

Production and Consumption of Ozone Depleting Substances under the Montreal Protocol

1986 – 2004



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United Nations Environment Programme
PO Box 30552
Nairobi - 00100
Kenya

Web site: <http://www.unep.org/ozone> or <http://www.unep.ch/ozone>

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Preparation:
Gerald Mutisya, Database Manager, Ozone Secretariat

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Introduction

1. This report summarizes data on production and consumption of ozone-depleting substances as of 31 October 2005, reported by the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer under Article 7 of the Protocol.
2. The first edition of this report was issued in 1997, on the occasion of the 10th anniversary of the adoption of the Montreal Protocol. An updated version was published in 2002 containing data reported by the Parties for the period 1986 to 2000. The present report contains additional and updated data on the production and consumption of ozone-depleting substances (ODS), as reported to the Secretariat during the period 1986-2004, by 188 of the 189 Parties to the Montreal Protocol. The Secretariat has arranged the data provided by the Parties into groups for which control measures are prescribed in the Protocol.
3. The substances subject to reporting requirements and control measures are as follows:
 - (a) Annex A, Group I: chlorofluorocarbons (CFCs) and Group II: halons (*reporting obligations and control measures introduced in the original Montreal Protocol, 1987*);
 - (b) Annex B, Group I: other fully halogenated CFCs, Group II: carbon tetrachloride and Group III: methyl chloroform (*reporting obligations and control measures introduced in the London Amendment to the Montreal Protocol, 1990*);
 - (c) Annex C, Group I: hydrochlorofluorocarbons (HCFCs) (*reporting obligations introduced in the London Amendment to the Montreal Protocol, 1990, but to control measures introduced by the Copenhagen Amendment to the Montreal Protocol, 1992*);
 - (d) Annex C, Group II: hydrobromofluorocarbons (HBFCs) (*reporting obligations and control measures introduced in the Copenhagen Amendment to the Montreal Protocol, 1992*);
 - (e) Annex C, Group III: bromochloromethane (BCM) (*reporting obligations and control measures introduced in the Beijing Amendment to the Montreal Protocol, 1999*);
 - (f) Annex E, Group I: methyl bromide (MBr) (*reporting obligations and control measures introduced in the Copenhagen Amendment to the Montreal Protocol, 1992*).
4. The list of controlled substances under the Montreal Protocol, as well as the summary of the control measures applicable at the time of preparing this report follow this introduction. However, for an authoritative interpretation of the control measures, please refer to the relevant provisions of the Montreal Protocol.
5. Depending on the dates of ratification for the Protocol and Amendments, Article 7 of the Montreal protocol requires each Party to report data for the base year of the specific annex and for each year beginning with the year in which the Protocol or the Amendment entered into force for that Party. The ratification of amendments has proceeded steadily and by 31 October 2005, 189 Parties have ratified the Montreal Protocol, 179 the London Amendment, 168 the Copenhagen Amendment, 134 the Montreal Amendment and 97 the Beijing Amendment. The definition of a state not Party to the Montreal Protocol is contained in Article 4, paragraph 9 of the Protocol.
6. In the tables of the report, not all groups of controlled substances will have figures for each country for the different years. One reason is that Parties are required to report, and are bound by the control measures, for only those substances controlled by the Protocol and/or Amendments that they have ratified. Further, the obligation to report data starts from the year in which a particular ratification enters into force for a Party.
7. In the data presented in the annexes of this report, a hyphen (–) has been used where Parties have not reported and are not required to report data while the abbreviation N.R. (not reported) is used where Parties are required to report but have not done so.

8. Only Parties that have reported production of a certain substance or group of substances, or a Party with a non-zero calculated production for a given group of substances, will show up in the respective production table in this report. The tables of the report include, for each Party, the date of ratification of the Montreal Protocol and/or the relevant Amendment of the Protocol. The tables also include subtotals for Article 5 Parties (developing countries) and Non-Article 5 Parties (developed countries), as well as totals, for each year for each annex group.
9. The calculated production and consumption figures are based on formulae derived by applying the provisions of the Montreal Protocol. To calculate the figures for each group, the quantities in metric tonnes reported by the Parties for each substance in the group are multiplied by the ozone-depleting potential (ODP) of that substance and added together, after which adjustments are made based on the Protocol. All the data in this report is therefore presented in ODP tonnes.
10. Some of the calculated production or consumption figures may be negative. Production has been defined under Article 1(5) of the Protocol as production minus the amount destroyed minus the amount entirely used as feedstock in the manufacture of other chemicals. Process agent applications are treated in a manner similar to feedstock applications for non-Article 5 Parties, hence they are also deducted (decisions VII/10 and X/14 of the Meeting of the Parties). Calculated production may therefore be negative in cases where the destroyed amounts exceed the production. Since the figures are for each calendar year, it is quite possible that in some years the feedstock figure may exceed the production figure of that year, if the feedstock use is from a carry-over stock. The calculated production could be negative in such cases.
11. Consumption is defined as production plus imports minus exports of controlled substances (Article 1(6) of the Montreal Protocol). For reasons similar to those for calculated production, such as the case of exports from carry-over stock, the consumption could also be negative.
12. The Ninth Meeting of the Parties approved new formats for reporting data under Article 7 of the Protocol. The old data formats used by the Parties to report data were replaced, and beginning 1997 onwards, the revised formats have been used. To assist the Parties in providing the data as required by the revised formats, the *Handbook on Data Reporting under the Montreal Protocol* was prepared and distributed to all Parties by United Nations Environment Programme – Division of Technology, Industry and Economics (UNEP-TIE). This handbook is also available on the web at the address <http://www.uneptie.org/ozonaction>.
13. The Secretariat hopes that this publication will be of interest to many readers and would be grateful for any suggestions on ways of improving the format of the presentation or for any corrections. The Secretariat will prepare an update of this publication periodically, taking into account any suggestions received.

Marco González
Executive Secretary
Ozone Secretariat
United Nations Environment Programme
November 2005

List of Controlled Substances under the Montreal Protocol

Annex A: Controlled substances

Group	Substance	Ozone-Depleting Potential*
<i>Group I</i>		
	CFCl ₃ (CFC-11)	1.0
	CF ₂ Cl ₂ (CFC-12)	1.0
	C ₂ F ₃ Cl ₃ (CFC-113)	0.8
	C ₂ F ₄ Cl ₂ (CFC-114)	1.0
	C ₂ F ₅ Cl (CFC-115)	0.6
<i>Group II</i>		
	CF ₂ BrCl (halon-1211)	3.0
	CF ₃ Br (halon-1301)	10.0
	C ₂ F ₄ Br ₂ (halon-2402)	6.0

* These ozone depleting potentials are estimates based on existing knowledge and will be reviewed and revised periodically.

Annex B: Controlled substances

Group	Substance	Ozone-Depleting Potential
<i>Group I</i>		
	CF ₃ Cl	(CFC-13)1.0
	C ₂ FCl ₅	(CFC-111)1.0
	C ₂ F ₂ Cl ₄	(CFC-112)1.0
	C ₃ FCl ₇	(CFC-211)1.0
	C ₃ F ₂ Cl ₆	(CFC-212)1.0
	C ₃ F ₃ Cl ₅	(CFC-213)1.0
	C ₃ F ₄ Cl ₄	(CFC-214)1.0
	C ₃ F ₅ Cl ₃	(CFC-215)1.0
	C ₃ F ₆ Cl ₂	(CFC-216)1.0
	C ₃ F ₇ Cl	(CFC-217)1.0
<i>Group II</i>		
	CCl ₄	carbon tetrachloride1.1
<i>Group III</i>		
	C ₂ H ₃ Cl ₃ *	1,1,1-trichloroethane*0.1 (methyl chloroform)

* This formula does not refer to 1,1,2-trichloroethane.

List of Controlled Substances under the Montreal Protocol

Annex C: Controlled substances

Group	Substance	Number of isomers	Ozone-Depleting Potential*
<i>Group I</i>			
	CHFCI ₂ (HCFC-21)**	1	0.04
	CHF ₂ Cl (HCFC-22)**	1	0.055
	CH ₂ FCI (HCFC-31)	1	0.02
	C ₂ HFCl ₄ (HCFC-121)	2	0.01–0.04
	C ₂ HF ₂ Cl ₃ (HCFC-122)	3	0.02–0.08
	C ₂ HF ₃ Cl ₂ (HCFC-123)	3	0.02–0.06
	CHCl ₂ CF ₃ (HCFC-123)**	—	0.02
	C ₂ HF ₄ Cl (HCFC-124)	2	0.02–0.04
	CHFCICF ₃ (HCFC-124)**	—	0.022
	C ₂ H ₂ FCI ₃ (HCFC-131)	3	0.007–0.05
	C ₂ H ₂ F ₂ Cl ₂ (HCFC-132)	4	0.008–0.05
	C ₂ H ₂ F ₃ Cl (HCFC-133)	3	0.02–0.06
	C ₂ H ₃ FCI ₂ (HCFC-141)	3	0.005–0.07
	CH ₃ CFCl ₂ (HCFC-141b)**	—	0.11
	C ₂ H ₃ F ₂ Cl (HCFC-142)	3	0.008–0.07
	CH ₃ CF ₂ Cl (HCFC-142b)**	—	0.065
	C ₂ H ₄ FCI (HCFC-151)	2	0.003–0.005
	C ₃ HFCl ₆ (HCFC-221)	5	0.015–0.07
	C ₃ HF ₂ Cl ₅ (HCFC-222)	9	0.01–0.09
	C ₃ HF ₃ Cl ₄ (HCFC-223)	12	0.01–0.08
	C ₃ HF ₄ Cl ₃ (HCFC-224)	12	0.01–0.09
	C ₃ HF ₅ Cl ₂ (HCFC-225)	9	0.02–0.07
	CF ₃ CF ₂ CHCl ₂ (HCFC-225ca)**	—	0.025
	CF ₂ ClCF ₂ CHClF (HCFC-225cb)**	—	0.033
	C ₃ HF ₆ Cl (HCFC-226)	5	0.02–0.10
	C ₃ H ₂ FCI ₅ (HCFC-231)	9	0.05–0.09
	C ₃ H ₂ F ₂ Cl ₄ (HCFC-232)	16	0.008–0.10
	C ₃ H ₂ F ₃ Cl ₃ (HCFC-233)	18	0.007–0.23
	C ₃ H ₂ F ₄ Cl ₂ (HCFC-234)	16	0.01–0.28
	C ₃ H ₂ F ₅ Cl (HCFC-235)	9	0.03–0.52
	C ₃ H ₃ FCI ₄ (HCFC-241)	12	0.004–0.09
	C ₃ H ₃ F ₂ Cl ₃ (HCFC-242)	18	0.005–0.13
	C ₃ H ₃ F ₃ Cl ₂ (HCFC-243)	18	0.007–0.12
	C ₃ H ₃ F ₄ Cl (HCFC-244)	12	0.009–0.14
	C ₃ H ₄ FCI ₃ (HCFC-251)	12	0.001–0.01
	C ₃ H ₄ F ₂ Cl ₂ (HCFC-252)	16	0.005–0.04
	C ₃ H ₄ F ₃ Cl (HCFC-253)	12	0.003–0.03
	C ₃ H ₅ FCI ₂ (HCFC-261)	9	0.002–0.02
	C ₃ H ₅ F ₂ Cl (HCFC-262)	9	0.002–0.02
	C ₃ H ₆ FCI (HCFC-271)	5	0.001–0.03

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