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**Analysis and calculations on the various scenarios for accelerated HCFC  
phase out contained in the proposed adjustments of the Protocol –  
Submission by the Multilateral Fund Secretariat**

1. At the twenty-seventh meeting of the Open-ended Working Group, the Parties considered proposals for adjustments of the Montreal Protocol with respect to the phase out of hydrochlorofluorocarbons (HCFCs). The Working Group, among other things, looked forward to the results of the study undertaken by TEAP pursuant to decision XVIII/12 which it felt would contain much information that would be important to the discussions on the issue. The Working Group also strongly encouraged and invited Parties and relevant organizations to share their analysis and calculations on the various scenarios for accelerated HCFC phase out contained in the proposed adjustments of the Protocol and to provide that information to the Secretariat for posting on the Secretariat's website.
2. The attached analysis was submitted to the Secretariat by the Multilateral Fund Secretariat on 4 September and posted on the Secretariat's website at [http://ozone.unep.org/Meeting\\_Documents/mop/19mop/MLF-Submission-on-HCFC-Adjustment-Proposals.pdf](http://ozone.unep.org/Meeting_Documents/mop/19mop/MLF-Submission-on-HCFC-Adjustment-Proposals.pdf)
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## Introduction

1. In response to the invitation of the twenty-seventh meeting of the Open-ended Working Group to Parties and relevant organizations to share their analyses and calculations on the various scenarios for accelerated phase-out of HCFCs contained in the proposed adjustments, the Fund Secretariat informed the Executive Committee that it could provide information related to the agencies' business plans and the findings of the HCFC surveys that had been funded by the Multilateral Fund. It should be noted that any cost estimates for HCFC projects and activities based on the business plans would be highly variable in the absence of guidelines agreed by the Executive Committee for the calculation of the incremental costs for such projects, and represent only the estimate of implementing and bilateral agencies. These estimates are not able to take into account any future guidelines the Executive Committee might agree. Further, the estimates provided apparently do not in some cases take fully into account the present Executive Committee guidelines regarding limitations in the eligibility of beneficiaries, which could have a significant impact.

## Business Plans

2. The 2007-2009 business plans as submitted by the implementing agencies included US \$81.3 million for HCFC activities. Of this, US \$1.4 million was for surveys, US \$9.8 million was for investment activities, US \$5.7 million was for strategies, surveys and project preparations in 2008 and the balance of US \$64.4 million was for activities in 2009. The total volume of HCFCs addressed in the business plans, as submitted by the implementing agencies, was 3,474 ODP tonnes, representing 17 per cent of current levels of HCFC consumption (20,467 ODP tonnes). HCFC production closure projects were not included. The Executive Committee decided to remove HCFC activities from the 2007-2009 business plans for the time being on the understanding that those issues would be considered at the first meeting of the Committee in 2008 (decision 51/5(d)).

## Surveys

3. A strategy for the long term management of HCFCs in China approved in 2004 was prepared as a bilateral activity by Germany. HCFC surveys approved in 2005 were conducted during 2006 and 2007 by UNDP for 12 countries. The following table summarizes the consumption information for 2005 by HCFC-22 and HCFC-141b for the 13 countries along with the forecasts for 2015 provided in those surveys.

Country	2005		Forecast on 2015		Grand Total
	HCFC-22	HCFC-141b	HCFC-22	HCFC-141b	
Indonesia	2,340	1,636	6,070	1,064	11,110
India	8,854	2,156	20,643	6,416	38,069
Venezuela	1,887	256	3,378	458	5,979
Colombia	900	857	1,850	1,762	5,369
Argentina	3,004	460	6,400	1,030	10,894
Mexico	7,214	7,002	18,663	13,776	46,655
Brazil	7,956	3,759	5,561	18,812	36,088
Iran	1,323	791	5,190	3,103	10,407
China	122,000	21,000	252,000	46,000	441,000
Lebanon	324	11	669	23	1,027
Malaysia	4,553	1,007	6,675	1,476	13,711
Sri Lanka	224	1	530	0	530
Syria	619	237	1,901	64	1,965
Total studies	160,974	38,935	329,530	93,985	622,805

UNDP

4. UNDP provided the following conclusions on the first nine surveys to the 51<sup>st</sup> Meeting in document UNEP/OzL.Pro/ExCom/51/Inf.2 as follows:

- “33. Countries were pleased with the information developed through the surveys and feel that the preparation of the surveys on HCFC use and the growth patterns are an essential first step in managing HCFC use;
- 34. There is general agreement that a “no action” scenario is not an option and would lead to violation of 2016 consumption freeze;
- 35. There is broad commitment to accelerate the HCFC phase-out process but that this would require follow up, such as a country strategy to be able to do so;
- 36. There is a strong will to investigate combining HCFC phase-out with CDM programmes;
- 37. The need to adjust current policies of the Multilateral Fund—or even to amend the Montreal Protocol—were mentioned several times;
- 38. In this regard, a presentation by the TEAP Chairs to a Workshop of the “Stockholm Group” in July 2006 was of interest. Following questions were posed:
  - How can Article 5 countries phase-out HCFCs without major disruption?
  - How to access technology and financing?
  - How does energy efficiency factor in?
  - What are the related financial and environmental costs?
  - What are the costs of an accelerated phase-out of HCFCs?
  - How do we deal with unwanted by products of HCFCs (HFC-23, CTC)?
- 39. The surveys provide a partial basis to address some of these questions. UNDP has developed a mathematical model that allows predicting costs of different phase-out scenarios. Discussion of the model will exceed the scope of this introduction to the surveys but it is thought that it will be instrumental in developing strategies that are financially affordable and environmentally effective.
- 40. UNDP believes that the Multilateral Fund can play a significant role in assisting Article 5(1) countries in preparing and implementing strategies that will allow meeting the Protocol’s deadlines—or even do better.
- 41. Suggested areas of further preparatory activities towards a comprehensive HCFC Management Policy for Article 5(1) countries would be:
  - Preparation of a proposal to adjust Multilateral Fund funding policies and guidelines for HCFC phase-out projects that have typically at equal ODS effect, but only 5-11% of the ODP impact.
  - Preparation of more country specific HCFC surveys
  - Preparation of Country Strategies towards HCFC management
  - Preparation of pilot projects to validate new/modified technologies
  - Fine-tune the UNDP phase-out cost model
  - Address sector-specific issues (flushing, use of HCFC -141b in firefighting, etc.)
  - Investigate co-funding opportunities
  - Preparation of projects for specific opportunities”.

Germany

5. The Executive Summary from the German bilateral project on a Suitable Strategy for the Long Term Management of HCFCs, in particular HCFC -22, in China that was presented to the 51<sup>st</sup> Meeting of the Executive Committee in document UNEP/OzL.Pro/ExCom/Inf.3, includes the following points:

“China may have reached the status of largest HCFC producer and consumer in the world by 2004. By the end of 2004, there were 18 HCFC -22 producers in China, with a total capacity of 368,000 metric tonnes/year and actual output of 247,687 MT in 2004. Domestic consumption was 177,150 MT, of which about one third was used as raw material;

Excluding this feedstock consumption, about 90,000 MT of HCFC-22 was used as refrigerant and about 10,000 MT were used as foaming agent and aerosol;

Future demand of HCFCs is likely to continue to increase unabated for domestic consumption to about 300,000 MT during the next 10 years, unless constrained by policy and technology improvements;

The largest share of HCFC -22 consumption is for room air-conditioners. Total production for domestic use and export reached a total of 67.6 million units in 2005. The room air-conditioner sector is expected to grow at a rate of 7% annually. Expanded polystyrene (XPS) foam production is expected to increase by 9 % annually. These growth rates are the highest of all HCFC-22 uses, and therefore total consumption of HCFC-22 will continuously increase;

A range of viable alternatives is available for HCFC-22 uses. Several of these already exist commercially, especially those using R -410a and R -407. Expanding the use of alternatives is hampered mainly by economic barriers;

Three examples of possible alternative development routes (scenarios B, C and D) are analysed and compared to the forecast based on business as usual (BAU, scenario A), reflecting different levels of consumption management policy. These include demonstration projects, public information campaigns, training activities, consumption limitations, production quotas and standards on energy efficiency and leakage rates. Compared to BAU with 18,920 ODPtonnes in 2015, the scenarios lead to 15,730 (scenario B), 13,640 (scenario C) and 11,990 ODP tonnes in 2015 for scenario D. Basically, scenario B would require to convert a quarter of air-conditioner production to non HCFC-22, whereas scenario C necessitates one third and scenario D implies that one half of all air conditioner production is converted to alternatives by 2015;

Cost estimates for production line conversions, new types of compressors, alternative refrigerants and gains from air-conditioner energy efficiency are provided. The estimates are based only on one example, namely the conversion from HCFC-22 to R-410a. Other possible conversions, i.e. using hydrocarbon technology, were omitted in the current study as cost and efficiency gains could not be estimated with sufficient accuracy at present;

Consideration of Scenario B is recommended as the most feasible for implementation because its requirements for available capital, degree of executing laws and impact on chemical industries are lower than for scenarios C and D. Total costs for scenario B between 2007 and 2015 are estimated at 14.4 billion Yuan (US \$1.9 billion). Two thirds of the additional cost estimates reflect the conversion of the production of compressors to non-HCFC-22 refrigerants;

Potential energy savings achievable from widely increasing non-HCFC -22 air-conditioner sales in the domestic market may increase the policy makers' attention for HCFC-22 replacement.”

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