS	2009-2011	2009-2011 agency	2012	2012 agency	2013	2013 agency	2014	2014 agency
<i>ODS Phase-out plans Approved</i>	10.731	1.025	0.113	0.008				
<i>ODS Phase-out plans New</i>	1.750	0.131						
<i>TPMPs, new</i>	4.896	0.595						
<i>MDI</i>	23.950	1.796						
<i>CTC, approved</i>	3.212	0.241						
<i>Process Agents, approved</i>	2.500	0.182						
<i>CTC and TCA, assistance</i>	0.220	0.020						
<i>Halons, assistance</i>	0.075	0.006						
<i>MB, approved</i>	5.926	0.500	2.500	0.229	0.980	0.083	0.343	0.026
<i>MB, new</i>	6.280	0.544	0.400	0.030				
<i>CFC production phase-out</i>	14.500	1.060						
<i>CFC accel. prod phase-out</i>	1.300	0.098						
<i>MB production phase-out</i>	2.000	0.150					1.790	0.134
TOTALS	77.340	6.348	3.013	0.267	0.980	0.083	2.133	0.160
Total 2009-2011	77.340	6.348						
Total 2012-2014	6.126	0.510						

Table 5-2 Total funding requirement for all ODS sectors in the 2009-2011 replenishment period (in US \$ million) and for the years 2012, 2013 and 2014 in order to meet the different ODS (non-HCFC) control schedules

6 HCFC Consumption and Production for the Period 2000-2006 and Extrapolation towards 2010-2020

Parties in Decision XIX/6 decided on an (accelerated) HCFC consumption and production phase-out in Article 5 Parties with the following reduction steps:

- 2013: *Freeze at baseline level, the baseline being the average HCFC aggregated ODP consumption of the years 2009 and 2010;*
- 2015: *10% reduction from the baseline*
- 2020: *35% reduction from the baseline*
- 2025: *67.5% reduction from the baseline*
- 2030: *97.5% reduction from the baseline*
- 2040: *Phase-out.*

This chapter starts with considerations of the trend in HCFC consumption from a number of sources for the period 2007-2015; these sources include the IPCC TEAP Special Report, as well as the UNDP and the China HCFC strategy done by Germany. 2000-2006 HCFC data as reported under Article 7 to the Ozone Secretariat have been considered for all Article 5 Parties and all separate HCFC chemicals. Using these data, certain mathematical methods were used to extrapolate HCFC consumption levels for the years 2007-2012.

On the basis of the 2004-2005 HCFC aggregated consumption, Article 5 Parties were subdivided in groups. Each of these groups has specific consumption characteristics, so that it will be useful to use this subdivision for the calculation of the funding requirement for the first HCFC phase-down or reduction steps.

6.1 IPCC TEAP Special Report, UNDP Surveys and UNEP Article 7 Data

The Task Force has reviewed and evaluated a number of sources for HCFC consumption data in the preparation of this report. These include

- the IPCC TEAP Special Report on Ozone and Climate (2005) -SROC- and its Supplement Report (2005);
- Country specific HCFC surveys from UNDP (12 Article 5 Parties) and the China HCFC strategy done by Germany (2004/2005);
- UNEP Article 7 reported consumption and production data through the year 2006.

One of the complications of comparing various datasets is that their scope and time scale can often be very different, making it difficult to reconcile the data.

The SROC gives as Article 5 consumption 217 ktonnes of HCFCs in 2002 and 504 ktonnes of HCFCs in 2015, which implies a growth factor of 1.71 or a growth of 5.5% per year.

The UNDP and the China HCFC strategy give a HCFC consumption of 207 ktonnes for 2005 and 430 ktonnes for 2015, which is a growth by a factor of 2.124 or 7.8% per year (for 13 Article 5 Parties).

In Table 6-1 data are given for the different sources for the years 2000, 2005, 2006, 2010 and 2015. All data for 2010 and 2015 are based on extrapolations in the original reports.

Data Source	Sub-set	2002	2005	2006	2010	2015	Growth and Growth %
SROC	Global	496,000				551,000	
	Non-A5	268,000					
	A5	217,000	294,000*		385,000*	504,000	1.71-5.5%
HCFC surveys	China		148,000			307,000	
	12 A5		207,000		301,000*	440,000	2.12-7.8%
Article 7 data	China	84,900	186,700	238,100			
	A5	193,700	318,500	380,300			
	Non-A5	291,000	182,100	122,100			
	Global	484,700	500,600	502,400			

Table 6-1 Data for HCFC consumption from different sources (* means obtained from interpolation for this replenishment report only)

Article 7 reported data show that, for the years 2005 and 2006, global HCFC consumption is more or less equal; although there is a substantial decrease in non-Article 5 consumption, this is counterbalanced by the growth in HCFC consumption in Article 5 Parties, particularly in China.

It can be observed in Table 6-1 that, in case of the SROC, the growth for the Article 5 Parties (bottom-up data) is 5.5% and the growth factor between 2005 and 2015 amounts to 1.71. The growth derived from the surveys is larger, averaged 7.8% per year during the period 2005-2015.

Article 7 reported data for the period 2002-2006 are given in tonnes for the period 2002-2006.

It can be observed that the SROC data for 2002 overestimate the reported consumption in the Article 5 Parties (by about 23,000 tonnes). However, SROC data (based on the 5.5% growth) already give lower values for the Article 5 Parties 2005 HCFC consumption in comparison to Article 7 data (by 24,000 tonnes). This is mainly due to a much larger growth in China than

assumed in the SROC. This is also shown in the survey data, where the survey for China by Germany reports 148,000 tonnes of HCFC consumption for the year 2005 (an estimate based upon the 2003 data known at the time of the survey), whereas the real reported consumption in 2005 was 186,700 tonnes (i.e., 25% higher).

The coverage of the HCFC data from the surveys is not good enough, due to the limited number of countries considered. Where 2002 data from the SROC seem reasonable, data for 2005 and 2010 (which have been interpolated) are (too) low compared to the data reported following Article 7. Data reported under Article 7 for 2006 by all Article 5 Parties including China are comparable to the 2010 SROC data estimated for all Article 5 Parties. This leads to the conclusion that the comparison of the various sources does not yield enough consistent information.

Due to the large fluctuations and inconsistencies between sources, the Task Force decided to use the only official data available, which is the Article 7 reported data to the Ozone Secretariat. They should be accurate enough through 2006 for extrapolating consumption data for the years after 2006. Extrapolation is particularly important for the consumption in the years 2009 and 2010 (the average being the baseline HCFC consumption), as well as for the year 2012. The 2000-06 data reported under Article 7, as well as the extrapolated ones (see below) form the backbone for the calculation of the funding requirement for the HCFC phase-down for different trienniums (2009-2011 and beyond) as determined in this report.

HCFC production data were not considered in the reports and surveys mentioned above. Article 7 reported production data are analysed below.

6.2 Grouping Article 5 Parties

All Article 5 Parties reported the consumption of the various HCFC chemicals for the period 2000-2006 conform Article 7. The Task Force decided to construct four groups of countries for the determination of the HCFC funding requirement based on the average 2004/2005 HCFC aggregated consumption.

Only three HCFC chemicals (HCFC-22, -141b and -142b) are significant where it concerns consumption. The share in the total of HCFC-123, HCFC-124, HCFC-225ca/cb etc. is less than 1% for virtually all Parties (in ODP tonnes). These HCFCs have therefore not been considered in this report.

The following four groups have been made:

1. Very high volume consuming countries (> 100,000 tonnes ODS);
2. Larger volume consuming countries with, normally, both HCFC-22 and -141b consumption;

3. Smaller consuming countries with, in most cases, both HCFC-22 and -141b consumption (where the main consumption is HCFC-22), which could be dealt with as one group;
4. “Low HCFC volume” consuming countries (in fact, all countries that consume low volumes of HCFC-22 only).

This leads to the following countries in the groups¹:

1. One country (China), with a consumption in the order of 15,000 ODP tonnes (or 200,000 ODS tonnes);
2. 17 countries with a consumption between 120 and 1200 ODP tonnes (or between 2,000 and 14,000 ODS tonnes), with, in most cases, very significant HCFC-141b consumption (Mexico, Thailand, Brazil, India, Turkey, Indonesia, Kuwait, Saudi Arabia, South Africa, Philippines, Argentina, Malaysia, Egypt, Venezuela, Colombia, Vietnam and Iran);
3. 34 countries with a consumption between 6 and 100 ODP tonnes, or 100-2,000 ODS tonnes, with a smaller than 20% consumption of HCFC-141b in the total;
4. 83 countries with a consumption up to 6 ODP tonnes (0-100 ODS tonnes), this being HCFC-22 consumption for servicing only.

Year/ HCFC	2000	2001	2002	2003	2004	2005	2006
Consumption							
Group 1							
HCFC-141b	1081	1313	2246	3569	4370	3157	8229
HCFC-142b	6	3	-	234	220	391	1420
HCFC-22	4075	3806	3542	3950	5752	8417	7782
Group 2							
HCFC-141b	2910	3046	2946	3322	3724	3898	3881
HCFC-142b	82	78	83	116	109	199	474
HCFC-22	2489	1923	1734	1839	2567	2546	2816
Group 3							
HCFC-141b	62	79	77	63	100	148	147
HCFC-142b				1	5	9	10
HCFC-22	453	472	451	491	573	608	857
Group 4							
HCFC-22	106	133	115	91	127	126	148
Total	11263	10853	11360	13675	17547	19005	25764

Table 6-2 HCFC reported consumption for 2000-06 (Article 7 reporting) for the different HCFC chemicals for the different groups of countries (chemicals with very small consumption have not been included, HCFC-123, -124, -225ca/cb)

¹ The HCFC consumption (and production) of the Parties Rep. of Korea, Singapore and UAE has not been taken into account.

6.3 HCFC Consumption Extrapolated

The most important issue in this report is the calculation of the funding requirement for HCFC reductions for all Article 5 Parties in the first triennium 2009-2011 and in the two trienniums thereafter. As mentioned before, there is a funding requirement for existing and new multi-year agreements, as well as for supporting activities, in particular for the triennium 2009-2011. However, the funding for HCFC activities is assumed to have the largest share in the total, already in the first triennium 2009-2011.

If only Article 7 reported data for the period 2000-2006 are to be used, an extrapolation method has to be applied. Details are given in Annex 3, which also contains aggregated HCFC consumption values for all Parties. Table 6-3 (a and b) is derived from this table and gives the HCFC consumption in ODP tonnes for the four Groups of countries.

In deriving the consumption data for future years (the years after 2006) one adjustment has been made for the case of China. This because China's consumption for the year 2006 is substantially higher than the consumption for the year 2005. It is so much higher, that the extrapolation using the least square method would yield such a high growth percentage for the years 2007-2010 that it is highly doubtful that this could ever become reality. The consumption for China for the years 2005 and 2006 (for the different HCFC chemicals) has therefore been averaged, resulting in a higher consumption level for 2005, and a lower level for 2006, compared to the reported values².

The extrapolated consumption data form the basic assumption in the determination of the HCFC funding requirement, based primarily on the phase-out of HCFC consumption. The Task Force considered deriving a high and a low consumption scenario for all countries too much a random choice and decided that the above approach is the most sensible one.

Year/ HCFC	2000	2001	2002	2003	2004	2005	2006
Consumption							
Group 1	5162	5122	5789	7753	10342	14980*	14345*
Group 2	5481	5047	4764	5276	6400	6642	7171
Group 3	514	551	528	555	678	764	1015
Group 4	106	133	115	91	127	126	148
Total	11263	10853	11360	13675	17547	22511*	22678*

Table 6-3(a) HCFC reported consumption for 2000-06 (Article 7 reporting) (* values for the years 2005 and 2006 for China have been averaged for the separate HCFC chemicals and then combined again in ODP tonnes)

² If the values would not be averaged (marked with * in Table 6-3(a), the extrapolated consumption in the year 2012 would be larger than 36,000 ODP tonnes, compared to 25,160 ODP tonnes (see Table 6-3(b))

Year/ HCFC	2007	2008	2009	2010	2011	2012	2013
Consumption							
Group 1	16473	19028	21410	23453	24573	25160	22431
Group 2	7239	7901	8568	9001	9242	9444	8775
Group 3	954	1062	1185	1295	1359	1393	1240
Group 4	138	142	155	166	170	173	160
Total	24805	28134	31318	33915	35343	36170	32606

Table 6-3 (b) HCFC extrapolated consumption for 2007-2013, based upon the 2000-2006 reported values and extrapolation methods; 2013 is the freeze year with the 2009-2010 baseline consumption

It can be noted that the 2012 consumption for the country in Group 1 is determined at somewhat higher than 300,000 ODS tonnes, where the 17 countries in Group 2 are expected to have a total HCFC consumption of about 75,000 ODS tonnes. In metric tonnes, the total amount of HCFCs (extrapolated data for 2007-2012) is considerably larger than the amount of CFCs addressed with Multilateral Fund assistance.

6.3 HCFC Production

Production of HCFCs is taking place in a small number of Article 5 Parties. As one can take from Article 7 reported data the largest production takes place in the Group 1 country, China, and includes the three important HCFC chemicals, HCFC-141b, -142b and -22. HCFC-22 production is also taking place in four other Article 5 Parties, which are all in Group 2 (Argentina, India, Mexico and Venezuela). One manufacturer of HCFC-22 (Republic of Korea) has not been considered in this report since it has never requested MLF assistance.

Table 6-5 shows the amounts reported as produced during 2000-2006.

Year/ HCFC	2000	2001	2002	2003	2004	2005	2006
Production							
Group 1							
HCFC-141b	947	1154	2246	3569	4370	4786	8182
HCFC-142b	4	1		234	220	366	1420
HCFC-22	4989	5867	6404	7886	10820	12910	14509
Group 2							
HCFC-22	1047	1042	1102	1363	1724	1845	2343
Total	6987	8064	9753	13052	17134	19906	26455

Table 6-4 Production of the three main HCFCs in Group 1 and 2 countries as reported under Article 7 for the period 2000-2006

The production of HCFC-22 in the Group 2 countries has been about 15-20% of the production in China. The total amount of HCFC-22 produced in 2006 was about 16,850 ODP tonnes, slightly larger than 300,000 ODS tonnes. Production of HCFC-22 in the year 2006 in the countries in the Groups 1 and 2 was larger than the demand in all Article 5 Parties. Before 2005, the production was smaller than the demand, which implies that certain amounts of HCFC-22 were imported from non-Article 5 Parties until that year³.

Production of HCFC-141b and -142b took place in one Article 5 Party only and was sufficient to precisely cover the domestic demand. This implies that both chemicals HCFC-141b and -142b have been imported from non-Article 5 Parties by virtually all (non-Group 1) Article 5 Parties with HCFC-141b and -142b consumption. This may be true until 2006, but is assumed to rapidly change during the period 2006-2010. It is assumed in this report that virtually all production of the three relevant HCFCs --for Article 5 Parties' consumption-- will take place in Article 5 Parties by 2010-2012.

On the basis of the 2000-2006 data one can extrapolate the production amounts for the years 2007-2012 as was done with consumption data. However, also in this case one would have to average the production of the HCFC-141b/-142b chemicals in the Group 1 country. Extrapolation of the HCFC-22 production patterns in the Group 1 and 2 countries are believed to introduce a substantial uncertainty. This implies that the extrapolated production numbers will deviate from the extrapolated consumption numbers for the years 2007-2012.

The Task Force has therefore assumed that production will follow (will be largely equal to) the demand (assumed to be equal to consumption).

Country information learns that the part of the production of HCFC-141b, -142b and -22 for Article 5 Parties that takes place in China will be gradually phased out in the period after 2013, and will ask for (production) closure compensation funding. This will be different for the other Article 5 Parties that produce HCFC-22, because their production phase-out is not eligible for funding, since it results from CFC swing plants that have already been funded for closure (conversion).

Assumptions for the calculation of the production phase-out funding can be found in chapter 8.

³ Imports of HCFC-22 from non Article 5 Parties could continue after 2006, but this would then imply that certain amounts of HCFC-22 have been exported from Article 5 to non-Article 5 Parties

7 Funding Aspects for HCFCs

7.1 HCFC Phase-out Management Plans

The Task Force studied document ExCom 54/53 on HCFC Phase-out Management Plans, HPMPs. Here the MLF Secretariat considered several aspects of decision 53/37, Decision XIX/6 of the Nineteenth Meeting of the Parties, as well as decision 35/57 on the starting point for reducing aggregate remaining consumption.

HPMPs are performance based agreements on an annual basis. Document 54/53 mentions that a staged implementation would be the best approach with regard to HPMPs. This would then consist of developing both an overarching programmatic view of the entire phase-out process, and a specific plan for meeting the initial freeze and the 10 per cent reduction step. Furthermore it is mentioned that, in terms of the broad view, Parties could develop a long-term strategy that provides an overall direction and includes a list of critical actions that a country expects to undertake to achieve the HCFC phase-out. It is also mentioned that a staged approach to the implementation of HPMPs would have the benefit of limiting growth and of eliminating HCFC uses in the near term in areas where substitute technologies are readily available and cost-effective.

The staged approach is also important for the large amount of Article 5 Parties with HCFC consumption in the servicing sector only. For these Parties, stage one would likely address many of the same types of activities that are included in RMPs, TPMPs and NPPs. These include measures such as establishing regulatory frameworks, customs training, refrigeration technician training, incentive programmes, and requirements for project management units/capacity building. The training and capacity building already funded under the CFC phase-out for servicing and other programmes could be used effectively in the HPMPs.

It can be assumed that the average implementation period of an individual phase-out project is about 35 months. Therefore, HCFC projects within an HPMP (a performance based agreement) would need to be approved by early 2010 in order to enable countries to meet the freeze in consumption in 2013. Guidelines for HPMPs are of utmost importance.

The adoption of the HPMP guidelines occurred at the 54th Executive Committee meeting, in Decision 54/39, which reads:

- (a) Countries should adopt a staged approach to the implementation of an HCFC phase-out management plan (HPMP), within the framework of their over-arching-strategy;

- (b) As soon as possible and depending on the availability of resources, countries should employ the guidelines herein to develop, in detail, stage one of the HPMPs, which would address how countries would meet the freeze in 2013 and the 10 per cent reduction in 2015, with an estimate of related cost considerations and applying cost guidelines as they were developed;
- (c) The elaboration of stage one of the HPMP and subsequent stages should be developed as follows:
 - (i) For countries with consumption in the servicing sector only:
 - (a) To be consistent with existing guidelines for the preparation of RMPs/RMP updates pursuant to decisions 31/48 and 35/57; and, if applicable, with the preparation of TPMPs pursuant to decision 45/54;
 - (b) To contain commitments to achieve the 2013 and 2015 HCFC control measures and include a performance-based system for HPMPs based on the completion of activities in the HPMP to enable the annual release of funding for the HPMP;
 - (ii) For countries with manufacturing sectors using HCFCs, HPMPs should contain a national performance-based phase-out plan (NPP) with one or several substance or sector-based phase-out plans (SPP) consistent with decision 38/65 addressing consumption reduction levels sufficient to achieve the 2013 and 2015 HCFC control measures and provide starting points for aggregate reductions, together with annual reduction targets;
- (d) For countries that chose to implement investment projects in advance of completion of the HPMP:
 - (i) The approval of each project should result in a phase-out of HCFCs to count against the consumption identified in the HPMP and no such projects could be approved after 2010 unless they were part of the HPMP;
 - (ii) If the individual project approach was used, the submission of the first project should provide an indication of how the demonstration projects related to the HPMP and an indication of when the HPMP would be submitted;
- (e) Consideration should be given to providing funding for assistance to include HCFC control measures in legislation, regulations and licensing systems as part of the funding of HPMP preparation as necessary and

confirmation of the implementation of the same should be required as a prerequisite for funding implementation of the HPMP;

- (f) In cases where there were multiple implementing agencies in one country, a lead agency should be designated to co-ordinate the overall development of stage one of the HPMP;
- (g) HPMPs should contain cost information at the time of their submission based on and addressing:
 - (i) The most current HCFC cost guidelines at the time of submission;
 - (ii) Alternative cost scenarios based on different potential cut-off dates for new capacity if a specific cut-off date had not yet been decided, for funding eligibility of manufacturing facilities as specified in decision 53/37(k), as well as the current policy for a 25 July 1995 cut-off date;
 - (ii) Alternative cost scenarios for the operational and capital costs for second conversions;
 - (iii) The incremental costs of regulating import and supply to the market of HCFC dependent equipment once proven alternatives were commercially available in the country and describing the benefits to the servicing sector of associated reduced demand;
 - (iv) Cost and benefit information based on the full range of alternatives considered, and associated ODP and other impacts on the environment including on the climate, taking into account global-warming potential, energy use and other relevant factors;
- (h) Countries and agencies were encouraged to explore potential financial incentives and opportunities for additional resources to maximize the environmental benefits from HPMPs pursuant to paragraph 11(b) of decision XIX/6 of the Nineteenth Meeting of the Parties;
- (i) HPMPs should address:
 - (i) The use of institutional arrangements mentioned in decision 53/37(e) and (f);
 - (ii) The roles and responsibilities of associations of refrigeration technicians and other industry associations and how they could contribute to HCFC phase-out; and

- (j) HPMPs should, as a minimum, fulfil the data and information requirements, as applicable, listed in the indicative outline for the development of HPMPs, as set out in Annex XIX to the present report.

For the determination of the funding requirement for the replenishment for the three three-year periods (2009-2017) no HPMPs were available to the Task Force.

The Task Force has therefore independently determined the consumption phase-down steps in the separate countries or country groups for the separate years as of 2013. It furthermore selected the way (via the phase-down of the consumption of certain HCFC chemicals) the total reduction of the consumption would take place.

7.2 Implementation Lags

The phase-down steps as of 1/1/2013 until 1/1/2021 will imply funding requirements as of the year 2009 until at least the year 2017. This is based upon the three year implementation lag assumed for all types of HCFC projects, and this is comparable to the historic implementation lag between approval and implementation as recorded by the Multilateral Fund Secretariat.

7.3 Cut-off Date Dependency

During the ODS phase-out process (excluding HCFCs) a cut-off date for funding new capacities was determined. This date was determined when the (CFC) funding process was already ongoing and criteria had been developed. The Executive Committee at its July 1995 meeting decided that 25 July 1995 should be the cut-off date. This date was established before the baseline consumption (or production) was established; this baseline was defined as the average of the 1995-1997 consumption or production levels.

Proposals for a cut-off date have now been discussed to some degree (and were also given in written comments submitted by Parties. This cut-off date determines the date of installing capacities for the production of HCFC chemicals or the manufacturing of HCFC based products.

The arguments for a cut-off date used by Parties yield conclusions for a year that varies from

- the year 2000, to
- the date when the approvals in the CDM process started for the funding of abatement of HFC-23 emissions in HCFC-22 plants (2003/2004), to
- a date when HCFC alternatives were widely available in the developed countries (2005), to
- the date when the Adjustment in Decision XIX/6 was decided (September 2007), to

- as a maximum, one of the baseline years (2009).

A cut-off date would only be important for countries with manufacturing facilities, which are only those with medium to large consumption.

A cut-off date for capacities to be funded can be easily established in principle. This would then mean that no capacities can be funded, which are established after that date. However, certain Parties will argue that, if this date is going to be in the past, it should allow for some flexibility given the fact that the installing of capacities already decided at that moment should also be counted.

At this moment in time in the process, the Task Force is of the opinion that a cut-off date for HCFC capacities to be eligible has to be in the period 2005-2008. The Task Force is of the opinion that a cut-off date in the future would open a window for installing capacities that should again be funded for phased-out within a relatively short timeframe.

If the cut-off date is not too far away from the years 2009-2012 (e.g. 2005-2007), the initial freeze and first 10-25% reduction will not be impacted by the capacities present at the cut-off date. This because there will always be enough capacities eligible for the first 10-20% HCFC consumption / production reduction steps. The issue of the cut-off date is therefore not further considered here.

A decision on a cut-off date has so far not been taken by the Executive Committee, an extra reason why this issue is not being discussed here.

7.4 Second-stage Conversions

In Decision XIX/6, the Parties directed the Executive Committee to make the necessary changes to the eligibility criteria related to second-stage conversions. While this suggests that the Executive Committee should consider providing assistance to firms which converted to HCFCs with MLF financing, it is not clear whether the entire costs associated with the conversions of such enterprises should be covered.

All MLF-assisted transitions from CFCs to HCFCs were in the foam sector, and not in the refrigeration and AC sector where it would have been a conversion from CFCs to HCFC-22 (there have been a small number of compressor conversion projects). In how far mature replacements do exist for the HCFCs in the foam sector that would not necessitate conversion, but only adjustment of the machinery plus training of personnel, is an important issue. This in particular if one would consider “second-stage conversions”.

For funding calculations for HCFC phase-out it depends very much on how many pieces of equipment, or number of operations in an Article 5 Party can be considered as a result of a Multilateral Fund supported conversion. If the number would be relatively small, it is questionable whether second conversions (or the funding of the conversion away from HCFC, which was already financially supported) play any role in the determination of the funding requirement for the first reduction steps.

The Task Force has considered information on CFC-11 conversions as available from the MLF Secretariat. This shows that, in China, 10-15% of the expected baseline HCFC-141b consumption is in companies that have had a funded conversion from CFC-11 to HCFC-141b, whereas this figure is about 35% in the larger HCFC consuming countries (Group 2). This implies that a large number of operations can be selected for the first 35% reduction (up to 2020), which do not fall under “second stage” conversions, in whatever way this will be defined.

The Executive Committee has so far not addressed the “second conversion” issue. Together with the arguments mentioned above, the Task Force decided therefore to not take into account any financial implications of this issue.

8 Modelling the Funding Requirement for HCFCs

In this chapter the funding requirement for the compliance of all Article 5 Parties with the HCFC phase-out schedule is being determined. In principle this would be the funding required as indicated in the various HPMPs for all Article 5 Parties once submitted and approved.

Since the process has not proceeded that far (HPMPs have not yet been prepared), the only way the Task Force can calculate the funding requirement is on the basis of a sort of activity by activity approach, which considers the reduction schedule, allowable consumption and cost effectiveness for sub-sectors.

8.1 Parameters of Importance

For the determination of the funding requirement for HCFC conversions the following is important.

1. Calculations are done separately for all the countries in Groups 1 and 2; furthermore, calculations are done for the aggregated consumption of the separate HCFCs for the countries in Group 3;
2. Funding for the HCFC phase-out is determined *on the basis of costs in US\$ per metric kg, not per ODP kg, since there is no relation between the conversion costs and the ODP of the substance* (it happened to be that one ODP kg is equal to one metric kg in the case of CFC-11 and CFC-12).
3. The HCFC phase-out for the countries in Group 4 is based upon a sort of (HCFC) TPMP approach where currently the total costs for the period 2010-2030 (or theoretically even until 2040) are not known. Costs are assumed to be comparable to TPMPs for ODS (CFCs and other chemicals) but would be spreaded over a longer period. Tranches are assumed to be approved in certain years, so that the near future HCFC reduction steps in consumption can be handled.
4. The implementation lag for the phase-out projects in Phase-out Management Plans for the countries in Groups 1, 2 and 3 is assumed to be three years. This implies that reductions that should take place before 1/1/2013 have to be approved before 2010, reductions before 1/1/2015 have to be approved before 2012.
5. Approvals of HCFC phase-out activities in a certain year (in fact, in future, following the HCFC strategy in the HPMPs) are assumed to imply funding via tranches in three years: 40% of the funding in the year of the

approval, 30% in the year following the approval and 30% in the year thereafter.

6. In the case of the phase-down for the countries in Groups 1, 2 and 3 it would concern phase-out of activities using HCFC-141b, HCFC-22/-142b and HCFC-22. For transparency reasons the same approach has been used for all countries in groups 1, 2 and 3. Once the HCFC Management Plans for the different countries have been approved, costs could be adjusted.
7. In the case of most of the larger HCFC-consumers (Group 2 and 3 countries) it is assumed that 25% of the HCFC-22 consumed is for manufacturing, 75% is for servicing and assembling equipment on site. In case of the Group 1 country, servicing and assembling on site is assumed to take about 60% of the total HCFC-22 consumption.
8. In the case of countries in Group 4, there may be some small amounts of equipment installed on site, but this is assumed to disappear at an early stage once the (LVC) HPMPs for these countries (comparable to LVC TPMPs) have become active and legislation for imports of HCFC-22 based equipment has brought this to a minimum. This implies that the countries in Group 4 (with HCFC-22 consumption smaller than 100 ODS tonnes) will have servicing uses only. These uses are assumed to be addressed via the LVC HPMPs, following a more or less general approach, taking into account country circumstances. For the countries in Group 4, reduction steps in consumption are as per Decision XIX/6 (Montreal Protocol schedule: 5% per year as of 2013, until 2020).
9. As the strategy for reducing the HCFC consumption of the countries in Groups 1, 2 and 3, the following steps are made
 - (a) servicing amounts are assumed to decrease by 5 per cent per year (based on the Montreal protocol schedule) once the control schedule will be in place in the year 2013 (this implies the same reduction in the servicing sector as the overall control schedule reduction steps).
 - (b) The remaining consumption to be phased out for compliance is then in a first instance HCFC-141b, which means that many countries only phase out HCFC-141b during many of the years in the period 2012-2020. In countries where the HCFC-141b consumption is relatively low (compared to the HCFC-22 consumption), the remaining consumption to be phased out in order to comply with the schedule consists of HCFC-22 used in manufacturing.
 - (c) In this strategy, the phase-out of the HCFC-22/-142b consumption (which is mostly small) is considered clearly after 2013, i.e. during the

period 2015-2020, except in two or three cases where Article 5 Parties have a relatively high consumption, which needs to be addressed for compliance reasons.

- (d) HCFC-22 in air conditioning and refrigeration manufacturing is phased out in amounts that are calculated from the remaining obligations of Parties in order to achieve compliance; this means that HCFC-22 reductions are calculated after that reductions in servicing and in HCFC-141b have been achieved. However, this cannot be completely separated; certain amounts of HCFC-22 are phased out together with HCFC-141b where it concerns conversion of commercial refrigeration equipment with foam blowing (HCFC-141b) operations. Certain amounts of HCFC-22 are also phased out in Parties with large AC manufacturing operations as of 2014-2015 (approval for these projects in 2011-2012).

8.2 HPMP Preparation Costs and HCFC Demonstration Projects

HPMPs will be prepared as soon as possible after the adoption of the guidelines (at the 54th Executive Committee meeting), which implies that approvals will take place as of the 55th Executive Committee meeting.

At an average cost of US \$170,000 each, it would concern about US \$7.8 million (plus US \$624,000 support costs) for the preparation of all HPMPs for the countries in Groups 1,2 and 3 (52 countries). It would cost about US \$4.15 million (plus about US \$498,000 support costs) for the 83 countries in Group 4 (assuming US \$50,000 each). The funding information is based upon costs for these activities as indicated in the Consolidated Business Plan 2008-2010. Assuming that all plans will be approved in 2008 and 2009, the likely funding requirement for the preparation of the HPMPs in the year 2009 would be **US \$3.5 million** (plus about US \$360,000 agency support costs).

It can logically be assumed that a number of HCFC demonstration projects will be approved while the HPMPs are still being prepared, and where the funding will be approved during the year 2009. An amount of US \$15 million was assumed for demonstration projects in the year 2008 and 2009 (which amount is based upon information given in the Consolidated Business Plan). Demonstration projects were deferred pending the preparation of HPMPs. **US \$5 million** (plus US \$400,000 agency support costs) is assumed by the Task Force to be approved for demonstration projects in the year 2009.

8.3 Funding Requirement Calculation for Non-servicing

On the basis of the above approach, funding requirement calculations have been made for the different Groups of countries.

In principle an early cut-off date (e.g. the year 2000) would have an impact on the operations that would have to be phased out during 2012-2020, since most of the capacity would have been installed after 2000. However, the Task Force considers a cut-off date of 1995 (as for the CFC operations) or 2000 as not feasible; cut-off dates in the range 2005-2008 are considered to be more logical. This, however, implies that for the consumption growth after 2005-2008, less than about 30-40% of total installed capacity would be new, i.e., 60-70% of the capacity would not be limited by any cut-off date rule. Article 5 Parties would therefore be able to request funding for the full reductions in the period 2012-2020 (35-45% reduction, dependent on the 2012 consumption level).

8.3.1 Starting point and funding of certain HCFC consumption levels

The Executive Committee discussed the issue of a starting point during its 54th Meeting, and specifically in much detail in a Contact Group that reported on this to the plenary meeting. Discussions focused on whether an early submission of project proposals (in a HPMP) would be prohibitive for further growth, i.e., whether they would initiate the start of aggregated reductions from a certain level (e.g. the baseline level). Several Parties mentioned that the funding of growth after the years 2009-2010 until the year 2012 would certainly be eligible, even when they would show that, with lower growth, the HCFC phase-down process would have started. The result of the discussions was that all HPMPs will be considered on their own merits, i.e. certain Parties would be able to obtain funding for early reductions, others would be funded up to the 2012 consumption, however, most likely at a lower level per ODS kg than others.

The Task Force is not able to translate this discussion into one mathematical approach for the determination of the funding requirement.

It has therefore decided to calculate two funding requirements (actually, specifically for the first 2009-2011 replenishment period):

1. Funding of reductions from the baseline level only; this would represent a minimum in the funding for HCFCs in the first replenishment period;
2. Funding of reductions from the 2012 consumption level for all Article 5 Parties; this would represent a maximum in the funding for HCFCs in the first replenishment period since an extra 5-10% reduction between 2012 and 2013 would be funded.

It will be shown that this choice between baseline and 2012 funding is a very important parameter in the funding calculations. The reality may well lie in the middle, i.e., somewhere between the funding requirement determined for baseline funding and for 2012 funding.

It will be clear that the starting point choice has no meaning for the countries in Group 4, which will be funded to phase out their consumption, which is entirely in the servicing sector.

8.3.2 *Costs and cost effectiveness factors derived*

In the calculation of the funding requirement two cost effectiveness factors have been used, one based upon the funding of two years operating costs and one based on the funding of no operating costs.

One could argue that the principle of funding 2 years operating costs is part of the existing guidelines under the Multilateral Fund. However, it should also be mentioned that

- air conditioning conversions have so far not been considered under the Multilateral Fund (which could result in any decision on the funding of operating costs), and that
- the Fund has not considered operating costs in the conversion of MACs and compressors.

According to the Task Force this would justify the variation in the cost effectiveness, with consideration of two and zero years duration of operating costs.

HCFC-141b

Since the data for HCFC-141b reported under Article 7 do not give any information on which types of foam and which types of companies it concerns, certain assumptions have to be made. This concerns the number of companies at certain sizes in a country, and the alternatives for HCFC-141b chosen. The Task Force reviewed the information currently available, i.e., the ExCom paper 54/54, which contains information on capital cost in relation to retrofits and replacements for HCFC-141b, as well as on operating costs, and information from other sources. On this basis, cost effectiveness factors assumed to be globally valid have been determined by the Task Force.

Capital costs are generally estimated higher than the operational cost or saving (both for one and for two years operating costs). The cost effectiveness factor calculated on the basis of two years operating costs is equal to US \$6.85 per ODS kg. The second cost effectiveness factor, which is based on no operating cost funding at all equals US \$5.32.

HCFC-141b is also used as a solvent, where it can be replaced by a number of replacements, which are often flammable, sometimes toxic. The percentage of HCFC-141b in the total that is used in solvent operations, is estimated at 0-20% of the HCFC-141b consumption, dependent on the Article 5 Party. Replacements cannot be done without reformulation and adjustments in

equipment. It is difficult to come up with cost estimates at this stage. Due to the fact that the quantities are relatively small compared to the use of HCFC-141b in foam, the same cost effectiveness factors as for the replacement of HCFC-141b in foams have been used in this report.

HCFC-142b

Where it concerns HCFC-142b the following can be stated. Foam can be blown with varying percentages of HCFC-142b and HCFC-22, where HCFC-22 can go up to 100%. Given the consumption figures for HCFC-142b as reported under Article 7 for the years 2005 and 2006, the tonnages involved in foam blowing with HCFC-142b and HCFC-22 have been estimated. It concerns relatively low amounts of HCFC-142b in virtually all Article 5 Parties (except for three major consumers). The same method has been applied for estimating the cost effectiveness factor for HCFC-142b foam blowing as for HCFC-141b. This results in a cost effectiveness factor of US \$5.50 for two years operating costs funding (where there is in fact an operating cost saving). The cost effectiveness factor would be US \$5.70 for no operating cost funding. It should be emphasised that the lowest cost would occur in case operating costs would be taken into consideration.

HCFC-22

In the case of the use of HCFC-22 in refrigeration and air conditioning products, it concerns again a variety of sub-sectors, and a variety of companies (with specific sizes) that manufacture products; certain assumption have to be made here as well.

On the basis of

- a two-third/one-third product mix of air conditioning and commercial refrigeration,
- the assumption of the possible use of HFC blends as well as the possible use of hydrocarbons (mostly propane), particularly in smaller sized equipment (and to a certain degree in larger size equipment),
- the funding of two years of operating costs,

a cost effectiveness factor of US \$17.37 per ODS kg can be determined. The calculation is based upon information regarding capital and incremental costs such as given in ExCom document 54/54 and on information from some other sources.

The cost effectiveness is based upon a factor of US \$17.1 in commercial refrigeration and US \$17.5 in air conditioning. These figures assume a reasonable amount of conversions to hydrocarbons (order of 25% of the total quantities considered), but the proliferation of hydrocarbons and other low GWP solutions into many sub-sectors is something that may increasingly happen in the future.

The cost effectiveness factors are high because of the high operating costs in particular in the case of air conditioning (US \$15 in the costs per kg is due to two years operating costs). In the case of the funding of no operating costs funding the factor would be US \$5.17, where the capital costs are US \$2.5 for air conditioning and US \$10.5 for commercial refrigeration (using the shares of 67% for air conditioning and 33% for commercial refrigeration in the global total).

A large portion of all air conditioning is exported to non-Article 5 Parties, which may well be 35% in certain Parties. However, if this aspect would have to be translated into a global cost effectiveness figure (which takes into account both commercial refrigeration and stationary air conditioning), a reduction by 20% for the cost effectiveness figure seems reasonable.

This would imply a value of US \$13.90 per ODS kg in case of the funding of two years operating costs, and a value of US \$4.14 per ODS kg in the case of no operating costs funding.

Once the HCFC phase-out will be addressed via the future HPMPs, issues such as export etc. can be considered differently, and the type of cost effectiveness considered in the HPMPs will be a more specific one.

8.3.3 Results of calculations

As a result of the above strategy and the cost assumptions, the following funding requirement has been calculated for all Article 5 Parties for the conversion of all non-servicing uses during 2012-2020 (approvals in 2009-2017), for two funding policies as defined above, and for two combinations of cost effectiveness factors (HCFC-141b and -142b foams and refrigeration, 2 years and zero years duration of operating costs).

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
FU BASE CE 2Y OP	0	42.61	74.76	109.13	111.00	102.64	106.22	106.09	125.35
FU BASE CE 0Y OP	0	24.81	43.07	65.06	67.47	68.70	69.27	69.09	77.74
FU 2012 CE 2Y OP	99.00	116.87	149.01	109.13	111.00	102.64	106.22	106.09	125.35
FU 2012 CE 0Y OP	70.19	77.45	95.71	65.06	67.47	68.70	69.27	69.09	77.74

Table 8-1 Funding requirement calculated for HCFC consumption for the years in the period 2009-2017 (US \$ million) for four cases, involving two funding principles and two combinations of cost effectiveness factors. It is shown that there are in fact only two scenarios for the period after 2011.

This considers the phase-out of HCFC-141b in most years for most Article 5 Parties. It considers relatively small amounts of HCFC-22 in approvals

before 2015, with the exception for some countries in Group 2 and Group 3 (countries in the latter Group have virtually only HCFC-22 consumption).

8.4 Funding Requirement Calculation for the Servicing Part

8.4.1 *Ways and means*

Addressing HCFC consumption in the servicing sector in many Article 5 Parties (in particular the small volume consuming countries) is required for achieving the 2013-2015-2020 allowable levels of consumption. This because HCFC-22 used for servicing equipment represents a substantial portion of the total consumption of HCFCs in virtually all Article 5 Parties and HCFC-22 is the only HCFC used in a large number of Parties.

The addressing of the servicing sector could include similar activities as approved in RMPs and NPP/TPMPs (for CFCs), adapted to the circumstances of HCFCs. The Task Force mentions as examples::

- Assistance for drafting new or reviewing the current ODS legislation in general and the licensing system in particular to include all HCFCs;
- Additional support to strengthen the institutional capacities in the country, in particular the customs department and enforcement officers, directed towards HCFCs;
- Additional support for refrigeration servicing technicians by providing hand-on training in good service practices of HCFC-based equipment, retrofit techniques for HCFC-based refrigeration, and handling of various different refrigerants;
- designing a sustainable incentive programme that would allow for retrofitting or replacing HCFC-based equipment at a minimum cost to end-users etc.;
- Additional support to the institutions that have been established in the servicing sector, in particular schools for training refrigeration technicians; project management units which are responsible for the preparation of action programmes, co-ordination of phase-out activities with stakeholders, and monitoring and reporting; and refrigeration associations.

8.4.2 *Incremental costs in the servicing sector*

On the basis of the modelling of the different sectors for the different Parties where it concerns the amounts to be phased out, and based on the assumptions mentioned above, it can be calculated that, in the period 2013-2020, more than 70,000 ODS tonnes of HCFC-22 could be phased out.

The Task Force has made a preliminary calculation regarding incremental costs in this sector. The calculation is based on the providing of additional funding for activities as mentioned above (reviewing ODS legislation, customs training, training programmes for refrigeration technicians, funding for monitoring and evaluation etc.). In all cases a relation has been assumed

between the HCFC consumption level and the funding considered for the different activities.

The total funding for a country with 2 tonnes of ODP consumption in servicing would be US \$115,400 for the complete support of the phase-out of HCFC-22 in servicing. For a country with 20 ODP tonnes consumption it would be US \$221,500, for a country with 100 ODP tonnes consumption US \$552,900, and for 7,800 ODP tonnes consumption in servicing it would be US \$13,819,400.

Consumption (ODP tonnes)	2	5	10	35	70	190	350	560	11700
Number of countries	61	15	25	12	6	8	4	3	1
Costs (US \$ million)	7.039	2.798	5.538	4.420	3.317	7.735	5.406	5.971	20.202

Table 8-2 Cost estimates for Article 5 Parties for addressing the servicing sector on the basis of the HCFC-22 consumption in the servicing sector (ODP tonnes); costs for all countries on each category are given

The amounts can be calculated in each consumption group by multiplying the number of countries with the cost estimated for a country in a category. The consumption level, which forms the basis for the calculation of the different elements, can be based on a certain year. In this study the consumption estimated (extrapolated) for the baseline (or freeze value) has been selected and this yields a total of US \$62.424 million.

Funding for servicing is supposed to be disbursed for three-year periods. It is assumed that one time the amount of US \$63 million would be needed to reach the 2105 10% reduction level. As a next step, the amount of US \$63 million is assumed for the next 20-25% reduction, i.e. for the next two three-year periods. This would imply as funding of US \$31.5 million per triennium.

8.5 HCFC Production Phase-out

The HCFC production phase-out has been taken into account in the following manner:

- production phase-out of HCFC-141b and -142b is assumed in parallel with the consumption phase-out and is based on plant closures (as in the case of CFCs, halons, MB etc.);
- Production phase-out will be funded once the funded consumption reduction has been implemented, i.e., the funding of production phase-out does not start until 2012 (once first projects approved in 2009 in HPMPs will have been implemented);
- During the triennium 2012-2014, the phase-out of HCFC-141b is actually the only one considered, since this is the chemical that will be phased out

first (because of its high ODP compared to HCFC-22 and -142b) and since HCFC-141b has no feedstock use;

- production phase-out of HCFC-22 is assumed in parallel with the consumption phase-out, as of the year 2014-2015 (when CDM approvals for HCFC-22 plants have been reviewed and a new post Kyoto regime could have started; in this regime, the issuing of CERs for HFC-23 abatement in HCFC-22 plants may be considered differently). Matters are complicated because of the fact that HCFC-22 is also used as feedstock and this feedstock use will be growing during the next decades. Furthermore it is complicated by the fact that only a certain percentage of the HCFC-22 plants (in China) is considered under the CDM, and it is unclear whether these plants are assumed to produce for feedstock or for emissive uses;
- the production phase-out of HCFC-22 in all Parties except China (about 10% of the Article 5 HCFC-22 consumption) will have no impact on production phase-out funding. Namely, it concerns plants which have already been funded for CFC closure; these plants are swing plants, that could also manufacture HCFC-22;
- Based upon experience in CFC plant closure, costs could be between US \$3.00 and 3.50, with maximum values ranging up to US \$8.00. The Task Force decided to use the value of US \$3.00 per kg of HCFC phased out in production. More precise knowledge of the age of production plants at closure would lead to more accurate figures (which should become available once more details are given in HPMPs).

Calculation based upon the assumptions mentioned above gives the following amounts for approval in the period 2009-2017:

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
Funding Baseline	0	0	0	0	27.66	26.46	31.05	64.41	61.47
Funding 2012 Consump	0	0	0	93.06	27.66	26.46	31.05	64.41	61.47

Table 8-3 Cost estimates for addressing the production sector on the basis of the HCFC consumption phase-out (in US \$ million) for two different funding principles (baseline funding and 2012 consumption funding)

8.6 Funding Requirement for HCFCs

The funding requirement for HCFCs has been determined on the basis of:

- costs for the HCFC consumption phase-out in the non servicing sector for four cases, two funding principles (baseline funding and 2012 funding), and two cost effectiveness factor combinations;

- costs for the HCFC phase-out in the production sector for two funding principles (see above, differences only exist for the year 2009);
- costs for the HCFC phase-out in the servicing sector.

The above has been combined in funding ranges for the different situations. All values are given in Table 8-4.

Costs for the HCFC Phase-out Management Plans preparations in the period 2009-2011 and costs for demonstration projects in the period 2009-2011 have not been taken into consideration in Table 8-4.

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
HCFC Cons Funding Base CE 2Y OP	0	42.61	74.76	109.13	111.00	102.64	106.22	106.09	125.35
HCFC Cons Funding Base CE 0Y OP	0	24.81	43.07	65.06	67.47	68.70	69.27	69.09	77.74
HCFC Cons Funding 2012 CE 2Y OP	99.00	116.87	149.01	109.13	111.00	102.64	106.22	106.09	125.35
HCFC Cons Funding 2012 CE 0Y OP	70.19	77.45	95.71	65.06	67.47	68.70	69.27	69.09	77.74
HCFC Consumption Funding Base	0	24.81- 42.61	43.07- 74.76	65.06- 109.13	67.47- 111.00	68.70- 102.64	69.27- 106.22	69.09- 106.09	77.74- 125.35
HCFC Consumption Funding 2012	70.19- 99.00	77.45- 116.87	95.71- 149.01	65.06- 109.13	67.47- 111.00	68.70- 102.64	69.27- 106.22	69.09- 106.09	77.74- 125.35
HCFC Production phase-out Funding Base	0	0	0	0	27.66	26.46	31.05	64.41	61.47
HCFC Production phase-out Funding 2012	0	0	0	93.06	27.66	26.46	31.05	64.41	61.47
HCFC Servicing	21	21	21	10.5	10.5	10.5	10.5	10.5	10.5
TOTAL Funding Base	21	45.81- 63.61	64.07- 95.76	75.56- 119.63	105.63 149.16	105.66 139.60	111.27 148.22	144.00 181.00	149.71 197.32
TOTAL Funding 2012	91.19- 120.00	98.45- 137.87	116.71 170.01	168.62 212.69	105.63 149.16	105.66 139.60	111.27 148.22	144.00 181.00	149.71 197.32
TOTAL Triennium Funding Base		130.88-180.37		286.85-408.39			404.98-526.54		
TOTAL Triennium Funding 2012		306.35-427.88		379.91-501.45			404.98-526.54		

Table 8-5 Funding for addressing the HCFC consumption (non-servicing) and servicing sector as well as the production sector. Amounts given are for two different funding principles and for two cost effectiveness factor combinations.

9 **Destruction and Disposal**

One of the elements described in the report of the TEAP Task Force on Decision XVIII/12 as having the most significant environmental impact (accelerated recovery of the ozone layer, lowering of climate impact) is everything surrounding the end-of life and the sound disposal of ODS chemicals (and products containing ODS).

Although the Montreal Protocol has so far not considered emissions reduction measures, the language on environmentally sound replacement technologies for HCFCs in Decision XIX/6 is directly related to the emissions of high and low GWP gases.

Based upon the calculations and recommendations from the XVIII/12 Task Force report, the Replenishment Task Force is of the opinion that destruction and disposal need to be addressed under the Multilateral Fund now that the phase-out comes near and the amount of products containing CFCs and other ODS that become obsolete will further grow. Where it concerns the destruction of chemicals, the Task Force would like to note that this issue would not only apply to the Montreal Protocol, but also to possible decisions under the Stockholm Convention on POPs; this could have implications for projects, funding levels and co-funding.

Together with the proposal for some first small studies, the Implementing Agencies originally proposed a total funding of about US \$41 million for addressing ODS destruction and disposal in the period 2008-2010. The Executive Committee, in its 54th Meeting, decided to not further consider these types of projects in the period 2008-2010 (except for one bilateral project).

The Replenishment Task Force is of the opinion that, even with the current decision by the Executive Committee, revisiting of the decisions on funding can be expected in 2009 (and/or 2010).

The Task Force has considered numbers from Implementing Agencies and National Ozone Units, which indicate a total of about 9-12,000 metric tonnes in all Article 5 Parties.

The study published as Executive Committee document 48/42 indicates at an amount of about 1,200-1,500 tonnes of non-wanted and/or contaminated material that could become easily available per year. If efforts would be increased, this amount would even drastically increase.

The Task Force therefore proposes to consider a funding for destruction of 1,500 tonnes per year. Studies mention costs for collection, transport and storage of US \$5-7 per kg.

At US \$6 per kg, this implies an amount of US \$27 million for the triennium 2009-2011. As an indicative amount the Task Force has also used a funding requirement of US \$27 million for the period 2012-2014. This amount may well be the same in the triennium 2015-2017.

The cost of US \$5-7 per kg of ODS, with a GWP of about 4000-10,000, could be translated into about US \$1 per tonne of carbon dioxide. At current market trading prices of US \$5-15 per tonne of carbon dioxide, disposal and destruction of ODS can be considered a very cheap global warming gas emission abatement method, which would certainly deserve further consideration.

The Task Force is of the opinion that, if more funding would be needed for projects in the triennium 2009-2011, co-funding (even from climate directed funds) could be sought for addressing the issue.

10 The Funding Requirement for Supporting Activities for the 2009-2011 Replenishment and Indicative Figures for the Periods 2012-2014 and 2015-2017

This chapter presents the funding requirements for support activities for investment projects. These are classified as follows:

- (1) UNEP's Compliance Assistance Programme (CAP);
- (2) Institutional Strengthening projects;
- (3) Core unit funding for Implementing Agencies.
- (4) Secretariat, Executive Committee and Treasurer
- (5) Technical Assistance

10.1 Replenishment for 2009-2011

10.1.1 The CAP; Personnel Costs, Clearing-house and Information Exchange Activities (UNEP)

As an Implementing Agency of the Multilateral Fund, UNEP implements clearing-house and information exchange activities such as global information exchange, and the regional networking of National Ozone Officers. UNEP has brought its information dissemination, personnel, subcontract, training, equipment and premises components together in a "Compliance Assistance Programme", CAP. CAP has been functioning since the beginning of 2003.

For the year 2008 UNEP CAP costs are budgeted at US \$9,169,728. The costs for 2009-11 are pegged at US \$9,444,820 for 2009, at US \$9,728,164 for 2010 and at US \$10,020,009 for 2011, which amounts to a total of **US \$29.192 million** for the 2009-2011 triennium. The growth of 3% per year is following the relevant Executive Committee decision. Agency support costs for the CAP are at a level of about 8%, i.e. US \$2.33 million, which are included.

10.1.2 Institutional Strengthening (IS)

From MLF Secretariat information the Task Force has derived that the committed amounts for 2009-11 for IS projects are US \$6,711,920 for the year 2009, US \$8,998,009 for the year 2010 and US \$6,711, 920 for the year 2011, which yields a total of **US \$22.422 million** (the higher amount in 2009 is because of the fact that the separate Article 5 Parties get Institutional Strengthening funding approved for a two year period). In this amount agency support costs of US \$862,400 are included (UNEP does not receive support cost for IS as it is part of the CAP agreement). The annual amounts reflect the Parties up for IS renewal in the years above. Hence, a larger number of Parties and maybe Parties with higher Institutional Strengthening

support receive funding in even years. The average annual cost is US \$7,437,646.

10.1.3 Core Unit Funding for the Implementing Agencies

The current administrative cost regime is that the staffing levels of UNDP, UNIDO and the World Bank would be maintained by giving them a core unit funding in addition to applying an agency fee of 7.5% for projects with a cost of US \$250,000 and above (including Institutional Strengthening and project preparation costs) and 9% for projects below US \$250,000. The core unit costs were initially set at US \$1.5 million for the World Bank and at US \$1.7 million for UNDP and UNIDO. Annual increases of 3% are normally considered. There are no core unit costs for UNEP as it is covered under the CAP program and the associated support cost. The Task Force has estimated the core unit costs at US \$5,378,619 for 2009, at US \$5,539,977 for 2010 and US \$5,706,177 for 2011, a total of **US \$16.624 million**.

An independent administrative cost study is now being undertaken for the Executive Committee to provide a comprehensive review of the agency core unit costs, the UNEP CAP costs and the Implementing Agency fees. Results are expected before the 55th Executive Committee meeting in July 2008.

10.1.4 Operating Costs of the Executive Committee and the MLF Secretariat

The funding required for the operating costs of the MLF Secretariat -- including the monitoring and evaluation task-- and the Executive Committee was determined through consultations with the MLF Secretariat regarding past operating budgets and the anticipated future workload. In principle, no major change is expected to the level of the operating budget except for providing for monetary inflation. From the COM model the Task Force derived figures of US \$6,576,862 for 2009, US \$6,749,358 for 2010 and US \$6,930,479 for 2011 for the costs of the MLF Secretariat and the Executive Committee, totalling **US \$20.257 million**.

10.1.5 Costs of the Treasurer

The costs for the Treasurer are budgeted at US \$0.5 million per year. This implies a funding requirement of **US \$1.5 million** for 2009-2011.

10.1.5 Technical Assistance

In the replenishment period 2006-2008 technical assistance funding (which was used for updating all kinds of activities that fall outside the CAP program and other supporting activities, which could be related to updating of manuals, new brochures etc.) was used at a level of US \$ 1.0 million.

For the triennium 2009-2011 a sum of US \$2 million is proposed (including support costs).

10.2 Replenishment for the periods 2012-2014 and 2015-17 (projections for the future beyond 2011)

UNEP CAP

The indicative allocations will be US \$31.899million for the period 2012-14 with 8% support costs of US \$2.55 million; it will be US \$34.856 million for the period 2015-17 with US \$2.79 million support costs.

IS

The Institutional Strengthening component remains the same every two years if the funding is not changed by Executive Committee decisions. The costs for 2012-2014 will therefore be US \$24.416 million, for the period 2015-2017 it will be US \$22.422 million.

Agency Core costs

Assuming the same trend to continue in future, the replenishment for the Agency Core Unit costs for 2012-14 will be US \$18.165 million and for 2015-17 it will be US \$19.850 million

MLF Executive Committee and Secretariat costs

Assuming a 3% increase annually, the need for the UNMLF Executive Committee and Secretariat costs for 2012-14 will be US \$22.064 million and for 2015-17 it will be US \$24.188 million.

Treasurer costs

The costs of the treasurer paid now i.e., US \$500,000 per year are not based on actual costs but are notional reimbursements to UNEP. It is assumed that the costs of US \$1.5 million for the treasurer will continue for the next two trienniums, i.e., the two replenishment periods 2012-2014 and 2015-2017.

Technical Assistance

Technical assistance is assumed to continue at the level of 2009-2011.

10.3 Total funding requirement for supporting activities

In the table the total funding requirement for the supporting activities is given.

Cost Item	2009 to 2011	2012 to 2014 (indicative)	2015 to 2017 (indicative)
ExCom and MLF Secretariat	20.257	22.135	24.188
Treasurer	1.50	1.50	1.50
CAP	29.192	31.898	34.856
IS for NOUs	22.422	24.416	22.422
IA core unit cost*	16.624	18.165	19.850
Technical Assistance	2.000	2.000	2.000
Total funding (USD million)	91.995	100.114	104.816

* The agency support costs of 7.5-13% for Implementing Agencies and for Bilateral Agencies related to the individual Executive Committee approved and MLF funded activities are included in the ODS phase-out investment tables.

11 Total Funding Requirement

The estimates for the individual expenditure categories discussed in previous chapters are combined into the total estimated funding requirement for the 2009-2011 replenishment for four funding scenarios:

- Two scenarios in which the HCFC consumption level to be funded is either baseline funding (2009/2010) or 2012 funding (2012 being the year before the freeze in 2013), and
- Two scenarios in which the cost effectiveness parameter is varied by assuming zero or two years operating costs in the calculation of this parameter (no thresholds are applied).

In the first two funding scenarios the lower value is the funding of the baseline consumption of 2009/2010, the higher value is the funding of growth beyond the baseline, up to and including the estimated 2012 HCFC consumption. In the second two cost effectiveness scenarios (which can be combined with one of the two funding scenarios), the minimum is funding for zero years operating costs funding, the maximum is funding for two years operating costs. More details on the specific aspects for HCFC funding for these scenarios can be found in chapters 8 and 9.

In Tables 11-1 and 11-2 below, the results of the calculations for the four scenarios are given. Tables 11-1 and 11-2 contain a number of elements related to (1) the ODS (non-HCFC) phase-out where funding has been agreed, (2) new (non-HCFC) elements where the funding is expected to be agreed as of mid-2008, (3) funding estimates for disposal and destruction, (4) funding estimates for the preparation of HPMPs and demonstration projects, (5) the particularly important funding estimates for addressing HCFC reductions, as well as (6) funding estimates for supporting activities.

In Table 11-1 the funding estimate for HCFC phase-out projects is given as a range for the baseline funding scenario, with variation of the cost effectiveness parameter, together with an estimate for the funding required for the servicing sector. Table 11-2 is identical to Table 11-1, with the one major exception that the funding estimates for HCFC phase-out projects are given for the “year 2012 funding” scenario. In Tables 11-1 and 11-2 no funding for production closure is assumed since closure funding is not expected to be submitted and approved before the 2012-2014 triennium.

Tables 11-3 and 11-4 are comparable to Tables 11-1 and 11-2, with baseline funding assumed in Table 11-3, and 2012 funding assumed in Table 11-4. A major difference between those two tables is the funding assumed for production closure during the period 2012-2014, according to the funding scenarios, where the 2012 funding scenario yields the largest funding requirement (Table 11-4).

The indicative funding requirements for the separate years 2012, 2013 and 2014 and for the triennium 2015-2017 are also given. In the case of the years 2013 and 2014, the range that is calculated is due to the difference in the cost effectiveness scenarios, and there is no impact anymore of the different funding scenarios. The same applies for the indicative funding requirement calculated for the triennium 2015-2017.

Funding requirement estimates are based on the actual costs incurred and year 2008 prices.

Table 11-1 All elements that determine the 2009-2011 total funding requirement (US \$ million) for the scenario “baseline funding” and two cost effectiveness factor combinations

Funding requirement	2009-2011	2009-2011 agency support
ALL ODS RELATED ACTIVITIES		
ODS (NON-HCFC) CONSUMPTION		
<i>ODS Phase-out plans, approved</i>	10.731	1.025
<i>ODS Phase-out plans, new</i>	1.750	0.131
<i>TPMPs, new</i>	4.896	0.595
<i>MDI</i>	23.950	1.796
<i>MB, approved</i>	5.926	0.500
<i>MB, new</i>	6.280	0.544
CTC, Halons		
<i>CTC, approved</i>	3.212	0.241
<i>Process Agents, approved</i>	2.500	0.182
<i>CTC, TCA, assistance</i>	0.220	0.020
<i>Halons, assistance</i>	0.075	0.006
ODS (NON-HCFC) PRODUCTION		
<i>CFC production phase-out</i>	15.800	1.158
<i>MB production phase-out</i>	2.000	0.150
HCFC RELATED ACTIVITIES		
<i>HPMP preparation</i>	3.500	0.360
<i>HCFC Demo-projects</i>	5.000	0.400
HCFC PHASE-OUT ACTIVITIES		
<i>HCFC phase-out, non-servicing*</i>	67.88-117.37	(included)
<i>HCFC phase-out, servicing*</i>	63.000	(included)
<i>HCFC, production phase-out</i>	0.000	(included)
DESTRUCTION, DISPOSAL	25.116	1.884
SUPPORTING ACTIVITIES		
<i>ExCom, Secretariat</i>	20.257	
<i>Treasurer</i>	1.500	
<i>Core Unit costs</i>	16.624	
<i>CAP</i>	29.192	
<i>Institutional Strengthening</i>	21.560	0.862
<i>Technical Assistance</i>	1.820	0.180
TOTAL	332.79-382.28	10.03

If agency support costs are included, the total funding requirement for the period 2009-2011, assuming the scenario **baseline funding**, is determined at **US \$342.8-US \$392.3 million**.

Table 11-2 All elements that determine the 2009-2011 total funding requirement (US \$ million) for the 2012 funding scenario (allowing for funded consumption growth until 2012) and cost effectiveness factor combinations

Funding requirement	2009-2011	2009-2011 agency support
ALL ODS RELATED ACTIVITIES		
ODS (NON-HCFC) CONSUMPTION		
<i>ODS Phase-out plans, approved</i>	10.731	1.025
<i>ODS Phase-out plans, new</i>	1.750	0.131
<i>TPMPs, new</i>	4.896	0.595
<i>MDI</i>	23.950	1.796
<i>MB, approved</i>	5.926	0.500
<i>MB, new</i>	6.280	0.544
CTC, Halons		
<i>CTC, approved</i>	3.212	0.241
<i>Process Agents, approved</i>	2.500	0.182
<i>CTC, TCA, assistance</i>	0.220	0.020
<i>Halons, assistance</i>	0.075	0.006
ODS (NON-HCFC) PRODUCTION		
<i>CFC production phase-out (incl. Accel.)</i>	15.800	1.158
<i>MB production phase-out</i>	2.000	0.150
HCFC RELATED ACTIVITIES		
<i>HPMP preparation</i>	3.500	0.360
<i>HCFC Demo-projects</i>	5.000	0.400
HCFC PHASE-OUT ACTIVITIES		
<i>HCFC phase-out, non-servicing</i>	243.34-364.88	(included)
<i>HCFC phase-out, servicing</i>	63.000	(included)
<i>HCFC, production phase-out</i>	0.000	(included)
DESTRUCTION, DISPOSAL	25.116	1.884
SUPPORTING ACTIVITIES		
<i>ExCom, Secretariat</i>	20.257	
<i>Treasurer</i>	1.500	
<i>Core Unit costs</i>	16.624	
<i>CAP</i>	29.192	
<i>Institutional Strengthening</i>	21.560	0.862
<i>Technical Assistance</i>	1.820	0.180
TOTAL	508.25-629.79	10.03

If agency support costs are included, the total funding requirement for the period 2009-2011, under the scenario **funding to address the 2012 consumption**, is determined at **US \$518.3-US \$639.8 million**. Averaged this is about US \$210 million higher than the funding calculated for the baseline funding 2009/2010 with the same cost-effectiveness factor combinations.

It is likely that the funding requirement in future will neither be the baseline funding or the 2012 consumption funding. This will depend on the approaches how the HCFC phase-out will be dealt with in certain Parties, according to HPMPs to be submitted, and how these plans are validated in future Executive Committee approaches and decisions.

For all Article 5 Parties together, it could be assumed that the total funding requirement would be the medium of the two values, i.e., would be the average of the baseline funding and the 2012 consumption funding for the two cost effectiveness factor combinations selected.

This would yield a (more narrow) range for the 2009-2011 funding requirement (based upon two cost effectiveness factor combinations) of **US \$430.6-US \$516.1 million**. However, it should be realised that this figure is based on very definite funding assumptions that could be different in practice.

Table 11-3 All elements that determine the 2012-2014 total indicative funding requirement (US \$ million) for the scenario allowing for baseline consumption funding and two cost effectiveness factor combinations; in this triennium production closure is assumed to be funded

Funding requirement	2012-2014	2012-2014 agency support
ALL ODS RELATED ACTIVITIES		
ODS (NON-HCFC) CONSUMPTION		
<i>ODS Phase-out plans, approved</i>	0.113	0.008
<i>MB Phase-out plans</i>	4.223	0.368
ODS (NON-HCFC) PRODUCTION		
<i>MB production phase-out</i>	1.790	0.134
ALL HCFC RELATED ACTIVITIES		
<i>HCFC phase-out, non-servicing</i>	201.236-322.762	(included)
<i>HCFC phase-out, servicing</i>	31.500	(included)
<i>HCFC, production phase-out</i>	54.120	(included)
DESTRUCTION, DISPOSAL	25.116	1.884
SUPPORTING ACTIVITIES		
<i>ExCom, Secretariat</i>	22.135	
<i>Treasurer</i>	1.500	
<i>Core Unit costs</i>	18.165	
<i>CAP</i>	31.899	
<i>Institutional Strengthening</i>	23.477	0.939
<i>Technical assistance</i>	1.820	0.180
TOTAL	417.09-538.62	3.51

Tables 11-3 and 11-4 give the indicative values for the funding requirement 2012-2014. If agency support costs are included, the total funding requirement for the period 2012-2014 for the scenario **baseline funding** is determined at **US \$420.6-US \$542.1 million** (see Table 11-3).

It is assumed that, for all the years beyond 2009-2011, the Implementing Agency Core Unit costs, the Executive Committee and MLF Secretariat costs and the CAP costs do not change, except for a 3% per year increase.

For the baseline funding scenario, production phase-out (closure) costs in 2012 are zero, however, for the 2012 funding scenario the amounts to be funded for phase-out in production are at a maximum in 2012. This scenario then results in virtually the same numbers (Table 11-4) as given in Table 11-3, but with a major difference in the production phase-out funding.

Table 11-4 All elements that determine the 2012-2014 total indicative funding requirement (US \$ million) for the scenario “2012 funding” (allowing for consumption growth that will be funded until 2012) and two cost effectiveness factor combinations; in this case the production closure funding will be maximal due to the funding of the production up to and including the year 2012

Funding requirement	2012-2014	2012-2014 agency support
ALL ODS RELATED ACTIVITIES		
ODS (NON-HCFC) CONSUMPTION		
<i>ODS Phase-out plans, approved</i>	0.113	0.008
<i>MB Phase-out plans</i>	4.223	0.368
ODS (NON-HCFC) PRODUCTION		
<i>MB production phase-out</i>	1.790	0.134
ALL HCFC RELATED ACTIVITIES		
<i>HCFC phase-out, non-servicing</i>	201.236-322.762	(included)
<i>HCFC phase-out, servicing</i>	31.500	(included)
<i>HCFC, production phase-out</i>	147.180	(included)
DESTRUCTION, DISPOSAL	25.116	1.884
SUPPORTING ACTIVITIES		
<i>ExCom, Secretariat</i>	22.135	
<i>Treasurer</i>	1.500	
<i>Core Unit costs</i>	18.165	
<i>CAP</i>	31.899	
<i>Institutional Strengthening</i>	23.477	0.939
<i>Technical assistance</i>	1.820	0.180
TOTAL	510.15-631.68	3.51

If agency support costs are included, the total funding requirement for the period 2012-2014 for the scenario **funding to address the 2012 consumption**, is determined at **US \$513.7- US \$635.2 million**.

As for the 2009-2011 funding requirement, it could be assumed that the total funding requirement would be in the middle of the two extremes, i.e., would be the average of the baseline and the 2012 consumption funding scenarios, for two cost effectiveness factor combinations.

This would yield a range for the 2012-2014 indicative funding requirement (based upon two cost effectiveness factor combinations) of between **US \$467.2 and US \$588.7 million.**

Dependent on the cost effectiveness factor scenarios considered, the costs for the separate years 2012, 2013 and 2014 vary between US \$115 and US \$145 million as minimum values, and US \$180 and 210 million as maximum values per year. For each of the years 2012, 2013 or 2014, the average is in the US \$160-165 million range. Adding the funding requirement of one or two years to a certain triennium does not seem to have advantages, taking into account the assumptions and approaches used in this report; however, it is not for the Task Force to give a judgement here.

One aspect that deserves mentioning here is that, with the HCFC activities developing during 2008/2009, also via the submission and approvals of HCFC Management Plans, the uncertainty in the funding requirement as observed at present may decrease, in particular for the years after 2012. Further analysis regarding the period, i.e., the number of years, for which the funding requirement for the Multilateral Fund should be determined in the future, after the year 2011, might well be somewhat premature at this stage.

Table 11-5 Subdivision of funding elements for the separate years 2012, 2013 and 2014 for two scenarios regarding cost effectiveness factor combinations, for all separate years and two scenarios for consumption funding (baseline and 2012 funding). The difference between the funding scenarios is only visible in the year 2012, not in the years 2013 and 2014

Funding requirement	2012	2013	2014
ALL ODS RELATED ACTIVITIES	(US M\$)	(US M\$)	(US M\$)
<i>ODS, non HCFC</i>	0.121		
<i>MB, consumption / production</i>	3.159	1.063	2.293
ALL HCFC RELATED ACTIVITIES			
<i>HCFC phase-out, non-servicing</i>	65.064- 109.129	67.470- 110.997	68.701- 102.636
<i>HCFC phase-out, servicing</i>	10.5	10.5	10.5
<i>HCFC, production phase-out</i>	0-93.06	27.660	26.460
DESTRUCTION, DISPOSAL	9.000	9.000	9.000
SUPPORTING ACTIVITIES			
<i>ExCom, Secretariat</i>	7.138	7.353	7.573
<i>Treasurer</i>	0.500	0.500	0.500
<i>Core Unit costs</i>	5.877	6.054	6.235
<i>CAP</i>	10.321	10.630	10.949
<i>Institutional Strengthening</i>	8.998	6.712	8.998
<i>Technical Assistance</i>	0.663	0.663	0.663
TOTAL	115.0- 208.0	141.3- 184.8	145.5- 179.4

In Table 11-6 the indicative funding requirement for the period 2015-2017 is given, with a range for the HCFC funding requirement in the non-servicing sector, following the application of the two cost effectiveness scenarios. If agency support costs are included, the total indicative funding requirement for the period 2015-2017 is estimated at **US \$536.4-US \$657.9 million**. The higher amount of funding compared to the earlier triennium is caused by the increase in the production phase-out funding.

Table 11-6 All elements that determine the total 2015-2017 funding requirement (US \$ million) assuming two scenarios for cost effectiveness factor combinations

Funding requirement	ALL	2015-2017	2015-2017 agency support
ODS RELATED ACTIVITIES			
ALL HCFC RELATED ACTIVITIES			
<i>HCFC phase-out, non-servicing</i>		216.098-337.657	(included)
<i>HCFC phase-out, servicing</i>		31.500	(included)
<i>HCFC, production phase-out</i>		156.930	(included)
DESTRUCTION, DISPOSAL		25.116	1.884
SUPPORTING ACTIVITIES			
<i>ExCom, Secretariat</i>		24.188	
<i>Treasurer</i>		1.500	
<i>Core Unit costs</i>		19.850	
<i>CAP</i>		34.856	
<i>Institutional Strengthening</i>		21.560	0.862
<i>Technical Assistance</i>		1.820	0.180
TOTAL		533.42-655.00	2.93

In Table 11-7 an overview is given of the funding requirements (or indicative funding requirement for the different scenarios) for the trienniums 2009-2011 and 2012-2014. It is also given for two scenarios for cost effectiveness factor combinations for the period 2015-2017 (in this case the funding parameter, i.e., starting with the baseline or with the 2012 consumption level), does not play a role anymore. “Averaging” the two funding scenarios yields variations for the different trienniums as given for the two cost effectiveness factor scenarios.

The funding requirement per triennium based on different cost effectiveness factor assumptions (for zero year and two years operating costs) is US \$50-90 million smaller for the first triennium 2009-2011 than for the second, and US \$120-160 million smaller for the first than for the third triennium 2015-2017. This is due to the increasing costs for production phase-out (closure).

The difference between the funding requirements based upon two years operating costs and zero years operating costs is larger the higher the percentage of refrigeration and AC activities is in the total. This is particularly due to the air conditioning sector where the capital costs are small

compared to the operating costs (operating costs per year in this study estimated at three times the average capital costs).

Funding requirement Triennium/Assumptions	2009-2011 (US \$ million)	2012-2014 (US \$ million)	
Baseline funding, low cost	342.8	420.6	
Baseline funding, high cost	392.3	542.1	
2012 funding, low cost	518.3	513.7	
2012 funding, high cost	639.8	635.2	
Average of baseline and 212 HCFC consumption funding	2009-2011 (US \$ million)	2012-2014 (US \$ million)	2015-2017 (US \$ million)
Low cost	430.6	467.2	536.4
High cost	516.1	588.7	657.9

Table 11-7 Funding requirements for the Multilateral Fund for the trienniums 2009-2011, 2012-2014 (indicative) and 2015-2017 (indicative), which consist of all funding elements for ODS (non-HCFC) phase-out plans and HCFC phase-out plans (in US \$ million), for two different HCFC cost effectiveness factor combinations, the first one based on zero years, the second one on two years funding of operating costs. The values for the trienniums 2009-2011 and 2012-2014 are also averaged from the two funding cases studied (the baseline and 2012 funding scenarios), so that two values (ranges) remain for the different trienniums that are related to the two cost effectiveness factor scenarios (lower two rows in the table).

12 Concluding Remarks

12.1 Funding Estimates

The TEAP Replenishment Task Force prepared this report on the funding requirement for the 2009-2011 replenishment in accordance with Decision XIX/10 of the Nineteenth Meeting of the Parties. It estimates the funding required to enable the Article 5 Parties to comply with control measures for all Annex A, B, C and E substances. The total funding requirement was determined by the sum of the estimates for the following cost elements:

- a) forward commitments from approved investment projects in the consumption sector,
- b) certain new activities in the consumption sector, all listed in the Consolidated Business Plan for 2008-2010,
- c) forward commitments from approved investment projects in the production sector,
- d) supporting activities, including costs for the CAP programme, Core Unit funding for the Implementing Agencies, operating costs of the MLF Secretariat and Executive Committee and the costs for the Treasurer,
- e) HCFC phase-out investment projects in the non-servicing sector,
- f) investments in the HCFC servicing sector, and
- g) waste disposal and destruction activities.

The analytical methods used to estimate the cost components for non-HCFC investment projects were based on the information provided by the COM model /COM07/.

The cost estimates for HCFC consumption phase-out projects were based on mathematical methods used to estimate future consumption and on four cost scenarios for achieving the HCFC freeze followed by a 10% reduction step in 2015 and a further 25% step in 2020 towards phase-out. Two scenarios directly deal with the consumption level that would be eligible for funding; two other scenarios examine different costs effectiveness factors. The minimum and maximum values from the four different scenarios were used to present the estimate for the funding requirement for the triennium 2009-2011.

The study is based on all relevant decisions of the Executive Committee and the Meeting of the Parties, and on consultations with the MLF Secretariat, the Ozone Secretariat, the Implementing Agencies, and several members of the 2007 and 2008 Executive Committees.

12.2 Trends

Whereas the funding for the ODS consumption and production phase-out (including all supporting activities) was determined as US \$419 million by the 2005 Replenishment Task Force for the triennium 2006-2008, the current study presents a much smaller amount for these activities. For the triennium 2009-2011 it calculates an amount of US \$175.7 million for the ODS (non-HCFC) phase-out activities, including supporting activities. If the amount estimated for waste disposal and destruction is included, the amount would increase to US \$202.7 million. In fact, apart from small amounts for activities after 2011 (mainly methyl bromide), this is the last triennium in which funding will be made available to Article 5 Parties for complying with the ODS (non-HCFC) phase-out schedules, specifically the January 1, 2010 phase-out for most ODS substances.

With the adoption of Decision XIX/6 accelerating the control schedule for Annex C (HCFC) substances, the upcoming triennium immediately becomes important to enabling Article 5 Parties to comply with the new HCFC phase-out schedule, in particular the freeze in 2013 and the 10% reduction in 2015.

Although funding the HCFC phase-out in Article 5 Parties should occur via the approval of HCFC Phase-out Management Plans (HPMPs) (for which guidelines were approved by the Executive Committee in April 2008), no HPMPs have yet been prepared and submitted for approval. The earliest possible date that HPMPs might be considered is June 2008, at the 55th Executive Committee meeting. With a three year implementation lag for projects, and funding required before 2012/2013, it is clear that many HCFC phase-out activities will have to be approved in the upcoming triennium. Since the Task Force had to determine a best estimate for the 2009-2011 funding requirement by May 2008 and without any HPMPs submitted, it had to use a number of mathematical techniques, a large number of assumptions, and several scenarios to develop a best estimate of the cost for the reductions in HCFC consumption.

HCFC consumption data up to 2006 is known from Article 7 reporting to the Ozone Secretariat. But a number of key unknowns had to be estimated:

- The freeze (baseline) level and the HCFC consumption for 2010-2012
- Funding of HCFC consumption for various consumption levels (baseline 2009/2010, 2011 and 2012)
- Costs for a phase-out of HCFCs in USD per kg.

Since baseline levels and the consumption patterns after 2009/2010 had to be extrapolated on a Party by Party basis, the Task Force grouped Article 5 Parties as follows, according to 2004/2005-2006 reported consumption levels:

Group 1: China, accounting for about 75% of the total Article 5 HCFC consumption;

Group 2: 17 larger Article 5 Parties with a consumption of 120 - 1200 ODP tonnes (2000-14000 ODS tonnes), where data studies yield that each of the Parties has between 0.5 and 4% of the total consumption;

Group 3: 34 Article 5 Parties with a consumption of 6-100 tonnes ODP (100-1000 ODS tonnes). The Parties in this group account for less than 5% of the total Article 5 HCFC consumption;

Group 4: 83 Article 5 Parties with consumption up to 6 ODP tonnes (where the only HCFC consumed is HCFC-22 used only for servicing). The aggregate consumption of these 83 Parties constitutes less than 1% of the total Article 5 HCFC consumption.

The relative contribution of the groups to the total HCFC consumption make it clear that minor fluctuations in the forecast consumption of the Parties in Groups 2, 3 and 4 will have little impact on the funding calculations. However, China's consumption level during 2007-2012 (the only Party in Group 1, with 75% of the total consumption) will be determining for the overall funding requirement in the HCFC consumption sector. This is an important issue to take into account when studying the different funding requirement ranges presented in chapter 11.

12.3 HCFC Freeze Level and Consumption Level for Funding

The Task Force derived the baseline (freeze) level and the 2010-2012 consumption level by extrapolating the consumption of the various HCFCs in Article 5 Parties from 2006 (the most recent data reported) through 2012. Based on these results, the Task Force concluded that the use of a few scenarios could be useful. However, the range of funding requirements these scenarios would yield was considered less important than the range that could be derived from variations in cost effectiveness and from variations in the funding of a certain consumption level, from 2009/2010 to 2012.

To further elaborate this methodology, varying the baseline level by assuming different consumption growth rates affects the size of future reduction steps needed to achieve compliance. These steps are expressed as a percentage of the baseline, such as the 10% by 2015 or the 35% by 2020. Funding to enable Parties to achieve these reductions can come from the trienniums after 2011. However, growth that occurs shortly after the baseline years, particularly during the period 2010-2012, creates a more urgent funding requirement; one that must be accommodated during the upcoming triennium.

If the 2012 consumption were to be funded, it would have the effect of just reducing future growth (the principle of "funding against growth"). This is because the funding amount needs to be established in 2009 or 2010, but the

consumption for the year 2012 will not be known until 2013 or 2014, following Article 7 data reporting to the Ozone Secretariat. To address this dilemma, the Task Force assumed that funding could be provided for the 2012 consumption level as the higher limit for funding, and funding for the baseline level could be set as the lower limit. It is possible that Article 5 Parties could accept even lower consumption levels than the baseline level for HCFC funding, as has been discussed within the Executive Committee (April 2008); however, this remains hypothetical absent consideration and approval of HPMPs by the Executive Committee. As the Executive Committee gains more experience with HCFC projects, it will have better information on which to develop guidance to the Task Force.

12.4 Costs

The Task Force derived some cost estimates for specific types of activities that are likely required to phase out HCFCs, known as cost effectiveness factors. These are expressed in USD per kg of substance. They are not expressed in USD per ODP kg, as has been the case for CFCs and other (non-HCFC) ODS. This is because cost effectiveness of HCFCs cannot be compared to cost effectiveness of other ODS on an ODP weighted basis. The cost of phasing out a quantity of an HCFC should not be appreciably different than phasing out an equal quantity of another ODS. However, because the ODP of the HCFC is only a fraction of that of other ODS an ODP-weighted comparison would make it appear that the cost effectiveness of an HCFC conversion was many times lower (i.e., higher costs) than the conversion of another ODS.

As a result, no cost effectiveness thresholds have been applied to HCFC conversion projects, but cost effectiveness factors were calculated. The Task Force has only considered three HCFCs (HCFC-22, -141b and -142b), which are by far the most important HCFCs consumed by Article 5 Parties.

12.5 Climate Aspects

The choice of ODS (HCFC) alternatives and substitutes will affect GHG emissions. Decision XIX/6 requested climate change be considered when calculating the cost effectiveness of alternative technologies. The Task Force concluded that minimisation of climate impact is (1) related to a low GWP substitute or the alternative, and (2) related to energy efficiency.

In many cases the emissions of energy consumption related carbon dioxide will outweigh the emissions of the chemical expressed in carbon dioxide equivalent. However, the impact of a reduction in carbon dioxide emissions from energy use is much more difficult to generalise because energy use (and related energy efficiency) varies significantly depending on how and where specific equipment is used.

Climate effects can be calculated on the basis of emissions from foams at end-of-life and from refrigeration and air conditioning during the lifetime and at end-of-life. Taking into consideration the GWP of HCFC-141b and HCFC-22, and also the current market trading cost for one tonne of carbon dioxide (at US \$5-15), HCFC emissions may result in a equivalent carbon dioxide emission value between US \$0 and 20 per kg of HCFC. This amount is of the same order of magnitude as the cost effectiveness factors used. It might suggest that funding requirements could be reduced if substitute prices remain as assumed in this report and there would be other sources or methods of co-funding the “climate impact”. It might also imply that funding requirements could remain the same if choices for future low GWP substitutes would be more costly, and other sources and methods for co-funding the “climate impact” could reduce total costs.

Based on the actual emissions trading market price (or Kyoto Protocol value for sustainable annual reductions) of US \$10-15 for one tonne of CO₂, it would be easy to estimate the benefit and the “carbon price” for each (HCFC) conversion project. The additional costs needed, if any, to make a project more climate friendly could be met either through an additional contribution by Non-Article 5 Parties to the Multilateral Fund or by arranging for the requisite funds from different climate change funding mechanisms through the Multilateral Fund. Parties may wish to consider some potentially adverse consequences of co-funding individual projects. In this context, the Task Force would like to mention that current experience with funding mechanisms for co-funding, in the sense of two different financial mechanisms funding the same project, may lead to delays in approval and implementation of projects. Furthermore, the “single-window” of the Multilateral Fund, through which all funds could flow, could well be a better mechanism for rapid implementation of projects.

However, without experience in quantifying and comparing the climate effects and costs of various alternatives to specific applications, it is impossible for the Task Force to link additional funding to climate benefits. The answer is highly dependent on the choice of specific alternatives and substitutes.

With the submission of HPMPs, the Task Force expects that several specific climate aspects can be further quantified, also given the practical conditions outlined in the HPMPs and the necessary support of Article 5 Parties for the funding of certain technologies.

Technological developments anticipated during the next two to three years may also shed new light on how and where to use specific climate-friendly substitutes and alternatives. Furthermore, several bodies under the Montreal Protocol, such as the TEAP and its TOCs, can continue collecting data on

costs and climate effects of alternatives as they are developed, in an ongoing effort to assess the necessary accurate information for the use of all Parties.

12.6 Funding Requirement Results for 2012-2017

Indicative funding requirements have been derived for future trienniums (2012-2014 and 2015-2017) on the basis of the same type of cost effectiveness factors as for the triennium 2009-2011, and under the assumption that supporting activities would continue as during 2009-2011.

In the trienniums after 2009-2011, funding is practically only needed for HCFC projects and supporting activities, since virtually all other ODS projects needed to comply with the Protocol will have been funded (except for some methyl bromide commitments).

The funding profiles shown in chapter 11 for the trienniums beyond 2011 show that funding requirement per triennium increases. Costs to achieve the 35% consumption reduction by 2020 (based on an annual 5% reduction in HCFC consumption as of 2013) are not the reason for this increase. Rather, funding requirement increases because the production phase-out costs become a significant portion of the total funding for the trienniums 2012-2014 and 2015-2017 (at an assumed value of US \$3.0 per kg of HCFC phased out)⁴.

It is important to note that the only production capacity that is eligible for funding is in China. There is no HCFC-141b/-142b production in other Article 5 Parties, and all the HCFC-22 production capacities installed in Parties other than China are not eligible for funding, due to the fact that they are swing plants, which were already compensated for the CFC closure.

It is important to note that the funding requirements for production given for the two trienniums are indicative. It is likely that, during the next three years, more will be known about the production capacity of HCFC-141b that will need to be phased out, as well as its phase-out cost per kg. It is also likely that, during the next three years, more will be known about the increase of feedstock production (both HCFC-22 and HCFC-142b) in China, and whether or not certain HCFC-22 capacities that are currently used for non-feedstock production could take up feedstock production instead. For further considerations on this issue, the Task Force would like to refer to the report of the TEAP Task Force “Response to Decision XVIII/12”, published August

⁴ As a rough approach, the total funding requirement for all activities for the triennium 2009-2011 could be put at around US \$470 million (compare the mid-range of US \$430 to 516 million determined in the report, chapter 11). The funding requirement in the subsequent trienniums would then be around US \$430 million (“the average of the mid-ranges”). This shows the importance of adding the production phase-out component.

2007, which has considered many aspects involved in the HCFC-22 production issue. In a few years, more will also be known regarding the rules and guidelines of the CDM (which credits a significant amount of HCFC-22 capacity installed in China for HFC-23 emission abatement), in the context of negotiations regarding a follow-up to the Kyoto Protocol.

12.7 The Funding Requirement for the 2009-2011 Replenishment

Funding Requirement Elements for the Replenishment (including Agency Support)	US \$Million
ODS (non-HCFC) Consumption	64.56
ODS (non-HCFC) Production	19.11
HCFC related activities:	
HPMP preparation and demonstration projects	9.26
HCFC phase-out activities consumption	130.88-427.88
HCFC phase-out activities production	0.00
Waste disposal, destruction activities	27.00
Supporting activities	92.00
Total	342.8-639.8

The Replenishment Task Force estimated the total funding requirement for the period 2009-2011 to enable all Article 5 Parties to comply with all relevant control schedules under the Montreal Protocol to be in the range **US \$342.8-US \$639.8 million**. As shown in the table above, this estimate can be broken down into non-HCFC activities and HCFC activities, with the wide cost range reflective of uncertainties in the funding for phasing out HCFCs.

The upper and lower range in the funding estimate stem from the higher (2012) HCFC consumption level and the lower cost effectiveness (higher costs) and the lower, baseline consumption level and the higher cost effectiveness (lower costs). Taking into account the considerations mentioned above regarding the feasibility of the 2012 consumption level funding, funding in practice may well be somewhere between baseline and 2012 consumption funding.

It is expected that in the near future this wide range in HCFC funding can be narrowed down to more precise estimates by relevant decisions to be taken by both the Executive Committee and the Meeting of the Parties. As Parties have experienced in past replenishment studies, the Task Force will take on board any additional guidance from Parties to further reduce uncertainties.

Based on the mid-range assumptions for HCFC consumption funding, the total estimated funding requirement for the triennium 2009-2011 is in the range of **US \$430.6 to US \$516.1 million**.

13 References

- /CBP08/ Consolidated 2008-2010 Business Plan of the Multilateral Fund, given in ExCom Document 54/6, March 2008
- /COM04/ Compliance Oriented Model, as described in ExCom Document 44/7, December 2004
- /COM07/ Model rolling three-year phase out plan: 2008-2010 (follow-up to decision 50/5 (d)), as described in ExCom Document 53/7, November 2007, updated April 2008
- /HPMP08/ Draft guidelines for the preparation of HCFC phase-out management plans incorporating HCFC surveys, ExCom Document 54/53, March 2008
- /CoC08/ Preliminary discussion paper providing analysis on all relevant cost considerations surrounding the financing of HCFC, ExCom Document 54/54, March 2008
- /RTF02/ Report of the UNEP Technology and Economic Assessment Panel April 2002, Volume 2, Assessment of the Funding Requirement for the Replenishment of the Multilateral Fund 2003-2005
- /RTF05/ Report of the UNEP Technology and Economic Assessment Panel April 2005, Volume 2, Assessment of the Funding Requirement for the Replenishment of the Multilateral Fund 2006-2008
- /UNIDO08/ Business Plan for the Years 2008-2010 of UNIDO, given in ExCom Document 54/10, March 2008
- /UNEP07, 08/ Data submitted to UNEP on Production and Consumption of all ODS, per country, Personal Communications to Mr. Lambert Kuijpers (UNEP, Mr. Gerald Mutisya, Mrs. Martha Mulumba), December 2007/January 2008

Annex 1: Analysis of the Replies to the Questionnaire sent by the Replenishment Task Force

The Replenishment Task Force, in consultation with the Ozone Secretariat, drafted a questionnaire intended to elicit the facts and opinions of all the Parties on the issue of replenishment. The questionnaire was sent to all the Implementing agencies and Regional Network Coordinators with a request for their comments in view of their past experience in dealing with the Article 5 Parties and the Multilateral Fund. The questionnaires were sent on 17 January and a deadline of 18 February was given for replies. The replies until 25 February were analysed. For the purposes of this analysis, the countries were divided into five categories: (1) Non-Article 5 Parties, (2) China (being the largest consumer of ODS and accounting for more than 50% of the total annual consumption of HCFCs), (3) Large Article 5 Parties (an annual HCFC consumption of more than 100 ODP tonnes (17 Parties)), (4) Low Volume Consuming Parties (an annual consumption of 10-100 ODP tonnes (34 Parties)), (5) Very Low Volume Consuming Parties (annual consumption < 10 ODP tonnes) (all other Article 5 Parties), (6) Network Coordinators and (7) Implementing Agencies. In total 32 Parties (5 Non-Article 5 Parties, China, 5 Large Article 5 Parties, 8 LVCs and 13 VLVCs), four Network Coordinators and UNEP and UNIDO as Implementing Agencies responded. An analysis of their replies is given below.

A1.1 Reply Analysis (1): China

A. CFCs phase-out, recycling and availability for destruction.

Accomplished accelerated phased out of CFC and halon by July 1, 2007 (except for essential uses), and the phase-out of TCA and CTC is also going on well. The MLF has not yet approved the MDI sector plan. It is very difficult to complete the phase-out of CFC in the MDI sector by 2010. Halon banking program is at the initial stage. China may apply for essential use exemption for MDIs and halon 1301. In the next 3-5 years, there will be some amount of contaminated and/or unusable CFCs and halon 1211 that need to be collected/destroyed.

B. Further assistance needed from the MLF.

Funds for the destruction of halon 1211 reclaimed will greatly promote its reclamation- 100-200 tons of halon in the next 3 years. The MDI sector plan of over US \$22.3 million should be considered in the 2009-2011 replenishment. In addition, the funds needed for the ongoing sector plans of China needed in the years 2009-2011 should also be considered in this replenishment, which amount to over US \$21 million. Funding for institutional strengthening will not be sufficient for the coming three year period. With the depreciation of the US dollar the funds for the institutional

strengthening can not meet the need. The CAP program should continue after 2010.

C. Methyl Bromide.

Some new uses have been found. These uses are not mentioned in the sector plans. Further assistance will be needed. Preplant fumigation of ginger and grass plus treatment of wooden products and warehouses need alternatives. These uses were not considered previously. Alternative technologies for these and other agricultural uses are not yet sufficiently mature for wide commercial adoption to occur.

D. HCFCs.

A licensing system on export and import of HCFCs is in place since 2005 but no quotas have been fixed. Consumption during 2010-2013 will be increasing. HCFC-141b accounts for 30% (in ODP tons) of the total. Foaming operations are around 75%, and solvent accounts for around 20% of the total use. HCFC-22 accounts for 60% of the consumption (in ODP tonnes) in which the share of foaming operations is around 12%, and refrigeration and air conditioning manufacturing accounts for about 66%. Servicing accounts for around 5-10%. Around two thirds is used for middle size units (refrigerant charge 250g-2.5kg) and one third for large units (larger than 2.5kg).

E. Second conversion.

The HCFC-141b consumption in China in 2006 is higher than the aggregated amount of HCFC-141b phased in through previous conversion projects. Their phase-out must be funded by the MLF.

F. HCFC substitutes:

Name of substitutes	ODS to be substituted	Areas of use	Impacts on energy efficiency
R-417	HCFC-22	Industrial and commercial refrigeration equipment	
R-407C, R-410A	HCFC-22	Air conditioning	A bit higher
NH3	HCFC-22	Large scale freezers	
R-290	HCFC-22	Home use air conditioners (relevant technology still needs to be developed)	A bit higher
R-134a	HCFC-123	Centralized air conditioners	May be a little lower, controversial
Cyclopentane	HCFC-141b	PU foam products	Almost the same
Water -CO2	HCFC-141b	PU foam products	Lower
R134a - CO2	HCFC-22 / HCFC-142b	XPS foam products	
HFC-245/HFC-365	HCFC-141b	PU rigid foam products	Almost the same
ZCI-8 (a blend of three HFCs)	HCFC-22	Air conditioners	Higher

G. Assistance from MLF for HCFCs

China plans to carry out the following activities in order to successfully freeze its HCFC production and consumption in 2013:

1. Formulate the HCFC management program and sector strategies;
2. Ban the use of HCFC in new projects at an appropriate time;
3. Implement a quota management system for the production, export and import of HCFC at an appropriate time;
4. Carry out demonstration projects in every sector, implement sector plans in sectors with practicable conditions, and control the total consumption amount of HCFC in different sectors;
5. Develop and promote substitute technologies;
6. Raise public awareness, promote HCFC recycling.

To accelerate the phase out of HCF-141b in the foam sector, the following fund support and technical assistance should be provided to the enterprises:

1. Funding for conversion or purchasing equipment that uses substitutes foam agent.
2. Funding for purchasing auxiliary equipment, i.e. anti-explosion and material mixing equipment.
3. Funding for safety-improvement of workshops and warehouses, including cost for fire-fighting system, ventilation system, monitoring system, etc.
4. Trial run cost, including trial run cost in substitution and contingency for product quality risk.
5. Incremental operation cost, including cost changes caused by material system alteration (not only foam agent, but changes of polyols), cost changes caused by products performance, i.e. the insulation performance drops after substitution causes the increase of material consumption; cost increase of fire-retardants as fire-fighting figure goes down after substitution.
6. Training expenditure, including training on production process using new foam blowing agents and production safety technology.
7. Technical support, including provision of new foam blowing technology, new formulation, adjustment in formulation, selection of fire retardant and formulation, provide exemption for some patent technologies.

The normal lifetime of foaming equipment in use is around 10 years.

In order to achieve the goals set in the Adjustment the following actions are needed:

1. In the production of PU foam products, substitute technologies such as cyclopentane and water (CO₂) should be introduced as soon as possible to reduce the growth of HCFC consumption. Technologies like the ones using HFC-245 and HFC-365, which are mainly used in spray foam products, since they are expensive and have high GWP, may be used when technologies such as

- cyclopentane and water could not be applied.
2. In the household air conditioning sector, substitute technologies such as R-290, ZCI-8 and R-410A from 2009 or 2010. One should speed up the development of R-290 and ZCI-8 (developed recently by China) application technologies to avoid the use of substitutes with high GWP like R-410A.
 3. In the industrial and commercial refrigeration sector, one should further promote and apply substitute technologies such as NH₃ and R-410A from 2009 or 2010.
 4. In the production of XPS foam, we should apply technologies such as CO₂, vacuum foaming and R134a. However, these technologies are expensive and will lead to high conversion cost.

China does not know the exact costs of introducing the above-mentioned substitute technologies for the lack of demonstration projects. China prepared a table of prices for HCFCs and relevant alternatives for reference purposes. (1USD=7.2 RMB)

ODS	Price (US \$/ton)	Alternatives	Price (US \$/ton)
HCFC-22	1,640	R-290	9,500
HCFC-141b	1,670	R-134a	3,930
HCFC-142b	2,055	Cyclopentane	1,875
HCFC-123	4,170	HFC-245	9,722
		HFC-365	20,833
		R-410A	5,140
		R-407C	5,140

Activities by China and time frame.

Activities	Reasons	Timeframe
Formulation of HCFC country program and sector strategies, including HCFC surveys	They will provide guideline and strategy for the phase-out of HCFC in China.	2008-2010
Implementation of demonstration projects in every sector (30-50 demonstration projects)	Beneficial for choosing substitute technologies, and provide experience.	2009-2011
Implementation of sector plans: 1) Sector plan for the phase out of HCFC-141b in the household appliance sector (freezers, water heaters, etc.) 2) Sector plan for the phase out of HCFC-141b in thermal pipes 3) Sector plan for the phase	We plan to implement sector plans in sub-sectors with mature technologies and good management, and to complete a batch of conversion projects in big enterprises before 2013, and by these activities, we aim to slow down the growth of HCFC consumption, so that we could successfully freeze by 2013.	2009-2011

<p>out of HCFC-141b in PU foam sector</p> <p>4) Sector plan for the phase out of HCFC-141b in the production sector</p> <p>5) Sector plan for the phase out of HCFC-22 in the household air conditioning sector</p> <p>6) Sector plan for the phase out of HCFC-22 in a sub-sector of industrial and commercial refrigeration</p> <p>7) Sector plan for the phase out of HCFC-141b in the solvent sector</p>	<p>In addition, we will develop the sector plans in the rest sectors.</p>	
<p>8) Sector plan for the phase out of HCFC-22 in the production sector</p> <p>9) Sector plan for the phase out of HCFCs in the XPS foam sector</p> <p>10) Sector plan for the phase out of HCFC-141b in the spray foam sector</p> <p>11) Sector plan for the phase out of HCFCs in the industrial and commercial refrigeration sector</p> <p>12) Sector plan for the phase out of HCFC-142b in the production sector</p> <p>13) Other sector plans</p>	<p>To implement the approved sector plans and develop the rest sector plans to realize the 10% reduction goal by 2015.</p>	<p>2012-2014</p>
<p>Implementation of TA projects including policy research, training, awareness raising, capacity building, etc.</p>	<p>These TA projects will assist the implementation of the above mentioned activities, and provide support in terms of policy, technology, and etc.</p>	<p>After 2008</p>

A1.2 Reply Analysis 2: Large Article 5 Parties (3 Parties)

A. CFCs phase out, recycling and destruction

The phase-out is progressing well, but Essential Use applications are likely for MDIs. Some quantities may be available for destruction once recycling picks are up. Indonesia and Mexico have destruction facilities.

B. Further assistance from MLF

Assistance will be needed for MDIs, chillers, halon banks and CFC recycling. The Institutional Strengthening funds should be increased. CAP must continue as is.

C. Methyl Bromide

Sectors such as grain storage, dates and grapes need assistance.

D. HCFCs

Consumption is increasing at more than 10%. About one third is HCFC-141b. Rest is HCFC-22, with 67-75% of it in servicing. Growth can be reduced significantly through licensing and policy measures.

E. Second Conversion

Needs full support from MLF.

F. Support needed from MLF for HCFCs for the freeze and 10% reduction.

Surveys for identifying consumption, preparation of country programmes and management plans, formulation of policies and regulations, projects for sectors with readily available climate friendly technologies and pilot projects for other sectors in the immediate future.

A1.3 Reply Analysis 3: LVC Countries (7 Parties)

A. CFC phase out, recycling and destruction

Phase-out proceeding smoothly. Recycling needs further work. Small quantities available for destruction.

B. Further assistance from MLF

Halon Banks and CFC recycling need further assistance. Institutional Strengthening and CAP need to continue.

C. Methyl Bromide

The phase-out of MB use for dates in some countries needs assistance.

D. HCFCs

Consumption is increasing. Only some countries have details.

E. Second Conversion

Only a few plants need second conversion.

F. Support needed from MLF for HCFCs for the freeze and 10% reduction.

Assistance is needed for surveys, management plans, servicing, policies and regulations, training of technicians and for some projects in sectors where alternatives are readily available.

A1.4 Reply Analysis 4: VLVC (12 countries)

A. CFC phase out, Recycling, destruction

Phase-out proceeding well. No or little stocks built up for destruction.

B. Further assistance from MLF

Recycling and Halon Banking need assistance. Institutional strengthening amount should be increased due to the US\$ devaluation. CAP should be continued.

C. Methyl Bromide

No problem generally. Awareness needed.

D. HCFCs

Increasing consumption, mostly for servicing. Only little HCFC-141b.

E. Second Conversion

Needed in a few countries.

F. Support needed from MLF for HCFCs for the freeze and 10% reduction.

Assistance is needed for surveys, management plans, servicing, policies and regulations, training of technicians and for some projects in sectors where alternatives are readily available.

A1.5 Summary of Article 5 Party responses

The Article 5 Parties are of the opinion that the institutional strengthening funds should be increased in future because the role of the National Ozone Units will continue at the same level in future. Even beyond phase out of CFCs, halons and CTC by 2010, Article 5 Parties need to manage the completion of all projects, to phase out the remaining methyl chloroform and methyl bromide before 2015, to manage recycling for servicing, to fulfill data reporting obligations and to curb illegal trade. In addition, the national ozone units will have to take immediate steps to meet their obligations to comply with the new HCFCs control measures of the 2007 adjustment (Decision XIX/6). Most of them, while they report the data for HCFCs annually, have little idea of the profile of the consumption. In almost all countries, the

consumption is increasing at about 10% or more per year. They need to understand and quantify where the consumption is located sector-wise, which service needs there are etc. They need to identify and link with the industry and organizations connected with the consumption. As an immediate step, in order to meet the freeze deadline by 2013, they will have to establish policies and regulations to regulate the import of HCFC technologies and products. They also will have to reduce the service usage through good practices through training and using retrofits where possible. Almost immediately they have to undertake a massive awareness and training exercise, almost on the same level they did for CFCs in the early 1990's. They also need to have national strategy and benchmarks for the ultimate phase out of HCFCs. They need to identify alternatives, create awareness and prepare projects. Some of the Article 5 Parties feel that there is a need to further strengthen the institutions to meet the future challenges. It is true that they have a certain advantage because of their experience with the phase out of CFCs. The NOUs are well established and have the regulatory regimes and awareness methodologies tried and tested. However, there is felt the need to continue on the whole for the next two replenishment periods the institutions created in the countries. In the countries' opinion, with the depreciation of US dollar, the funds from the institutional strengthening can not meet the needs and have to be increased.

Article 5 Parties also feel that the CAP program has helped them greatly in complying with the control measures so far. The CAP program has to create awareness about the HCFC control measures and the alternatives to HCFCs and assist the countries to take policy and legal measures necessary to reduce the consumption of HCFCs to the required extent. The reduction of the servicing demand through good practices, recycling, licensing, curbs on import of HCFC products, drop-in substitutes where available and other legal and policy measures plays a very important role in the compliance of the Article 5 Parties with the HCFC control measures. CAP would play an important role in such compliance; CAP should in the countries' opinion continue after 2010 to assist with the remaining tasks.

A1.6 Reply Analysis 5: Non-A5 Parties (4 Parties)

A. Experience of Non-A5 Parties.

Regulations and awareness campaigns helped HCFC controls implementation. Taxes on HFCs reduce demand. The system for regulation in different countries has the following elements.

1. Allowance system – All HCFC consumers are granted an annual HCFC consumption allowance, based on baseline calculations, which are reduced in step with the Montreal Protocol phase-out obligations. The consumers are divided into two sectors: 1. the cooling sector

- (refrigeration and air conditioning) and 2. Other uses (foam blowing, solvents, etc.). Consumption allowances are transferable among allowance holders but only within sectors.
2. Manufacture or use or sale or import of specified HCFCs or products containing them banned from specified dates.
 3. Regulation on the end-of-life (collection, storage, recovery, licensing of facilities) of these substances, which includes managing emission and servicing of systems.
 4. Control measures have been negotiated with the concerned industrial sectors and adapted to what was considered feasible based on the availability of alternatives. The sector's professional associations have played a major role. Industry has contributed to the phase-out through outreach and training on the phase-out of ODS and the possible alternatives provided by industry associations and in the research and development of alternatives.
 5. Ban on servicing with virgin HCFCs after certain date and with recycled HCFCs after a later date.
 6. A system of sector wise general ban on HCFCs with the possibility for granting upon request timely limited exemptions for essential uses.
 7. The refrigerant alternatives for residential and commercial air conditioning equipment are HFC-134a and HFC blends. R-410A has also been identified as an alternative. Chillers use either high or low pressure refrigerants. Low-pressure chillers have traditionally used CFC refrigerant (CFC-11) and the current alternative is HCFC-123. To the countries' knowledge, no alternative to HCFC-123 has been identified to date. High pressure chillers use HCFC-22 (R-22) and the refrigerant alternatives are HFCs, HFC blends and ammonia. R-410A is available as an alternative in new equipment but not as a "drop-in". In one country, the current refrigerant alternatives for commercial and industrial refrigeration systems are HFCs, HFC blends and ammonia. Above 300 kW, when safety measures are economically affordable: natural refrigerants (in general ammonia, newly CO₂, some newly cases of large HC chillers in particular when installed on the roof of the building.
 8. The foam-blowing industry has indicated that they move towards HFC-245fa and water. Hydrocarbons, CO₂, some HFC 134a/152a are used in the one component spray foam. For solvents alternatives applied are: fine mechanic, optic, electronic sectors: mainly water based or organic and/or chlorinated solvents. Some cases of fluorinated organic solvents exist. For fire fighting alternatives applied are: "No-extinguishing agent" based strategies, water based systems, CO₂, N₂ based systems, HFC (Novec 1230) based systems; halon banks are remaining, and a ban on servicing of halon based systems was enforced in 2004.

9. HFCs and other high GWP substances are regulated as replacements to HCFCs. Energy standards have been fixed and some concessions given to low GWP substances.
10. Technical experts hired by one government have played a major role in outreaching available non-ODS technologies and raising awareness of the industry especially in the two sectors of fire fighting and solvent uses.
11. RAC technicians have been given a special training raising their awareness regarding the protection of the ozone layer and the environment. Training on leak minimization and recycling has been given to technicians.

B. Suggestions on replenishment

The ozone institutional capacity in Article 5 Parties can be scaled down after 2010. Funding for Institutional Strengthening could be slightly lower. A smaller CAP will be needed in the future.

In determining the level of support of the MLF for second conversions from HCFC-141b one should consider the following:

- (1) In many cases, drop-in substitutes to HCFCs can be used in existing foaming equipment, making conversion unnecessary;
- (2) The enterprises concerned signed letters committing to phasing out HCFCs without further assistance from the MLF, and
- (3) Since the majority of MLF foam projects were implemented prior to 2002, a significant portion of the manufacturing capacity installed will need to be replaced anyway by the time Article 5 Parties have to achieve their first HCFC reduction (i.e. 2015)

For these reasons, the MLF should not pay full conversion costs of companies that transitioned to HCFC-141b, and need not pay for new foaming equipment using alternatives. However, when necessary to ensure that phase-out takes place, the Fund could provide:

- a. training and technical assistance for basic adjustments to existing foaming equipment, if needed, to ensure such equipment can function effectively and efficiently with substitutes when possible;
- b. funding for additional safety-related costs associated with the use of substitutes, mainly when hydrocarbons are selected as alternatives to HCFCs, and
- c. Funding to cover the operational costs of using HCFC substitutes for the traditional 2-year period.

The best option for the ozone layer would be for the Article 5 Parties to start limiting this increase in HCFC consumption as soon as possible e.g. with import and production control measures on HCFC based equipment. To encourage countries to introduce such import / control measures financial or other incentives would be necessary. The MLF ExCom could consider

funding national incentive programs which would allow subsidising non HCFC new equipment and the conversion of existing HCFC equipment when relevant.

C. Suggestions to Article 5 Parties

The potential increase of HCFC consumption between the 2009-2010 baseline and 1 January 2013 could, to some extent, be avoided through a few policy and licensing measures. Major users of CFCs, as well as importers and producers should be consulted, informed about the phase-out of HCFCs that will begin shortly, and provided with information on alternative technologies and substances. In addition, once the Executive Committee determines a cut-off date for funding eligibility, countries could inform their industries.

The key lessons learned can be summarized as follows.

- Use bans accompanying production and consumption phase-out steps to assist in accelerating transition and avoid the building up of stockpiles.
- In the EU a sector based phase-out based on easiest/worst first and most difficult/least damage last works and significantly reduced compliance cost.
- A clear setting of the policy direction and of the objectives accompanied with early and continued awareness raising efforts involving all stakeholders has been effective in progressing towards the phase-out from HCFCs. Adequate legal enforcement requirements (inspections and sanctions) are also essential to reach satisfactory results.
- The mandatory use of electronic licensing systems allows a better control of imports and exports of HCFCs.

A1.7 Concluding remarks for Non-Article 5 Parties

Non-Article 5 Parties felt that ozone institutional capacity in Article 5 Parties can be scaled down after 2010 with slightly lower funding. Their suggestion is based on their experience that once the majority of consumption and production of CFCs, halons and CTC have been eliminated, institutional capacity dedicated to the phase-out of ODS can be scaled down. They also feel that beyond 1 January 2010, the number of phase-out targets to comply with under the Montreal Protocol will be significantly less than before and spread out over a longer time-frame. In addition, since HCFCs are used in similar applications as CFCs, many of the training, information and awareness-raising tools developed under the CAP could, with minor modifications, be adapted to assist with the phase-out of HCFCs. A smaller CAP would be needed in the future, in the non Article 5 Parties opinion.

A1.8 Reply Analysis of Network Coordinator responses

A. CFC phase out, Recycling, destruction

Legislation is available in most countries. Whether recycling is adequately successful is not clear or is minimal. Some quantities may be available for destruction.

B. Further assistance needed from MLF for CFCs.

National Ozone Units and Networks must be continued with increased allocations. Servicing sector, recycling, halon banking and MDIs need continued assistance.

C. Methyl Bromide

No problems mentioned.

D. HCFCs

Consumption is increasing. Can be curbed in the first stage through import control systems and foam projects.

E. Second Conversion

The increase in HCFC-141b is also from factories not assisted by the MLF. Support is needed for these as well as conversions.

F. Support needed from MLF for HCFCs for freeze and 10% reduction.

Assistance is needed for surveys, management plans, servicing, policies and regulations, training of technicians and for some projects in sectors where alternatives are readily available.

A1.9 UNEP's response

CAP has the following broad goals (and needs to be continued):

- Help countries that are in non-compliance to return to compliance (*restorative role*).
- Help countries that are in danger of becoming in non-compliance to remain in compliance (*preventative role*).
- Assist countries that have already achieved compliance to maintain that condition until they have met the major phase out targets (*support role*).
- Ensure or enable countries to *sustain* compliance indefinitely, or as long as needed, to fully implement the provisions of the Montreal Protocol (*guardian role*).

The key to long-term sustainability for the above and other issues requires that the country *fully internalizes the Montreal Protocol in its national development plans*. The goal is that the country will reduce and eventually eliminate its need for structured external assistance and intervention, including financial, technical and political support. Part of the answer includes *exporting the Montreal Protocol goals* into the agendas, legal mandates and work of other institutions and mechanisms, which are supported by core, long-term funds. Once adopted, those goals should become sustainable in the long term as they no longer require the active promotion of the Montreal Protocol community. Such

exports must take place at all levels, i.e. national, regional and international. In the proposed replenishment there is need to give a strong message that Ozone Layer Protection has links with other environmental issues. The efforts to reach out to other environmental conventions and to work with them would benefit the efforts of sustaining the compliance under the Montreal Protocol. The resources for the activities like Green Customs Initiative would have to be included in the replenishment.

The Clearing-house common to interlinked and relevant MEAs would benefit the countries to expedite the compliance under the MP. Replenishment should consider the resources for such activities.

- Article 5 Parties to start limiting this growth as soon as possible e.g. with import and production control measures on HCFC based equipment and appliances. As alternative equipment and appliances using alternatives (e.g.HFCs) will in many cases be more expensive, such control measures will create incremental costs for the country. It would therefore be very useful to have an idea of the extent of these incremental costs based on the typical price difference between HCFC based and non-HCFC based new products. This might also allow an assessment of the feasibility of the MLF funding some early incentive/subsidy programs within the HCFC Phase-out Management Plans. Financial or other incentives would no doubt be necessary.
- In addition to production and supply of new equipment, the issue of conversion/retrofitting of existing equipment might be useful to consider. For instance, conversion from R-22 to propane might be considered as it seems to be quite straightforward, energy efficient and economic in some cases.
- Article 5 experience in converting large and small equipment might be collected (e.g. Indonesia experience in converting mid-size chillers from R-22 to R-290, and examples from Cuba and Africa for domestic refrigerators). Positive examples have been presented at a workshop in Bali in 1999.

Presently nearly all alternatives have HFCs as full or part component. In 2005, the IPCC/TEAP report has analyzed the impact particularly on emissions of HFCs and more importantly the large banks that would be needed to be destroyed in the future. The cost of such operations dictate that funds be spent on the R&D for developing non-HFC alternatives would be more effective. The RTF should make such cost benefit analysis and present before the Parties the options for the replenishment. UNEP could catalyze such actions with the help of existing industries, venture capitalists and the channeling the government aid that is earmarked for the climate change.

A1.10 UNIDO's response

Article 5 Parties may not be able to give accurate answers to the questions due to the absence of reliable consumption data, absence of long term and generally accepted alternatives and/ or lack of sufficiently high technical capacities in Article 5 Parties, mainly in connection to HCFCs phase out, MB critical uses and destruction of unwanted ODS. The information and data requested should be collected through the planned surveys under the HCFC phase out management plans.

Where it concerns Article 5 Parties meeting the 2010 targets:

- Assistance should be provided to sustain the phase out achieved so far and to further address the remaining ODS consumption , for example in the MDI sector (major countries, like China and Argentina have no approved phase-out projects), destruction of the unwanted ODSs and the MB critical uses.
- The IS assistance should be increased to sustain the current operations and to assist in the new and urgent challenges such as the HCFCs phase out schedule.
- The CAP was structured to meet the 2010 phase out requirements. It should be restructured to respond to the new HCFCs phase out.

Where it concerns the HCFC phase-out:

- The planned surveys will help provide a clear picture on the current situation and trends.
- The current guidelines should be revisited and revised in line with the recent MOP 19 decision, since assistance should be provided by the fund to cover the incremental costs related to HCFCs phase out. This is a very complex question, since the best environment friendly technology would be hydrocarbon technology, which is associated with high investment cost and for very small enterprises would be not appropriate from technical and safety point of view.
- The currently available HFC alternatives have high GWP and are very expensive. Their availability is also questionable. If the HFC alternatives are selected the incremental operating cost has to be compensated for a longer period of time and in a well regulated manner (according to documented consumption) to avoid returning to HCFC-22. This has to be supported with appropriate legislation and monitoring/control as well. Experience in A5 countries provides that pieces of foaming equipment are used for a very long time and therefore they will not be replaced by new technologies in the near future without assistance from the MLF.
- Transitional alternatives to HCFCs should be avoided and rather long term environmentally friendly substitutions should be adopted.
- The limited available data from the field and through technology providers and chemical industry provides that the estimated cost for

HCFCs phase out in refrigeration and foam sector is the same as the cost effectiveness used in CFC projects. However, there are factors, which should be taken into consideration:

1. lower ODP. So, replacement of HCFC 141b in ODP tones is about 9 times more expensive (1/0.11).
2. The amount of HCFC-141b is about 70% less in a refrigerator or cubic meter of foam. So, the cost effectiveness is accordingly higher (1/0.7).
3. Since the time of establishment of the cost effectiveness threshold figures the US\$ lost over 50% of its value. Thus, in US\$ terms the cost will be increased (most equipment required in the projects are manufactured in Europe).

The same applies for the refrigerant replacements.

The above data are preliminary. The experience of the first two-three years of implementation of projects will bring better understanding and more accurate data.

The preparation of HCFC phase-out management plans, and series of stand alone and umbrella projects in various countries, dealing with the conversion of HCFC user enterprises working in different sectors and of various sizes will be the best and most important first step in the HCFC phase-out process.

Annex 2: Control Schedules

A2.1 Compliance with the Control Schedules

The individual Parties, respectively, are responsible for their own compliance with the control schedules.

External financial assistance and technology transfer are essential to the phase-out process. Recognition of these needs led to the establishment of the Multilateral Fund. The Multilateral Fund is mandated to assist the Article 5 Parties to comply with the control schedules of the Montreal Protocol.

The resources to be made available through the 2003-2005 replenishment of the Multilateral Fund will be instrumental in making it possible for the Article 5 Parties to meet their, respective, incremental costs in securing progressive compliance with all the control measures.

A full description of all control measures for all controlled substances is given in Table A2-1.

Table A2-1 Control Schedules for Article 5 Parties

Annex A – Group I (Production and Consumption)	
Chlorofluorocarbons: CFC-11, CFC-12, CFC-113, CFC-114 and CFC-115	Base level: average of 1995-97 85 percent reduction by January 1, 2007 * 100 percent reduction by January 1, 2010 (with possible exemptions for essential uses) **
Annex A – Group II (Production and Consumption)	
Halons: halon 1211, halon 1301 and halon 2402	Base level: average of 1995-97 50 percent reduction by January 1, 2005 * 100 percent reduction by January 1, 2010 (with possible exemptions for essential uses) **
Annex B – Group I (Production and Consumption)	
Other fully halogenated CFCs CFC-13, CFC-111, CFC-112, CFC-211, CFC-212, CFC-213, CFC-214, CFC-215, CFC-216, and CFC-217	Base level: average of 1998-2000 85 percent reduction by January 1, 2007 * 100 percent reduction by January 1, 2010 (with possible exemptions for essential uses) **
Annex B – Group II (Production and Consumption)	
Carbon Tetrachloride	Base level: average of 1998-2000 85 percent reduction by January 1, 2005 100 percent reduction by January 1, 2010 (with possible exemptions for essential uses)
Annex B – Group III (Production and Consumption)	
1,1,1-trichloroethane (methyl chloroform)	Base level: average of 1998-2000 70 percent reduction by January 1, 2010 * 100 percent reduction by January 1, 2015 (with possible exemptions for essential uses) **
Annex C – Group I (Consumption)	
HCFCs	Base level: 2009-2010 Freeze: January 1, 2013 20% reduction by January 1, 2015 35% reduction by January 1, 2020 67.5% reduction by January 1, 2025 97.5% reduction by January 1, 2030 100 percent reduction by January 1, 2040
Annex C, Group II (Production and Consumption)	
HBFCs	100 percent reduction by January 1, 1996 (with possible exemptions for essential uses)
Annex E (Production and Consumption) (exemption for quarantine and pre-shipment)	
Methyl Bromide	Base level: Average of 1995-1998 20 percent reduction by January 1, 2005 100 percent reduction by January 1, 2015

* 10% of base level of production allowed to be produced additionally to meet the basic domestic needs of Parties operating under Article 5(1).

** 15% of base level production allowed to be produced additionally to meet the basic domestic needs of Parties operating under Article 5(1).

Annex 3: Extrapolation method applied to 2000-2006 data; HCFC reported consumption values for the years 2000-2006 and HCFC extrapolated consumption values for the years 2007-2012 (ODP tonnes)

The most important issue in this report is the calculation of the funding requirement for HCFC reductions for all Article 5 Parties in the first triennium 2009-2011 --and in the two trienniums thereafter--.

When only using the Article 7 reported data to the Ozone Secretariat for the period 2000-2006, an extrapolation method has to be applied to derive 2007-2012 data. Several methods (using as base information the levels for different years in the past) have been investigated. The normal type “least squares” method was selected (given as the normal “TREND” function in Excel analysis). This implies that the extrapolated consumption values are calculated as follows, specifically for the years 2007-2010:

$C(i) = \text{TREND}(\text{LSQ}) ((C(i-7), C(i-1)),$
with i being the year for which the consumption is calculated.

Values are calculated for the years 2007-2010 by taking the consumption values for the separate HCFC chemicals for each country (in Groups 1 and 2) and for the separate HCFC chemicals in the aggregated consumption in Groups 3 and 4) over the years 2000-2006. The HCFC levels in ODS or ODP tonnes are added to give aggregated HCFC ODP tonne consumption levels for the period 2007-2010. The baseline (per Article 5 Party) is then determined as the average ODP consumption of the years 2009 and 2010 and this is the consumption value that is valid for the consumption in the freeze year 2013.

The consumption for the years 2011 and 2012 was extrapolated using a logarithmic extrapolation approach for the years 2008-2012. With starting values 2008, 2009 and 2010 the consumption in 2011, and subsequently in 2012 is calculated (using a “TREND” function in the Excel analysis which is based on a logarithmic approach).

$C(i) = \text{TREND}(\text{LOG}) ((C(i-3), C(i-1)),$
with i being the year for which the consumption is calculated.

This logarithmic approach yields a rapidly decreasing growth percentage per year, which is acceptable given the fact that certain Parties will have submitted their HPMP (see chapter 7) in 2009 or 2010. The fact that projects will be approved at that stage assumes that one has more or less defined a starting point (after which no growth should occur) for starting aggregate

reductions. Furthermore, funding is assumed to be approved at an early stage (see below) to address servicing and all the non-investment components in a country that have an impact on demand. This will also lead to a decrease in the growth percentage as of 2009/2010.

By using the phase-down schedule as determined in Decision XIX/6, values for the years 2015, 2020, 2025 and 2030 can be calculated. Aggregated consumption levels for HCFCs for the years in between are determined via linear interpolation. This results in a consumption pattern for all Parties in all categories as given in the table in this Annex (see below).

	Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2015	2020	2025	2030
	Consumption (ODP tonnes)																		
1	China	5,161.8	5,122.0	5,788.8	7,752.6	10,342.4	14,980.0	14,344.9	16,473.1	19,028.1	21,410.2	23,452.6	24,572.8	25,160.1	22,431.4	20,188.3	14,580.4	7,290.2	560.8
	Group 2																		
2	Mexico	1,855.4	1,168.0	791.9	728.2	1,313.8	1,178.4	1,283.6	1,020.9	1,211.0	1,334.4	1,360.8	1,330.8	1,414.0	1,347.6	1,212.8	875.9	438.0	33.7
3	Thailand	750.1	961.6	937.0	1,081.4	952.8	877.0	843.5	932.9	872.7	908.5	881.0	904.7	893.7	884.7	805.3	533.0	266.5	20.5
4	Brazil	902.3	755.2	714.2	763.3	856.0	846.0	873.7	849.8	906.2	939.4	952.4	959.0	962.3	945.9	851.3	614.8	307.4	23.6
5	India	250.2	256.8	330.5	360.3	445.5	724.2	592.0	719.2	814.7	900.5	987.2	1,034.7	1,059.6	943.8	849.5	613.5	306.7	23.6
6	Turkey	339.8	205.4	275.2	357.7	493.7	574.8	849.6	797.6	956.6	1,083.6	1,205.7	1,273.6	1,309.5	1,144.6	1,030.2	744.0	372.0	28.6
7	Indonesia	39.3	130.4	217.7	225.2	272.8	308.6	299.2	383.5	406.1	431.6	469.7	490.4	501.2	450.7	405.6	292.9	146.5	11.3
8	Kuwait	175.2	159.0	166.7	203.2	252.7	221.1	286.3	286.8	316.6	340.6	359.0	368.7	373.7	349.8	314.8	227.4	113.7	8.7
9	Saudi Arabia	110.6	143.7	138.4	176.0	212.9	239.3	239.3	273.1	296.6	324.4	344.0	354.4	359.8	334.2	300.8	217.2	108.6	8.4
10	South Africa	113.6	110.6	146.0	231.4	171.4	208.7	220.4	249.2	268.5	278.2	286.1	290.2	292.2	282.2	254.0	183.4	91.7	7.1
11	Philippines	158.2	128.1	141.4	189.1	166.0	206.3	198.8	213.0	232.7	243.1	250.2	253.8	255.6	246.7	222.0	160.3	80.2	6.2
12	Argentina	45.8	99.3	44.5	147.0	159.1	201.7	247.6	267.1	304.4	354.3	379.8	393.6	400.7	367.0	330.3	238.6	119.3	9.2
13	Malaysia	330.0	319.4	336.1	324.0	331.2	363.7	382.5	371.2	385.1	396.6	412.5	420.8	425.0	404.6	364.1	263.0	131.5	10.1
14	Egypt	151.8	121.6	120.1	111.6	155.0	170.7	249.0	214.9	248.5	279.4	309.1	325.6	334.2	294.3	264.8	191.3	95.6	7.4
15	Venezuela	192.2	241.1	95.9	72.5	221.1	96.6	124.3	96.6	86.8	104.2	91.7	94.9	97.7	98.0	84.8	61.6	30.8	2.4
16	Colombia	-	97.6	89.4	108.7	123.2	150.8	159.0	192.3	198.0	221.5	240.4	250.7	256.1	230.9	207.8	150.1	75.1	5.8
17	Vietnam	32.5	58.3	65.0	102.1	119.8	129.8	155.2	175.5	195.1	216.4	233.3	242.4	247.1	224.9	202.4	146.2	73.1	5.6
18	Iran	33.6	91.0	153.7	94.4	153.1	154.8	166.5	196.1	201.5	211.5	238.2	253.2	261.2	224.8	202.4	146.1	73.1	5.6
	Subtotal Group 2	5,480.6	5,047.1	4,763.7	5,276.1	6,400.1	6,642.4	7,170.5	7,239.6	7,901.3	8,568.1	9,001.3	9,241.5	9,443.8	8,774.7	7,902.8	5,659.4	2,829.7	217.7
	Group 3																		
19	Chile	58.7	52.5	52.6	37.5	70.0	73.7	79.4	78.0	87.2	96.1	105.2	110.2	112.8	100.6	90.6	65.4	32.7	2.5
20	Yemen	40.1	47.0	50.1	53.5	62.7	69.5	102.7	95.9	107.0	119.5	132.0	138.9	142.5	125.8	113.2	81.8	40.9	3.1
21	Syria	20.0	30.8	10.8	34.6	44.7	60.2	48.8	61.3	69.2	80.3	83.7	85.5	86.5	82.0	73.8	53.3	26.7	2.1
22	Nigeria	48.0	56.2	60.7	66.1	66.8	31.5	35.8	40.7	32.4	23.9	15.9	13.2	12.1	19.9	17.9	13.0	6.5	0.5
23	Morocco	21.3	21.3	1.9	5.4	40.7	31.9	49.8	45.4	54.9	68.8	76.0	80.0	82.0	72.4	65.2	47.1	23.5	1.8
24	Dominican Republic	17.9	15.6	-	12.0	31.8	35.0	55.3	50.1	62.4	76.2	84.5	89.1	91.6	80.3	72.3	52.2	26.1	2.0
25	Tunisia	16.6	28.6	29.8	24.5	31.9	30.3	36.2	37.5	37.7	40.3	43.5	45.2	46.1	41.9	37.7	27.2	13.6	1.0
26	Kenya	20.3	20.9	21.8	25.7	26.9	33.5	42.5	41.2	46.1	51.0	55.6	58.1	59.3	53.3	48.0	34.6	17.3	1.3
27	Trinidad and Tobago	7.0	10.3	28.2	11.5	19.7	33.7	69.7	58.1	68.5	79.1	95.0	104.6	109.8	87.0	78.3	56.6	28.3	2.2
28	Bahrain	38.5	35.2	40.9	34.0	19.8	26.9	28.7	22.4	19.7	16.4	15.8	15.5	15.3	16.1	14.5	10.4	5.2	0.4
29	Jordan	23.3	31.4	28.9	27.8	18.2	28.4	46.7	36.9	38.7	43.1	47.9	50.5	51.9	45.5	40.9	29.6	14.8	1.1
30	Oman	22.7	15.4	15.8	16.9	20.0	19.7	32.2	26.3	30.6	33.9	36.9	38.6	39.4	35.4	31.8	23.0	11.5	0.9
31	Panama	11.1	12.3	9.4	16.2	17.8	20.5	20.5	23.0	25.5	28.2	29.3	29.9	30.2	28.8	25.9	18.7	9.3	0.7
32	Lebanon	15.2	17.1	21.8	20.1	19.0	18.6	21.3	21.7	21.5	21.2	22.1	22.6	22.8	21.7	19.5	14.1	7.0	0.5
33	Libya	0.6	0.6	0.6	3.0	12.0	25.5	50.5	43.4	55.2	67.6	79.3	86.2	89.9	73.5	66.1	47.7	23.9	1.8
34	Peru	8.7	-	7.0	12.7	14.9	21.6	12.3	19.9	23.9	25.0	26.2	26.8	27.2	25.6	23.0	16.6	8.3	0.6
35	Serbia	5.2	6.6	6.6	-	14.5	18.8	9.1	15.0	17.1	19.6	22.0	23.4	24.1	20.8	18.7	13.5	6.8	0.5
36	Qatar	5.0	4.8	5.1	12.5	12.7	15.0	15.0	18.3	20.9	23.0	24.1	24.6	24.9	23.5	21.2	15.3	7.6	0.6
37	Uruguay	10.1	11.6	7.6	9.0	13.0	13.0	15.7	15.0	16.5	18.7	19.9	20.5	20.8	19.3	17.4	12.5	6.3	0.5
38	El Salvador	8.6	4.3	6.4	7.5	4.9	19.4	19.4	18.8	23.2	26.7	30.5	32.6	33.8	28.6	25.7	18.6	9.3	0.7
39	Sri Lanka	6.5	5.9	8.8	7.0	14.3	9.7	12.4	13.6	15.0	15.8	17.1	17.8	18.1	16.4	14.8	10.7	5.3	0.4
40	Cuba	1.1	10.1	4.6	3.6	6.8	16.2	15.9	16.7	18.4	22.7	25.9	27.8	28.7	24.3	21.9	15.8	7.9	0.6
41	Bangladesh	5.3	5.8	7.3	-	9.1	13.2	20.7	17.7	21.4	25.5	30.5	33.4	35.1	28.0	25.2	18.2	9.1	0.7
42	Mauritius	8.4	5.5	7.2	12.3	12.3	9.2	7.7	10.4	11.0	10.5	9.5	9.1	8.9	10.0	9.0	6.5	3.3	0.3
43	Honduras	6.3	6.8	12.0	5.9	10.9	10.0	12.2	12.4	13.1	13.5	15.4	16.4	17.0	14.4	13.0	9.4	4.7	0.4
44	Costa Rica	8.6	7.6	8.1	12.3	9.4	10.3	10.1	11.1	11.6	11.7	11.4	11.3	11.2	11.5	10.4	7.5	3.8	0.3
45	Ghana	3.0	5.5	2.8	5.3	11.9	7.7	21.1	17.9	21.2	25.3	28.5	30.2	31.2	26.9	24.2	17.5	8.7	0.7
46	Pakistan	34.5	34.5	46.3	58.2	14.0	5.3	66.5	37.8	37.1	35.6	38.0	39.2	39.8	36.8	33.1	23.9	12.0	0.9
47	Senegal	11.8	7.6	10.4	8.5	9.4	9.5	9.6	9.0	9.7	9.3	9.6	9.8	9.9	9.5	8.5	6.1	3.1	0.2
48	Croatia	6.4	13.1	4.6	2.0	7.7	10.3	11.5	9.8	10.2	13.1	14.6	15.5	15.9	13.9	12.5	9.0	4.5	0.3
49	Paraguay	21.0	21.0	5.7	6.7	2.7	15.3	16.8	8.9	10.2	14.0	15.0	15.6	15.9	14.5	13.1	9.5	4.7	0.4
50	Swaziland	0.5	0.3	0.5	0.3	0.4	4.5	5.3	4.9	6.3	7.7	9.1	9.9	10.4	8.4	7.5	5.4	2.7	0.2
51	Bosnia and Herzegovina	0.9	0.9	0.2	0.1	0.1	10.1	4.0	6.3	7.9	9.7	11.3	12.2	12.6	10.5	9.4	6.8	3.4	0.3
52	Guatemala	1.2	3.9	3.5	2.2	6.5	5.9	9.2	9.1	10.1	11.8	13.4	14.4	14.8	12.6	11.4	8.2	4.1	0.3
	Subtotal Group 3	514.4	551.0	528.0	554.9	677.5	763.9	1,014.6	954.3	1,062.3	1,184.9	1,294.7	1,368.5	1,392.8	1,239.8	1,115.8	805.9	402.9	31.0

	Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2015	2020	2025	2030
	Group 4																		
53	Angola	-	5.0	5.0	5.5	6.6	7.2	7.2	9.2	9.2	10.0	10.8	11.2	11.4	10.4	9.4	6.8	3.4	0.3
54	Algeria	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	5.9	4.3	2.1	0.2
55	Ecuador	-	-	-	-	13.1	-	-	3.7	4.0	3.9	3.1	2.8	3.8	3.5	3.2	2.3	1.1	0.1
56	Haiti	15.0	15.0	16.5	3.6	8.1	4.1	4.4	0.7	(2.0)	(4.3)	(4.7)	(4.9)	(9.8)	(4.5)	(4.0)	(2.9)	(1.5)	(0.1)
57	Zimbabwe	8.1	15.4	4.1	3.4	3.6	8.0	9.7	6.0	5.4	7.9	8.4	8.7	7.8	8.2	7.3	5.3	2.7	0.2
58	Bahamas	3.9	5.4	2.7	3.2	5.0	5.6	4.9	5.2	5.5	6.3	6.5	6.6	6.8	6.4	5.8	4.2	2.1	0.2
59	Cambodia	2.3	2.3	2.3	2.8	4.2	6.2	6.0	6.7	7.8	8.9	9.8	10.3	11.2	9.3	8.4	6.1	3.0	0.2
60	Fiji	1.6	1.3	5.0	-	3.9	5.1	4.7	5.3	6.0	6.4	7.8	8.8	8.4	7.1	6.4	4.6	2.3	0.2
61	Cote d'Ivoire	7.9	7.4	2.7	2.7	3.0	5.9	5.9	3.8	4.3	5.5	5.7	5.9	5.4	5.6	5.0	3.6	1.8	0.1
62	Papua New Guinea	3.9	2.1	3.8	3.6	3.8	3.7	3.9	4.0	4.4	4.3	4.5	4.6	4.8	4.4	3.9	2.8	1.4	0.1
63	Afghanistan	-	-	-	-	3.2	4.1	4.8	5.4	6.8	8.2	9.3	10.0	11.2	8.7	7.9	5.7	2.8	0.2
64	Togo	3.5	3.2	-	4.0	3.7	3.1	2.6	3.0	3.3	3.8	3.1	2.9	3.5	3.5	3.1	2.3	1.1	0.1
65	Macedonia, FYR	5.0	10.4	3.9	6.0	4.8	1.9	2.4	1.5	(0.4)	(0.6)	(2.2)	(4.9)	(3.8)	(1.4)	(1.2)	(0.9)	(0.4)	(0.0)
66	Bolivia	1.0	2.0	1.6	2.9	3.3	2.9	3.1	3.8	4.0	4.3	4.4	4.5	5.1	4.4	3.9	2.8	1.4	0.1
67	Armenia	0.7	1.7	1.7	1.7	2.9	3.0	3.8	4.1	4.5	5.1	5.7	6.0	6.6	5.4	4.8	3.5	1.8	0.1
68	Cameroon	0.3	0.3	1.3	1.2	1.3	4.4	9.4	7.7	9.6	11.5	13.7	15.0	16.9	12.6	11.4	8.2	4.1	0.3
69	Brunei Darussalam	1.1	1.7	2.9	1.4	3.1	2.6	0.8	2.1	1.8	1.5	1.5	1.5	1.1	1.5	1.4	1.0	0.5	0.0
70	Nicaragua	-	2.0	1.8	2.3	2.2	3.4	0.9	2.6	2.4	2.4	2.3	2.2	2.2	2.3	2.1	1.5	0.8	0.1
71	Jamaica	6.6	11.1	6.3	5.4	5.6	-	0.7	(0.7)	(3.4)	(4.6)	(6.5)	(7.9)	(9.5)	(5.6)	(5.0)	(3.6)	(1.8)	(0.1)
72	Botswana	1.6	1.6	1.8	2.2	2.3	3.1	6.9	5.6	6.6	7.8	8.9	9.5	10.8	8.3	7.5	5.4	2.7	0.2
73	Madagascar	0.8	0.6	0.6	0.6	2.6	2.6	1.7	2.6	3.1	3.5	3.7	3.9	4.2	3.6	3.2	2.3	1.2	0.1
74	Barbados	1.1	1.7	2.2	2.9	2.6	2.6	2.6	3.2	3.3	3.3	3.4	3.4	3.8	3.3	3.0	2.2	1.1	0.1
75	Mali	1.0	1.3	2.3	2.4	2.5	2.5	1.3	2.4	2.3	2.1	2.0	2.0	2.0	2.0	1.8	1.3	0.7	0.1
76	Maldives	-	1.7	1.2	2.0	2.2	2.7	3.3	3.7	4.0	4.6	5.0	5.2	5.9	4.8	4.3	3.1	1.5	0.1
77	Turkmenistan	2.6	4.4	0.4	1.0	0.8	3.8	5.6	3.8	4.5	6.1	6.9	7.3	7.8	6.5	5.8	4.2	2.1	0.2
78	Myanmar	0.3	-	2.2	2.1	3.4	0.2	1.3	2.0	1.9	1.4	1.3	1.3	1.7	1.4	1.2	0.9	0.5	0.0
79	Guyana	-	0.7	1.3	1.2	1.0	2.5	0.4	1.7	1.6	1.5	1.6	1.6	1.5	1.6	1.4	1.0	0.5	0.0
80	Somalia	0.8	0.9	1.1	1.2	1.5	2.0	2.7	2.6	3.0	3.4	3.9	4.1	4.5	3.6	3.3	2.4	1.2	0.1
81	Gabon	2.5	2.0	1.9	1.9	1.7	1.5	3.3	2.3	2.5	2.8	3.0	3.1	3.4	2.9	2.6	1.9	0.9	0.1
82	Sierra Leone	1.6	1.9	2.2	2.0	1.6	1.0	1.4	1.2	1.0	0.7	0.6	0.5	0.4	0.6	0.6	0.4	0.2	0.0
83	Mauritania	1.4	1.6	1.8	-	1.3	1.2	1.2	0.9	0.9	0.9	1.1	1.3	0.9	1.0	0.9	0.7	0.3	0.0
84	Moldova	-	-	-	-	1.5	0.9	0.7	1.2	1.5	1.7	1.8	1.9	2.1	1.8	1.6	1.1	0.6	0.0
85	Georgia	0.8	0.8	0.9	0.9	1.1	1.1	1.6	1.5	1.6	1.8	2.0	2.1	2.3	1.9	1.7	1.2	0.6	0.0
86	Malawi	1.0	1.0	1.0	1.1	0.7	1.5	3.0	2.3	2.7	3.1	3.6	3.9	4.3	3.4	3.0	2.2	1.1	0.1
87	Liberia	1.3	0.8	1.7	1.5	1.3	0.8	1.2	1.1	1.1	0.9	0.8	0.8	0.9	0.9	0.8	0.6	0.3	0.0
88	Lao, PDR	0.6	0.8	0.6	0.6	-	1.8	1.6	1.5	1.7	2.1	2.4	2.6	2.7	2.3	2.0	1.5	0.7	0.1
89	Burundi	-	-	-	-	1.0	0.7	0.8	1.0	1.3	1.5	1.7	1.8	2.0	1.6	1.4	1.0	0.5	0.0
90	Eritrea	2.6	-	-	-	-	1.7	1.7	1.0	1.8	2.1	2.5	2.7	2.8	2.3	2.1	1.5	0.8	0.1
91	Lesotho	-	0.9	1.0	0.9	0.9	0.8	1.4	1.4	1.4	1.5	1.6	1.7	1.9	1.6	1.4	1.0	0.5	0.0
92	Zambia	1.0	0.5	0.8	0.8	0.8	0.8	0.7	0.7	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.5	0.2	0.0
93	Kyrgyzstan	0.2	0.2	0.2	0.5	0.7	0.7	0.8	0.9	1.1	1.2	1.3	1.4	1.6	1.3	1.1	0.8	0.4	0.0
94	Djibouti	-	-	-	-	-	1.4	1.4	1.4	1.8	2.2	2.6	2.9	3.1	2.4	2.2	1.6	0.8	0.1
95	Guinea-Bissau	-	-	-	0.9	-	1.4	1.4	1.5	1.9	2.2	2.4	2.6	3.0	2.3	2.1	1.5	0.8	0.1
96	Suriname	5.0	5.0	5.0	0.1	0.4	1.0	1.3	(0.8)	(1.7)	(2.3)	(2.2)	(2.1)	(4.1)	(2.2)	(2.0)	(1.4)	(0.7)	(0.1)
97	Saint Vincent and the Grenadines	-	-	0.4	0.3	0.8	0.5	1.1	1.1	1.3	1.5	1.7	1.8	2.1	1.6	1.4	1.0	0.5	0.0
98	Antigua and Barbuda	0.1	0.2	0.3	0.2	0.7	0.6	0.5	0.7	0.8	0.9	1.0	1.0	1.1	0.9	0.8	0.6	0.3	0.0
99	Rwanda	0.3	0.3	0.3	0.3	0.3	1.0	1.0	1.0	1.2	1.4	1.6	1.7	1.9	1.5	1.4	1.0	0.5	0.0
100	Mongolia	0.2	0.6	0.4	0.5	0.4	0.6	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.3	0.2	0.0
101	Niger	1.0	1.0	1.0	0.9	-	0.9	0.8	0.5	0.5	0.5	0.5	0.5	0.3	0.5	0.4	0.3	0.2	0.0
102	Seychelles	0.1	0.1	0.3	0.5	0.5	0.3	0.6	0.6	0.7	0.7	0.8	0.8	1.0	0.8	0.7	0.5	0.2	0.0
103	Saint Kitts and Nevis	0.5	0.6	0.7	0.4	0.5	0.2	0.5	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.0
104	Grenada	0.2	-	0.2	0.2	0.5	0.1	0.3	0.3	0.4	0.4	0.4	0.4	0.5	0.4	0.3	0.2	0.1	0.0
105	Dominica	0.2	0.1	0.1	0.1	0.1	0.5	0.1	0.2	0.3	0.3	0.4	0.4	0.3	0.3	0.3	0.2	0.1	0.0
106	Samoa	0.1	0.3	0.4	0.2	0.4	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.0
107	Solomon Islands	0.5	0.5	5.2	0.2	0.4	0.2	0.2	0.1	(0.6)	(1.7)	(1.3)	(1.1)	(2.2)	(1.5)	(1.4)	(1.0)	(0.5)	(0.0)
108	Congo	0.9	1.0	1.5	1.7	0.2	0.4	0.5	0.4	0.1	(0.3)	(0.5)	(0.6)	(0.7)	(0.4)	(0.3)	(0.2)	(0.1)	(0.0)
109	Benin	0.6	0.5	0.5	0.5	0.3	0.3	0.3	0.2	0.2	0.1	0.0	0.0	(0.0)	0.1	0.1	0.0	0.0	0.0
110	Mozambique	0.5	0.5	-	0.4	0.3	0.3	0.3	0.2	0.2	0.3	0.2	0.2	0.2	0.3	0.2	0.2	0.1	0.0

111	Central African Republic	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.3	0.2	0.1	0.0
112	Chad	0.1	0.2	0.2	0.1	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.4	0.4	0.3	0.1	0.0
113	Micronesia	-	0.3	0.3	0.3	0.4	0.1	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
114	Uganda	1.5	1.6	1.7	0.2	0.1	0.3	0.3	(0.3)	(0.6)	(0.9)	(0.9)	(0.9)	(1.5)	(0.9)	(0.8)	(0.6)	(0.3)	(0.0)
115	Comoros	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
116	Gambia	0.1	0.1	0.2	0.2	-	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
117	Palau	-	-	0.1	0.1	0.1	-	-	0.0	0.0	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
118	Marshall Islands	0.1	0.1	0.1	0.1	0.1	-	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
119	Sao Tome and Principe	0.1	0.1	0.1	0.1	0.1	-	-	0.0	(0.0)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)
120	Tonga	-	0.1	0.2	-	0.1	-	-	0.0	(0.0)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)
121	Saint Lucia	0.8	0.3	0.1	-	0.1	-	0.1	(0.2)	(0.1)	(0.2)	(0.2)	(0.2)	(0.3)	(0.2)	(0.2)	(0.1)	(0.1)	(0.0)
122	Bhutan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
123	Cape Verde	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
124	Cook Islands	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
125	Ethiopia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
126	Kiribati	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
127	Montenegro	-	-	-	-	-	-	1.3	0.7	1.0	1.3	1.5	1.7	2.0	1.4	1.3	0.9	0.5	0.0
128	Namibia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
129	Nauru	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
130	Niue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
131	Tanzania	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
132	Tuvalu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
133	Congo, DR	-	0.6	0.6	-	-	-	6.6	3.7	4.7	6.0	7.4	8.3	9.6	6.7	6.0	4.3	2.2	0.2
134	Belize	0.2	0.8	-	-	-	-	-	(0.2)	(0.3)	(0.3)	(0.3)	(0.4)	(0.5)	(0.3)	(0.3)	(0.2)	(0.1)	(0.0)
135	Nepal	4.3	1.7	1.7	-	-	-	1.1	(0.8)	(0.7)	(1.0)	(0.9)	(0.9)	(1.7)	(1.0)	(0.9)	(0.6)	(0.3)	(0.0)
VLVC	Subtotal Group 4	106.4	133.2	115.3	90.9	126.8	125.5	148.3	138.3	142.0	154.8	166.0	170.4	173.4	160.4	144.3	104.2	52.1	4.0
	Total without Group 1	6,101.4	5,731.3	5,407.0	5,921.9	7,204.4	7,531.8	8,333.4	8,332.2	9,105.7	9,907.9	10,461.9	10,770.4	11,009.9	10,174.9	9,163.0	6,569.5	3,284.8	252.7
	Total with Group 1	11,263.2	10,853.3	11,195.8	13,674.5	17,546.8	22,511.8	22,678.4	24,805.3	28,133.8	31,318.0	33,914.5	35,343.2	36,169.9	32,606.3	29,351.2	21,150.0	10,575.0	813.5
	Observations																		
	*Source: Data reported by all Article Parties (excluding Republic of Korea, Singapore and United Arab Emirates (i.e., countries that have so not received assistance from the Fund) under Article 7 of the Montreal Protocol.																		
	*2005 and 2006 data for Group 1 has been averaged over the two years, with specific averages for each chemical, which numbers were totaled																		
	*2005 data was considered for 2006 for countries that had not reported data for 2006 as of 7 December 2007. Data for Palau for 2000 and 2001 was replaced to zero instead of the reported consumption of 1,274.6 metric tonnes																		
	HCFC-22 consumption level for Croatia for 2006 (-56.4 metric tonnes) was replaced by the 2005 reported data.																		
	*Only HCFC-141B, HCFC-142B and HCFC-22, representing over 99% of total consumption by Article 5 Parties, is included in this analysis.																		