



United Nations  
Environment  
Programme



Distr.  
LIMITED  
UNEP/OzL.Pro/ExCom/6/11  
27 February 1992



ORIGINAL: ENGLISH

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

Sixth Meeting  
Montreal, 27-28 February 1992

**ESTIMATED COST-EFFECTIVENESS OF WORLD BANK  
MONTREAL PROTOCOL PROJECTS**

## Estimated Cost-effectiveness of World Bank Montreal Protocol Projects

| Country  | Project Description                         | ODS Consumption Reduced | Tonnes ODS Phased out (MT)*** | Annual ODP Phased out (MT)*** | Total Project Cost (000's US \$) | Project Lifetime (yrs)** | Capital Recovery Factor** | Cost-effectiveness (\$ per kg) |
|----------|---------------------------------------------|-------------------------|-------------------------------|-------------------------------|----------------------------------|--------------------------|---------------------------|--------------------------------|
| China    |                                             |                         |                               |                               |                                  |                          |                           |                                |
|          | Halon fire extinguisher blend dev.          | H-1211/1301*            | 500                           | 2,000                         | \$1,800                          | 7                        | 0.21                      | \$0.18                         |
|          | Foam/hair spray aerosol conv. to LPG        | CFC-12                  | 13,000                        | 13,000                        | \$6,800                          | 20                       | 0.12                      | \$0.06                         |
|          | Polyurethane foam insulation 50% reduc.     | CFC-11                  | 2,200                         | 2,200                         | \$3,638                          | 25                       | 0.11                      | \$0.18                         |
|          | Polystyrene/urethane packaging to butane    | CFC-12                  | 400                           | 400                           | \$960                            | 20                       | 0.12                      | \$0.29                         |
|          | Halon prod. conv. to ABC powder             | H-1211                  | 500                           | 2,000                         | \$470                            | 20                       | 0.12                      | \$0.03                         |
|          | Halon extinguisher to ABC&AFT powder        | H-1211                  | 400                           | 1,600                         | \$720                            | 20                       | 0.12                      | \$0.05                         |
|          | Refrig.&A/C compressor conv. to HCFC-22     | CFC-12                  | 200                           | 200                           | \$1,750                          | 20                       | 0.12                      | \$1.05                         |
|          | Total                                       |                         |                               | 21,400                        | \$14,338                         |                          |                           | \$0.10                         |
| Ecuador  |                                             |                         |                               |                               |                                  |                          |                           |                                |
|          | Control and Env. Affairs Unit support       | n/a                     | n/a                           | n/a                           | \$300                            | n/a                      |                           | n/a                            |
|          | 6 Aerosol plant conv. to hydrocarbons       | CFC-12                  | 12,700                        | 699                           | \$2,500                          | 20                       | 0.12                      | \$0.43                         |
|          | Reduction of CFC-11 in refrig. foam insul.  | CFC-11                  | 400                           | 22                            | \$100                            | 25                       | 0.11                      | \$0.50                         |
|          | CFC refrigerant conserv. and training       | CFC-12                  | 600                           | 33                            | \$100                            | 5                        | 0.26                      | \$0.79                         |
|          | Total                                       |                         | 13,700                        | 754                           | \$3,000                          |                          |                           | \$0.45                         |
| Egypt    |                                             |                         |                               |                               |                                  |                          |                           |                                |
|          | Refrig. compressor HFC-134a modification    | CFC-12                  | 620                           | 620                           | \$2,400                          | 20                       | 0.12                      | \$0.46                         |
| Malaysia |                                             |                         |                               |                               |                                  |                          |                           |                                |
|          | Mobile A/C Recycling (200 units)            | CFC-12                  | 370                           | 370                           | \$900                            | 5                        | 0.26                      | \$0.63                         |
|          | Halon central recycling plant + 50 units    | H-1211                  | 300                           | 1200                          | \$2,100                          | 7                        | 0.21                      | \$0.37                         |
|          | Total                                       |                         |                               | 1570                          | \$3,000                          |                          |                           | \$0.43                         |
| Mexico   |                                             |                         |                               |                               |                                  |                          |                           |                                |
|          | Mobile A/C Demonstration Project            | CFC-12                  | 35                            | 2                             | \$75                             | 5                        | 0.26                      | \$10.03                        |
|          | Elimination of CFC aerosols & safety train. | CFC-12                  | 765                           | 43                            | \$105                            | 20                       | 0.12                      | \$0.30                         |
|          | Total                                       |                         |                               | 44                            | \$180                            |                          |                           | \$0.72                         |

\* The ODP of Halon 1211 is 4, and of Halon 1301 is 16, therefore the assumed ODP of 4 is conservative.

\*\* Assumes all projects survive number of years indicated, and are then repeated to keep reductions at the same level.  
Assumes a real discount rate of 10% and that all incremental costs are capital costs.

\*\*\* Per annum ODS phase out in China and Egypt. Cumulative ODS over 18 years to 2010 in Ecuador and Mexico.  
Ecuador and Mexico ODP phase out totals have been reduced by a factor of 1/18th to convert to per annum basis.