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THE COSTS TO DEVELOPING COUNTRIES OF ENTERING THE MONTREAL PROTOCOL: A SYNTHESIS REPORT

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INTRODUCTION

1. To date four papers have prepared which address the question of the size and scope of financial resources required by developing countries to meet the terms of the Montreal Protocol. Two of these were presented at an informal meeting of memebrs of the Protocol in January of this year. One was prepared by a team of Indian consultants from the Development Alternatives , New Delhi, and the other by a British Consulting Company, Metroeconomica Ltd. The third is a specific case st dy on the Costs of the Montreal Protocol to India, funded by the Overseas Development Administration of the UK, under a programme of country specific case studies initiated by UNEP. Finally, the fourth is a document prepared by the US Environment Protection Agency on the "Capital Costs for CFC Reductions for the First Three Years".

2. In advance of the Meeting of the Parties to the Montreal Protocol to be held in London in June of this year, it was felt that a synthesis paper be prepared, which would bring together the range of cost estimates and, as far as possible, resolve the differences between them. This exercise has to be much more limited than previously envisaged because most of the individual case studies have yet to be completed. There are studies under way for Algeria, Argentina, China, Egypt, Liberia, Panama, Philippines, South Korea, Tunisia and Venezuela.* As these studies are completed, information on these costs will become more precise. In the meantime, however, there is a need for an acceptable estimate for the next three years of the Protocol (1991-1993), so that funds can be allocated and the process of assisting developing countries got under way.

3. This short report looks at the three quantitative estimates for the costs to developing countries and seeks to establish a cinsensus figure fr m them. These are the Metroeconomica study, the ODA study on India and the recent EPA study. The Indian study referred to earlier had no quantitative estimates of the costs. The next section compares the Metroeconomica and USEPA figures and finds a great degree of similarity between them. However, they are compared only for the next three years as that is the extent of the USEPA study. The following section looks at the comparision between the UK study and the USEPA study, again for the next three years. A final section drwas some general conclusions on the estimates of costs to date.

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* In addition, some information is being collected in Brazil, Indonesia, Kenya, Malaysia, Malta, Mexico and Uganda. Of all the case studies, in addition to India, some results should be available by the end of this year from: Brazil, China, Egypt, Malaysia, Mexico, The Philippines and Venezuela. It is unrealisiticto expect much more information before the June meeting from the case studies, with the possible exception of Egypt and Mexico.

THE METROECONOMICA AND USEPA ESTIMATES

4. Table 1 summarises the costs of entering the Montreal Protocol, for the next three years, as estimated by Metroeconomica and the USEPA. If we exclude the additional operating costs, which were not estimated by USEPA, there is a remarkable similarity between the t sets of estimates. Metroeconomica a total budget of $220 million as being required for the capital costs, and USEPA has a budget of between $162 and $215 million. Given the general uncertainities surrounding these estimates, this represents a large degree of consensus. However, there are a number of detailed points that arise from the estimates that should be clarified:

(a) the USEPA capital costs were estimated on a fairly simple formula. A 'typical' country was taken and its costs of converting away from CFC use was estimated. This 'typical' country was assumed have costs similar to those of Egypt, Malaysia, Mexico, Singapore, Thailand and Venezula. For smaller developing countries that are parties to the Protocol, costs of 20% of those of the above count es were assumed to hold. Finally, for India and China, costs of two to four times those of the 'typical' country were taken. However, applying this formula to the individual cost items does not give a total figure equal to that reported by USEPA in Table 1. This can be seen from the comparison between the two costs, under detailed CFC use categories, as given in Table 2. According to that, the range of costs for the EPA study would be much wider - ranging from $176 million to $344 million. There may be a good reason for reducing the upper limit of this range but it needs to be stated;

(b) in addition to the capital costs, there are the additional operating costs to be considered. The EPA estimates exclude these, but the Metroeconomica ones are around $100 million for the next three years. This estimate cannot be directly compared as the comments on the operating costs in the EPA document are not fully quantified.

(c) The other cost itmes are roughly the same. That for technical assistance is very similar, and that for coordination is $7 million higher in the Metroeconomica study, because the latter includes the costs of country specific studies, and any follow up information gathering exercises that may be required.

5. In conclusion, however, the two sets of estimates are remarkably close, and suggest that a budget for the capital costs to developing countries for the next three years should be somewhere $160 and $220.

TABLE 1

ESTIMATES OF COSTS OF COMPLIANCE TO THE MONTREAL PROTOCOL FOR DEVELOPING COUNTRIES OVER THE NEXT THREE YEARS (1991-1993)

	METROECONOMICA	USEPA
CAPITAL COSTS OF CONVERSION 1/	$200 MILLION	$150-200 MILLION
OPERATING COSTS	$98 MILLION	NOT REPORTED
TECHNICAL ASSISTANCE	$10 MILLION	$9-12 MILLION
COORDINATION 3/	$10 MILLION	$3 MILLION
TOTAL EXCLUDING OPERATING COSTS	$220 MILLION	$162-215 MILLION
TOTAL INCLUDING OPERATING COSTS	$318 MILLION	NOT REPORTED

Notes:

1/ Details of the capital costs of conversion are given in Table 2.

3/ Coordination costs include the costs of information collection in the case of Metroeconomica.

TABLE 2

COSTS OF CAPITAL CONVERSION

	USEPA	METROECONOMICA
AEROSOLS: Plant relocation or adding filling room Compressed gas as propellants	$25,000-$750,000 according to plant size. $45,000-$120,000 according to plant size. Total cost: $20-105 million	Based on UK estimates cost of conversion of $ 3.3 million per 100 million aerosols. UK market was 750 million aerosols, about 2/3 rds of total LDC market. This would give an overall cost for LDCs of $37 million.
FOAMS: Packaging Polyurethane Insulation & Flexible foams	$50,000-$150,000 according to plant size. Little or no investment required. Total Cost: $10-13 million.	$100,000-150,000 for flexible foams for an average sized plant using AB technology. Higher capital costs for protection against explosion for rigid foam insulation. Safety standard costs for use of hydrocarons on foam sheets around $1 million per plant. No overall cost estimated.
HOUSEHOLD REFIGERATION:	Up to $50,000 per plant. Total Cost: $2-4 million.	No firm cost estimate given. However, costs of industrial refigeration at $9 million were included.
MOBILE AIR-CONDITIONING:	$1,000-$2,500 per machine. Total Cost:$7-44 million.	$1,500-$2,000 per machine. Lower costs for partial retrofitting and for new machines.
SOLVENTS: Aqueous cleaning: Engineering controls	$10,000-130,000 per machine. $1,900-$60,000 per machine. Total cost:$136-176 million.	No firm cost estimate given.
HALONS:	Recycling of portable and wheeled units: $1,000-$3,000 per machine. Total Cost:$1-2 million.	Costs of halons were not estimated.

addition, Metroeconomica included a cost of $370 million for the nversion of refigerated transport in developing countries over 18 ars. On a pro rata basis this amounts to $60 million r the three years, 1991-1993.

THE USEPA ESTIMATES AND THE INDIAN CASE STUDY

6. The Indian case study identifies THREE items of cost: to the producer sector, the user sector and the consumer sector. The producer sector is the sector manufacturing CFCs or their substitutes, and would have costs corresponding to the 'operating' cost item in the Metroeconomica study. This item was not estimated in the USEPA study. The Indian study assumes that no action will need to be taken before 1996 in this regard, and that in the period 1996-2000, the cost to producers will be negative. This arises because the items substituted in the first years are actually more expensive than the substitutes themselves. If this can be said to hold in other countries with large CFC manufacturing facilities, then the costs of substitution on the operating side could well be negative, or at least very small for such countries.

7. The second item of cost is in the user sector. Here the main costs arise because of changes in domestic refrigeration, industrial and commercial refrigeration, air conditioning, foam blowing, aerosols and cleaning. The most significant result as far as the comparison with the USEPA study is concerned is that no additional costs are estimated before 1996. This contrasts with the EPA document which assumes that between 15 and 23 percent of the total capital costs will arise in India over the first three years of the Protocol. Although a country like India would not need to shift its user sector to the new products before 1997, it is very unlikely that it will be able to postpone all the relevant changes to that date. Hence, the assumption in the EPA and the Metroeconomica studies that capital costs will be incurred before that date is probably correct.

8. We may also compare the estimated costs of capital conversion in the EPA and the Indian studies. The relevant figures are shown below*

	EPA STUDY	INDIAN STUDY
Domestic Refrigeration	$200000-400000	$325,000 (assembly lines) $1.3 million (compressors)
Mobile air-conditioners	$1-5 million	$630,000
Aerosols	$1-4 million	$260,000

In general the Indian study shows lower cost estimates, except for for domestic refrigeration, where the figure is considerably higher.

* Not all items of capital cost were comparable, as the published Indian study did not report full details of its capital cost calculations.

9. The final component of cost in the Indian study is that of the costs to to the consumers. This arises because of the earlier replacement of refrigerators, air conditioner compressors and ice candy machines' compressors when no CFC12 is available for recharging. Such costs do not arise until 2001 and are therefore of no relevance to the comparison with the EPA study. However, it should be noted that in the Indian study this component of cost is by far the largest, dwarfing the others by several orders of magnitude. For example, at an 8% real discount rate the costs to consumers were Rs. 19 billion, compared to Rs. 900 million for the producer and consumer sectors. This represents the total discounted present value costs to 2010. It is difficult to accept this estimate of cost as realistic. If there are such losses to be incurred from the premature depreciation of consumer equipment, a market in recycling CFCs would automatically develop, and much of the premature depreciation would be mitigated. As the Indian study itself shows, by delaying the shutdown of one of the old CFC12/13 plants by a few years, the total cost of sustitution to 2010 falls from nearly Rs. 20 billion, to Rs. 1 billion.

10. Given such wide variations in the Indian study, little value can be placed on its estimates at this stage. However, it does raise the question of the costs of early depreciation of consumer equipment, which needs to be addressed.

PRELIMINARY DATA FROM THE EGYPTIAN STUDY

11. Since this report was started, data from the Egyptian study have been made available, albeit in a preliminary form. At this stage it does not have any cost estimates in total but there are some figures for certain industries. These are discussed below:

Aerosols: Current capacity is 55 million units/year and the estimated cost of converting to hydrocarbons is estimated at $3.6 million at the current rate of exchange. However, not all plants would require the full cost identified above. Also, there would be savings in operating costs that need tobe accounted for. The EPA estimate of cost for aerosols in a country such as Egypt was $0.5-2.0 million, which suggests that the upper end of this range is more realistic.

Refrigerators: Production is around 1 million units and the estimated cost of insulation (injection, blending tanks and fitting) is put at $2.3 million. Again this is somewhat higher than the $2 00,000 assumed in the EPA document.

Air conditioning: Costs are not estimated b t are believed to be important.

Foams: No cost estimates are provided.

12. At this stage, therefore, it would appear that some of the cost items of capital cost for Egypt are higher than those included in the EPA report for a 'typical' country such as Egypt.

CONCLUSIONS

13. This brief report has examined all the quantitative evidence on the costs of entering the Montreal Protocol that has been available. This has has consisted of: the Metroeconomica Study, the USEPA Study, the Indian Study carried out by the Overseas Development Agency of the UK, and some preliminary results just received from the Egyptian study.

14. Both the Metroeconomica and EPA studies provide overall figures for all developing countries. Comparing both sets of estimates to 1993 - i.e. for the next three years, the numbers are remarkably similar. Looking at capital costs alone, these amount to somewhere between $160 and $220 million, with the higher figure probably being more realistic. However, there appear to be some discrepancy between the formula used in the EPA study, and the overall figures quoted in it. The other common items for technical assistance and coordination are also quite similar. Finally there is the item for operating costs in the Metroeconomica study that is not estimated in the EPA study.

15. The Indian study reveals three interesting findings. First, the 'operating' cost item is probably negative for India for the next six years. Second, no additional capital costs are to be incurred for the same period. Third the main item of cost in that country are the costs of premature depreciation of consumer equipment as suppiles of CFC12 run out. While there may be some validity in the first of these, the second and third are almost certainly not correct. Some capital cost expenditures are bound to be incurred in the next few eyars, and the very large figures for consumer costs arise because not enough attention is paid to the possibility of optimizing the depreciation of this equipment.

16. In so far as the figures of the Indian study and that of the EPA study can be compared, however, they reveal that the costs of coversion in the refrigeration industry are underestimated in the EPA study, and those of mobile airconditioners and aerosols overestimated.

17. Finally some data were made available from Egypt. These are very preliminary, but reveal that the costs of conversion in the aerosols and refrigerators industries are probably higher.

8. Some improvements in these estimates are bound to be made as more information is made available. However, at this stage, it would seem reasonable to think in terms of a consensus figure for the next three years of around $200 million for the capital cost item, $10 million for technical assistance and $5-10 million for coordination and information collection. The item of operating cost is still unclear. It could be very small for the next few years. However, it is an item that can be left unsettled for the time being, as it can always be compensated on an ex post basis.