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**Workshop on management and destruction of ozone-depleting substance
banks and implications for climate change**
Geneva, 13 July 2009

**Report by the Secretariat on funding opportunities for the
management and destruction of banks of ozone-depleting
substances**

Corrigendum

The annex to the present note replaces annex II of document
UNEP/OzL.Pro/Workshop.3/2/Add.1. It includes additional information received from China in
June 2009 and has not been formally edited by the Secretariat.

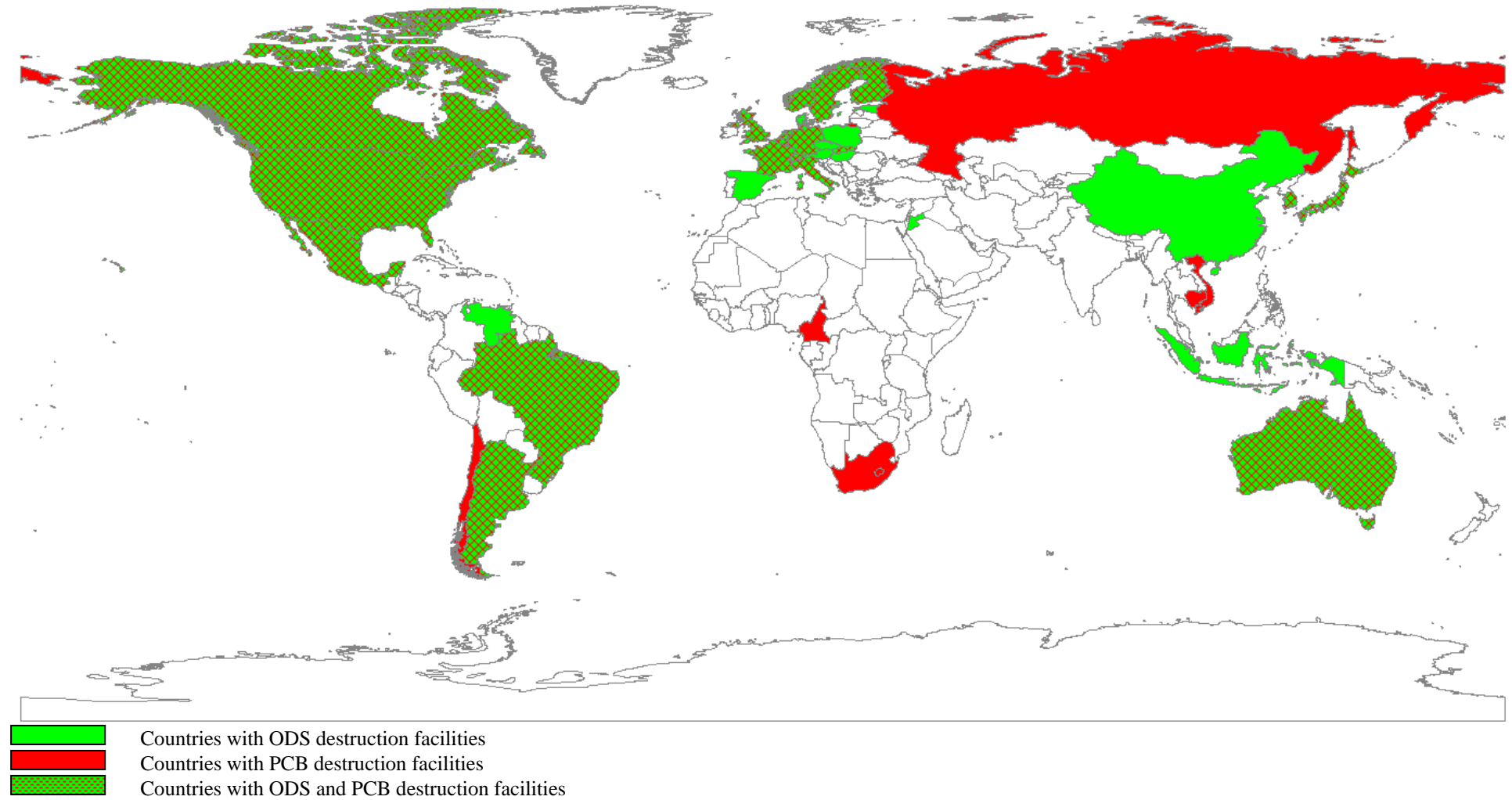
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Annex II

Known destruction facilities for ozone-depleting substances (ODS) and polychlorinated biphenyls (PCBs) worldwide

Figure 1: Countries with destruction facilities for ODS and PCBs



Source: See table 1

Table 1: Known destruction facilities for ODS and PCBs worldwide

Country	Number of known ODS destruction facilities in operation	Number of known PCB destruction facilities	Technologies used in ODS destruction facilities	ODS destruction capacity (except where indicated) (in metric tonnes (MT))	Destruction costs (US\$)
1. Argentina	NA	1	NA	NA	NA
2. Australia	1	1	Argon plasma arc	600 MT/year	\$7/kg
3. Austria	1	-	High temperature incineration	NA	NA
4. Belgium	1	1	Rotary kiln	NA	NA
5. Brazil	NA	NA	Rotary kiln	NA	NA
6. Cambodia	-	1	-	-	-
7. Cameroon	-	NA	-	-	-
8. Canada	1	6	Rotary kiln	45,000MT/year	As of 2007, the average programme cost to dispose of one kilogramme of ozone-depleting refrigerant is C\$11.50 The cost includes collection and destruction, which would also include transport and storage.
9. Chile	-	1	-	-	-
10. China	10	-	Plasma incineration <ul style="list-style-type: none"> ▪ Horizontal incinerator Thermal incineration <ul style="list-style-type: none"> ▪ Rotary kiln incinerator (continuous) ▪ Vertical incinerator ▪ Horizontal incinerator (continuous) ▪ Vertical incinerator (continuous) ▪ Vertical incinerator (continuous) ▪ Vertical incinerator (continuous) ▪ Rotary kiln incinerators (continuous) ▪ Vertical incinerator /Rotary kiln incinerator 	500 t/year 10000 t/year 60 t/year 600-1200 t/year 25000 (Efficiency 9000 t/year) 5000 t/year 666 (Efficiency 360 t/year) 4050 t/year 13500 t/year	NA
11. Czech Republic	1	-	Rotary kiln	40 MT/year	NA
12. Denmark	3	-	<ul style="list-style-type: none"> ▪ High temperature incineration ▪ Catalytic destruction 	NA	NA
13. Estonia	1	-	NA	NA	NA

Country	Number of known ODS destruction facilities in operation	Number of known PCB destruction facilities	Technologies used in ODS destruction facilities	ODS destruction capacity (except where indicated) (in metric tonnes (MT))	Destruction costs (US\$)
14. Finland	1	1	Rotary kiln (4)	545 MT/year	NA
15. France	2	3	High temperature incineration	NA	NA
16. Germany	7	11	<ul style="list-style-type: none"> ▪ Hazardous waste incinerator ▪ Reactor cracking ▪ Thermal splitting ▪ D10 ▪ High temperature incineration 	1,600 MT/year ^b (reactor cracking)	NA
17. Hungary	5	-	<ul style="list-style-type: none"> ▪ Rotary kiln ▪ Liquid injection incineration 	<ul style="list-style-type: none"> ▪ 13 MT/year (liquid injection incineration) ▪ 75 MT/year^a (rotary kiln) 	NA
18. Indonesia	1	-	Cement kiln	60 kg/hour	NA
19. Italy	12	1	NA	NA	NA
20. Japan	80	2	<ul style="list-style-type: none"> ▪ Cement kilns/lime rotary kilns (7) ▪ Nitrogen plasma arc (8) ▪ Rotary kiln incineration/ municipal solid waste incinerators (24) ▪ Liquid injection incineration (7) ▪ Microwave plasma (5) ▪ Inductively coupled radio frequency plasma (1) ▪ Gas-phase catalytic dehalogenation (1) ▪ Superheated steam reactors (25) ▪ Solid-phase alkaline reactor (1) ▪ Electric furnace (1) 	<ul style="list-style-type: none"> ▪ 36 MT/yr (one catalytic facility) ▪ 2,600 MT/year^b (one incinerator) 	Rotary kilns: \$4/kg Superheated steam: \$5/kg Plasma arc: \$9/kg Reactor cracking: \$4–6/kg Gas-phase catalytic dehalogenation: \$5–7/kg
21. Jordan	2	-	Incineration	NA	NA
22. Mexico	2	2	<ul style="list-style-type: none"> ▪ Argon plasma arc technology ▪ Modified cement kiln 	<ul style="list-style-type: none"> ▪ 60kg/hour ▪ 30–50kg/hour 	NA
23. Netherlands	6	3	NA	NA	NA
24. Norway	NA	1	Cement kiln	NA	NA
25. Poland	1	-	NA	NA	NA
26. Republic of Korea	1	-	High temperature pyrolysis technology (1,200~1,400) in a thermal oxidizer.	1,100 tonnes destroyed in 2008, 1900 MT destroyed in 2009 - only destroys byproduct of production	NA
27. Russian Federation	-	3	-	-	-

Country	Number of known ODS destruction facilities in operation	Number of known PCB destruction facilities	Technologies used in ODS destruction facilities	ODS destruction capacity (except where indicated) (in metric tonnes (MT))	Destruction costs (US\$)
28. Slovakia	1	1	Two step oxidation/high temperature incineration	NA	NA
29. South Africa	-	1	-	-	-
30. Spain	1	-	NA	NA	NA
31. Sweden	4	1	Air Plasma, among others	100 MT/year (air plasma)	NA
32. Switzerland	> 4	2	Rotary Kiln, among others	<ul style="list-style-type: none"> ▪ 910 MT/year^b (rotary kiln) ▪ > 320 MT/year (others) 	NA
33. United Kingdom of Great Britain and Northern Ireland	5	1	<ul style="list-style-type: none"> ▪ Chemical treatment ▪ Plasma arc ▪ High temperature incineration 	NA	NA
34. United States of America	< 10	5	<ul style="list-style-type: none"> ▪ Rotary kilns ▪ Plasma arc ▪ Fixed hearth units ▪ Liquid injection units ▪ Cement kilns ▪ Lightweight aggregate kilns 	318 MT/year (plasma arc) 6,188,600 MT/year ^b (US total hazardous waste destruction capacity)	\$2–13/kg
35. Venezuela, Bolivarian Republic of	NA	-	NA	NA	NA
36. Viet Nam	-	1	-	-	-

The ODS destruction facilities listed in the table above are only those known to be operational. It should be noted, however, that several Parties submitted information regarding the presence of incineration facilities that could, with appropriate funding, be upgraded to enable safe, localized ODS destruction.

NA = facility (-ies) known to exist but details are not available.

“-“ = no information available.

^a Number represents approximate ODS destruction capacity based on known overall plant capacity and typical ODS feed rates for rotary kilns.

^b Capacity is not specific to ODS; value shown refers to capacity for all hazardous wastes and/or other types of wastes.

Sources:

- ICF International. 2008. Study on the Collection and Treatment of Unwanted Ozone-Depleting Substances in Article 5 and Non-Article 5 Countries. Available at: http://ozone.unep.org/Meeting_Documents/oewg/28oewg/ICF_Study_on-Unwanted_ODS-E.pdf
- Reports by Montreal Protocol Parties received by the Ozone Secretariat in the first half of 2009.
- UNEP Chemicals. 2004. Inventory of Worldwide PCB Destruction Capacity. Available at http://www.chem.unep.ch/pops/pcb_activities/questionnaire/default.htm.