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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Thirty-first Meeting
Geneva, 5-7 July 2000

DESK STUDY ON RECOVERY AND RECYCLING PROJECTS

I Background, scope and methodology used

1. The Executive Committee decided in decision 30/9 "to request the Senior Monitoring and Evaluation Officer to present a desk study on recovery and recycling projects to the 31st Meeting of the Executive Committee, as an addition to the work programme for monitoring and evaluation for the Year 2000."

2. According to the latest data from the 1999 Progress Reports, 48 of 66 approved Refrigerant Recovery and Recycling Projects (except MAC) have been completed, as well as 16 of 23 approved MAC projects and 7 of 18 approved Halon Recycling and Recovery Projects. The total number of PCRs received has increased to 51 while another 20 are still due (see Annex I).

3. Recovery and recycling projects as part of Refrigerant Management Programmes (RMPs) were not included in this review because none of them has been completed as yet (see Table 4 in Annex I).

4. For this desk study, 50 completed recovery and recycling projects have been reviewed by a consultant. 50 project documents and 41 PCRs were studied, details of which are provided in Annex II. The projects reviewed showed the following structure by sub-sector:

(a) 32 projects or 64% were related to National and sub-sector based Refrigerant Recovery & Recycling projects (except MAC);

(b) 13 projects or 26% were related to R&R for Mobile Air-Conditioning (MAC) and Refrigerated Transport;

(c) 4 projects or 8% were related to Halon R&R;

(d) 1 project was related to solvent R&R.

5. In order to enrich the evidence gathered from the review of documentation, rapid field assessments of Recovery & Recycling projects were conducted by consultants during the evaluation of training projects in Zimbabwe, Namibia, Uganda, Ghana, Senegal, Malaysia and Trinidad and Tobago, as well as in Argentina and Uruguay. The findings of those, along with the review of Project Completion Reports and project documents available at the Multilateral Fund Secretariat, have been integrated into this desk study.

II Overview

6. The breakdown of projects reviewed by sector, region and Implementing Agency is shown in the table below. In addition, Canada had 3 projects in LAC (Refrigeration and Halon sectors); Denmark had one project in ASP (Refrigeration sector) and Finland had one project in AFR (Refrigeration sector).

Sector	UNDP				UNIDO			WB				USEPA	
	AFR	ASP	LAC	GLO	AFR	ASP	LAC	AFR	ASP	EUR	LAC	ASP	LAC
Refrigeration	4	1	7		6	1	1	1	1	2	3	1	1
MAC			2						1			2	8
Solvent									1				
Halon				1					1				
Total:	15				8			10				12	

7. The distribution of projects reviewed by sector and by approval dates are given below:

	1991	1992	1993	1994	1995	1996	1997	TOTAL
Refrigeration	3	4	1	2	10	4	8	32
MAC		2		3	4	3	1	13
Solvent	1							1
Halon		2				2		4
Total	4	8	1	5	14	9	9	50

III Analysis by sub-sector

Refrigerant R&R:

8. In addition to National Refrigerant R&R projects, two projects are reclaim (as opposed to recycling) projects, demonstration projects for large food stores and commercial refrigeration, projects for the chiller sub-sector, and R&R projects at enterprises.

9. At the fourth meeting of the Parties, the Parties also agreed on the following clarifications of the terms "recovery", "recycling" and "reclamation":

(a) Recovery: The collection and storage of controlled substances from machinery, equipment, containment vessels, etc., during servicing or prior to disposal;

(b) Recycling: The re-use of a recovered controlled substance following a basic cleaning process such as filtering and drying. For refrigerants, recycling normally involves recharge back into equipment that often occurs "on-site";

(c) Reclamation: The re-processing and upgrading of a recovered controlled substance through such mechanisms as filtering, drying, distillation and chemical treatment in order to restore the substance to a specified standard of performance. It often involves processing "off-site" at a central facility.[1]

10. All projects proposed the supply of refrigerant recovery and recovery & recycling machines (two projects for reclaim equipment), related equipment and training in the use of the equipment. The project documents generally do not provide details of how the number of equipment was arrived at and the proposed distribution. Some PCRs state that the number of equipment supplied was reduced from that proposed, either due to higher prices of equipment than envisaged, or a reallocation of funds to provide for activities not originally budgeted for.

11. Most of the project documents indicate the amount of ODS to be phased out, but the PCRs, in general, do not state what has been achieved, i.e. the quantity of ODS recovered, the quantity recycled or reclaimed, and the impact on the total consumption. Those that do, do not provide the basis for arriving at figures. In the case of PCRs which state what has been achieved, either the data is questionable or no basis has been given for arriving at the figures. None of the PCRs, even those provided much later than six months after project completion in the sense of

[1] UNEP/OzL.Pro/4/15 Decision IV/24, para 3.

equipment being delivered and training of technicians being finalized, report why the project is successful or unsuccessful, with background information such as the prevailing price of virgin and recycled/reclaimed ODS, and legislation to encourage recovery and recycling.

12. In some of the early projects, funding was provided for monitoring. However, in projects submitted later, this budget line was rarely approved because it was either not requested or considered to constitute double counting in view of monitoring of ODS consumption and project implementation being normally part of the approved action plans of institutional strengthening projects. Moreover, after the 23rd Meeting of the Executive Committee, RMPs were approved for most low-volume consuming countries, including budget provisions for monitoring.

R&R in MAC Sub-sector:

13. 10 projects have been implemented by U.S. EPA, 2 by UNDP and 1 by the World Bank. The two by UNDP were complementary to U.S. EPA, where U.S. EPA provided the training and UNDP procured the equipment. U.S. EPA conducted a follow-up visit six months or later after equipment was distributed, to determine the success of the project and whether retraining was necessary. In addition, a local distributor was appointed by the equipment supplier who could provide training and be the source for spares, consumables and new machines. U.S. EPA PCRs report that in many cases, additional equipment was sold indicating the success of the project. However, it is interesting to note that the UNDP PCR for Venezuela Phase II indicates that as of completion date of project, recovery/recycling was not yet a profitable operation. As no further information is available from the PCRs, no definite conclusion can be presented without field visits.

Halon Recovery and Recycling:

14. The Executive Committee has approved halon banking projects in the following countries: Argentina, Brazil, China, Indonesia, Iran, Jordan, Malaysia, Thailand, Uruguay, Venezuela, Vietnam and the Caribbean region. Halon banking is part of the overall China Halon Sector Phase-out plan, although some recovery and recycling equipment was provided to China in advance of the China Halon Plan. The Fund also supports on a recurring annual basis, the halon bank management clearinghouse at UNEP DTIE, and has funded the following technical manuals: a halon management resource manual (USA), a self-help guide for small-consuming countries (UNEP), and a handbook on standards and good practices in the halon sector (UNEP).

15. The halon banking programme in Malaysia was the first halon project approved by the Committee. At its 18th Meeting, the Executive Committee developed guidelines for halon banking and the projects in Brazil and Venezuela were approved at the same time as the guidelines. The project in Malaysia has been operational for several years under private management until it was recently moved to the Central Fire Training School (see para 51 below for more information). The project in Venezuela was considered a success in the PCR as halon is being restored to international standards and a fee is charged for the restored halon. The project completion report for Brazil was inconclusive as it was not clear to what extent the recovery and reclamation facility was being used.

Solvent Recovery, Recycling and Reclaim:

16. One project in Mexico implemented by the World Bank is listed. The PCR is incomplete and provides little information. All that is seen is that money has apparently been disbursed but no details are available as to what the money has been disbursed for.

17. Summaries of the PCRs are attached in tabular form as Annex II.

IV Financial analysis

18. Of 41 PCRs reviewed, one PCR by the World Bank did not provide sufficient information for further analysis and was therefore excluded from the analysis below. The breakdown of financial performance by Implementing Agency/Bilateral is as follows:

	UNDP	UNIDO	WB	U.S. EPA	CANADA	TOTAL
Projects completed at budget level	7	1	1	6		15
Projects completed at less than budget	7	5	5	1	3	21
Projects with cost overruns		2		1		3
Projects with no budget figures shown			1			1
Total	14	8	7	8	3	40

19. The above indicates that 36 of 40 projects (90%) were completed at or, in most cases, slightly below budget. Some of the projects were not yet financially closed at the time the PCR was prepared. The UNIDO projects with cost overruns could be considered as within budget since the excess was around 1% of the amount approved.

V Project implementation delay analysis

20. The project implementation delays reported in the PCRs are as follows:

Agency	Implementation Delays (Months)						
	Early	0	1 – 6	7 – 12	13 – 24	25 – more	Total
UNDP		1	5	4	3	1	14
UNIDO	6				2		8
WB	1			1	1	4	7
U.S. EPA	2	4		1	1		8
Canada	1			2			3

21. The causes attributed to the severe delays (more than 1 year) were generally attributed to legal problems, lack of government response, difficulty in identifying beneficiaries, search for experts, and coordination problems between agencies.

VI Overall assessment analysis

22. The overall analysis by implementing agencies of the recovery and recycling projects was as follows:

Assessment	UNDP	UNIDO	WORLD BANK	U.S.EPA	Canada	% of Total
Highly satisfactory, more than planned (1)			1	6		17.5%
Satisfactory, as planned (2)	6	7	2	2	2	47.5%
Satisfactory, though not as planned (3)	5	1			1	17.5%
Unsatisfactory, less than planned (4)	3		1			10%
Unacceptable (5)						
Not Provided			3			7.5%
Total	**14**	**8**	**7**	**8**	**3**	**100%**

23. In total, 65% of the projects were rated by the Implementing Agencies as highly satisfactory, or satisfactory.

24. However, the results and effectiveness of an R&R project cannot be determined only in terms of supply and distribution of equipment and delivered training in use of the equipment.

25. Most of the PCRs that were reviewed have not identified the impact of the project, in terms of quantity of ODS recovered, the quantity recycled or reclaimed, and the impact on the total consumption.

26. The PCRs for R&R projects need to specifically incorporate this information in order to enable an appropriate overall assessment of the project. In order to reflect this information, monitoring of the use of the equipment and the quantities of ODS recovery and recycling needs to be established (see below in Section IX).

VII Lessons learnt as presented in the PCRs

27. The information presented under the section 'Lessons Learnt in the PCRs' varies enormously between the agencies and individual projects. While UNIDO has repeatedly presented the same lessons learnt mostly from six projects in African countries, the World Bank only provided very brief texts. On the other hand, the lessons learnt presented by UNDP and U.S. EPA were quite substantial.

28. UNIDO presented the following lessons learnt:

(a) "The implementation of a Refrigerant Recovery-Recycling Scheme project (henceforth RMP) in LVCs is a very efficient means to reduce the emission of CFCs. However, the supply of equipment must absolutely be supported by specific training programmes for trainers and for technicians as well as by a training project for customs officers in order to implement good refrigeration management practices and to efficiently monitor and control the import of ODS.

(b) Project preparation, more specially the number of equipment to be supplied, should be based on accurate data and information in order to avoid wasted time, delays or equipment shortfalls.

(c) The issue of technical translation should be efficiently addressed by suppliers of equipment and training services as inappropriate wording could lead to damage to the equipment.

(d) During the preparation and the implementation of such a project, there is a need for: (a) close cooperation, active participation and full involvement of the local authorities in charge of the implementation of the Montreal Protocol, (b) thorough involvement of Ozone Office, (c) tight project management and monitoring by the project manager of the implementing agency.

(e) Following project completion to operate the reclaim and recycling of CFCs, it was realized that to operate the project effectively the quality of the reclaimed refrigerant must be guaranteed according to the procedure described by the ARJ Standard 700-95, Appendix C. The requirements were not mentioned in the project document."

29. The World Bank emphasized the importance of the presence of a regulatory policy, the question of ownership of the project and commitment of the training centre's management, and was concerned with eliminating the bias faced by the project beneficiaries concerning the VAT liability related to their choice of international executing agency.

30. The UNDP emphasized the experience made in Ghana, that the long time the government needed to install an appropriate institutional framework contributed in the end to make the project sustainable, but it also caused important project implementation delays. Another point mentioned was that projects approved during 1991-93 had a much greater degree of flexibility built in which contributed to sustainability, e.g. the flexibility of choosing between international and national consultants and using savings to train additional technicians. A positive lesson from Ghana was also that the Government was able to use the strength of both UNDP and UNEP for different project components.

31. The main barriers for proper refrigerant conservation as well as for an effective refrigerant recovery and recycling network operation were summarized by UNDP in the case of Uruguay as follows:

(a) "Low price of CFC.

(b) High cost of R/R equipment.

(c) Lack of environmental awareness and informality of the refrigeration service technicians.

(d) Misunderstanding about the refrigerant drop-in and other alternatives.

(e) Lack of information of the end-users as regards to the environmental damage caused by an inadequate operation of the refrigeration equipment, air/conditioning units and so on.

(f) Few technicians advise their clients that the avoidance of leaks is the best option to keep up a high cold installation running."

32. One more element was added as an experience from Venezuela where the conclusion was that the weight of the equipment to be used by the technicians when visiting clients turned out to be a crucial impediment which could only be overcome by additional measures to motivate and also to supervise the technicians.

33. Further important lessons learnt presented by UNDP were the following:

(a) "Actions on the part of the Government, such as introducing and enforcing legislation or regulations to prohibit purposeful emissions of ODS, and thereby enforce recovery, or controlling and restricting imports of CFC refrigerant, are necessary to assure that any R&R project is as successful as planned, particularly if inexpensive supplies of virgin CFC refrigerant are readily available in the country concerned.

(b) The Ozone Unit should be asked to supply more frequent reports on the project's progress to the implementation agency, possibly every 3 or 4 months.

(c) Dedicated monitoring of R&R Projects is essential to the project's successful implementation. This is best performed by a national consultant contracted specifically for this task.

(d) The contracts between the Government and the firms receiving the recovery and recycling equipment should incorporate the obligation to report those amounts recycled, as well as those recovered, and should contain a clause which would permit the Government to repossess the equipment if a given amount of CFC-12 was not recycled over a certain period of time."

34. U.S. EPA provided detailed lessons on MAC projects. In addition to the sections on 'lessons learnt in the PCRs submitted', U.S. EPA also prepared a summary paper on lessons learnt through the design and implementation of MAC servicing sector projects. In this paper, the lessons learnt were summarized as follows:

(a) "Qualified service shops must participate;

(b) Equipment and support services need to be specified and procured, and equipment must be nationalized;

(c) Equipment and servicing practices to conserve refrigerant must continue to be employed in the long term; and

(d) Special challenges must be overcome, in particular, the length of the procurement process, the seasonal character of the MAC business, the change in workshop owners and the challenge to develop an appropriate cost sharing system insisting on participant payments."

35. The following key criteria for the selection of qualified shops to participate in the projects were mentioned:

(a) "The shop owner (and sometimes the technicians) needs to be interested in and enthusiastic about participating in the project for a variety of reasons.

(b) It is important that the service shop owners believe in investing in the skills of their employees so that they will send them to the training workshops.

(c) From a physical-plant standpoint, a qualified service shop needs to fulfil certain requirements.

(d) It is critical that participating service shops have a significant amount of CFC consumption so that the projects can achieve their emission reduction goals."

36. Another lesson reported was that successful projects depend on conducting training workshops on time and in good coordination with the arrival of the equipment. The teaching curriculum should be tailor-made to the local conditions and to the technical knowledge of the participants. The importance of finding a suitable training location is emphasized as well as the necessary development of targeted communication materials for key stakeholders.

37. A number of interesting lessons were presented by U.S. EPA concerning lessons learnt in commercial refrigeration servicing projects in China and the Dominican Republic which presented a number of obstacles in comparison to MAC projects:

(a) "Equipment owners and service technicians may be resistant to the use of recycled refrigerant. This does not seem to be an unreasonable position, given owners' substantial investments in refrigeration equipment, the economic importance of reliable system performance in most commercial refrigeration applications (i.e. the risk of spoiled food, unhappy customers), and the fact that refrigerant is a relatively small part of each repair bill. This appears to be a distinctly different situation than in the MAC sector, where recycled refrigerant is widely accepted, partly through the efforts of automobile manufacturers. Business owners may also find the potential cost savings of recycled refrigerant less attractive than automobile owners.

(b) The percentage of repair jobs, which involve a recovery opportunity, seems to be substantially less than in the MAC sector.

(c) Because the recovery equipment tends to be cumbersome, and refrigeration equipment is often inconveniently located, it is difficult to motivate the technicians to take a recovery machine to every repair job. In the MAC sector, the recovery/recycle machine is readily available on the shop floor and can be easily brought over to each car being repaired.

(d) If the recovered refrigerant must be recycled before re-use, this means that the refrigerant must be transported to a recycling machine, recycled, then transported again to refrigeration equipment before it can be re-used. It is difficult to structure incentives to assure that this will be done, particularly if the economic value of the recycled refrigerant is low. No movement of refrigerant is required in the MAC sector."

VIII Evidence collected during field visits to selected projects

38. The contribution of recovery and recycling projects to reducing overall ODS consumption could not be verified. The R&R in the six African countries visited did not take off so far. One of the reasons is that the prices of CFC refrigerants have not increased as anticipated. The motivation to change habits and recover and recycle is still very low because there is no financial benefit. In addition, the large-scale use of second-hand refrigerators from Europe and Japan implies that repairs are much more frequent than with new units. As a result, consumption of ODS is increasing. Regulations prohibiting the imports of such refrigerators, coupled with customs training, will reduce this incidence. However, the limited purchasing power of many clients may not be able to sustain the procurement of new refrigerators.

39. In Africa, in particular, it was observed that the R&R equipment was being used for HCFC-22 more than for CFC-12. The enterprises met had not developed any costing but felt that recovery of HCFC-22 was profitable since the price of virgin refrigerant was more than that of CFC-12, and the equipment being serviced contained more quantity of refrigerant than a domestic refrigerator. This leads to a tentative conclusion that for CFC-12 recycling and recovery to be economically viable, the price of virgin CFC-12 should be similar to HCFC-22, and/or higher than that of recovered CFC.

40. In Uruguay, it was observed that the local price of CFC-12 interferes negatively with recycling and recovery project development and results. This is an external factor, but with bearing on project outcome and results.

41. Another experience from Uruguay was that contacts held with stakeholders in the early stages of project preparation yielded basic data and information and helped to focus the project proposal. This has proven to be crucial for project success. The data collected and the information acquired during the planning stage was later used in the different stages of project implementation.

42. In a few projects in Africa, the number of equipment ultimately supplied was significantly less than that approved, either due to the cost of equipment having escalated or to accommodate costs that had not been considered in the project proposal. This can lead to the conclusion that the number of equipment was selected arbitrarily.

43. It was also observed that technicians who were trained left the enterprise without training anyone else, or that workshop owners participated in the training and were not able to train their technicians properly. In several cases, technicians have reported that only when they have started using the equipment at their own enterprise, they realize they are not comfortable with the operation.

44. Where monitoring was approved, the National Consultant reported on project results. The NOUs rarely carried out the monitoring as they are neither refrigeration and air-conditioning practitioners nor do they find the time for a sustained monitoring of the projects.

45. One of the reasons for success attributed to the U.S. EPA MAC projects is the fact that a local distributor was established for the equipment. The number of equipment distributed within the country will determine the feasibility of such an approach. In Ghana, the Refrigeration Association was actively contemplating procuring and marketing all R&AC equipment, spares and consumables for its members. This may be another route to consider during project preparation.

46. In several African countries, it was observed that nearly 60 to 70% of domestic refrigerators are serviced due to leaking or burnt out compressors. The remaining need for servicing is due to blockage in capillaries (rare) or due to electrical faults which do not require the refrigerant side to be touched. Given that the initial charge in a domestic refrigerator is low (300 to 500gms), there is little or no refrigerant available to be recovered. The consumption of most service companies is double what is needed to charge a refrigerator since an equal or larger quantity of CFC-12 is used for flushing the system. This flushing refrigerant could be collected with the use of a recovery hand pump and recovery bag.

47. In Ghana, it was observed that technicians were using used compressors to recover refrigerant into a recovery cylinder from domestic and small commercial systems, and when the cylinder was estimated to be nearly full, it was taken to the nearest enterprise with a recycling machine for recycling.

48. It was observed in several African countries that the same equipment was being used to recover HCFC-22 and CFC-12. It is suspected that the lines are not flushed before changing refrigerants, leading to contamination over time.

49. The World Bank halon project in Malaysia has not been completed as yet. The site visit indicated that the Government took over the Halon Bank Management in January 2000 and the equipment, cylinders and portable extinguishers were moved to the Central Fire Training School. As of early May 2000, the Halon 1211 Recycling machines are lying unused. The Halon 1301 Recycling machine has been out of order for a while. Of the 40 Halon 1211 recycling machines supplied by UNDP in the global project, the two supplied to Malaysia have never been used and will probably not be used, since the Halon Management Strategy moved to managing Halon 1301. The PCR does not state whether the other countries have been using the equipment.

IX Monitoring and evaluation of recycling and recovery projects

50. The Implementing Agencies should enquire from the Government/NOU the status of all the R&R projects that they have implemented with a view to knowing whether they are in operation. Such reports should be based on a standardized format for data collection, both at the individual equipment user level, and as summarized information at the project level.

51. An evaluation of R&R projects should be undertaken in mid to late 2001, particularly of those projects that have been implemented as a component of a Refrigerant Management Plan and have had a chance to be monitored for a reasonable period. Depending on information forthcoming from the NOUs, IAs and in the PCRs, terms of reference for preparing the evaluation can then be made and presented to the Executive Committee for consideration.

52. The NOUs should also be requested to obtain costing data for R&R which should include the operating cost of equipment, to arrive at the cost for recovery and recycling as well as the pricing trends of CFC-12 and HCFC-22 during that period. The data would permit for the determination of the conditions for economically viable recycling and recovery operations, and should be made available to the Implementing Agency with a copy to the Multilateral Fund Secretariat.

Table 1: OVERVIEW OF MAC RECOVERY AND RECYCLING PROJECTS
(According to data from the Inventory and 1999 Progress Reports)

Agency	Number of Projects Approved	Number of Projects Completed*	Number of PCRs Received	PCR Due	Approved Funds (US$)	Funds Disbursed (US$)
IBRD	3	1	1	0	2,135,155	1,008,155
UNDP	3	3	3	0	258,236	245,031
USA	17	12	11	1	2,768,509	2,741,842
Total	23	16	15	1	5,161,900	3,995,028

*Financially completed projects (9)

Table 2: OVERVIEW OF RECOVERY AND RECYCLING PROJECTS*
(According to data from the Inventory and 1999 Progress Reports

Agency	Number of Projects Approved	Number of Projects Completed**	Number of PCR Received	PCR Due	Approved Funds (US$)	Funds Disbursed (US$)
Australia	2	1	0	1	322,687	40,000
Canada	1	1	1	0	488,600	488,600
Denmark	1	1	0	1	205,000	141,035
France	3	0	0	0	1,127,079	10,000
Germany	3	1	0	1	316,502	34,400
IBRD	12	9	6	3	5,347,666	2,733,089
UNDP	32	23	15	8	7,275,704	6,528,534
UNIDO	9	9	9	0	1,542,148	1,518,077
USA	3	3	2	1	967,400	1,039,400
Total	66	48	33	15	17,592,786	12,533,135

*Excluding recovery and recycling as part of RMPs
**Financially completed projects (23)

Table 3: OVERVIEW OF HALON RECOVERY AND RECYCLING PROJECTS
(According to data from the Inventory and 1999 Progress Reports)

Agency	Number of Projects Approved	Number of Projects Completed*	Number of PCR Received	PCR Due	Approved Funds (US$)	Funds Disbursed (US$)
Canada	3	3	3	0	761,685**	1,067,185
France	2	0	0	0	128,236	0
Germany	2	0	0	0	128,236	0
IBRD	4	0	0	0	1,379,820	0
Sweden	1	0	0	0	200,000	0
UNDP	4	3	0	3	548,233	419,700
UNEP	1	0	0	0	50,000	
USA	1	1	0	1	31,000	34,000
Total	18	7	3	4	3,227,210	1,520,885

*Financially completed project (7)
**Budget for VEN/REF/22/TAS/55 and BRA/HAL/19/TAS/47 only

Table 4: OVERVIEW OF RECOVERY AND RECYCLING PROJECTS AS A COMPONENT OF REFRIGERANT MANAGEMENT PLANS
(According to data from the Inventory and 1999 Progress Reports)

Agency	Number of Projects Approved	Number of Projects Completed	Number of PCR Received	Number of PCR Due	Approved Funds (US$)	Total Funds Disbursed (US$)
Canada	7	0	0	0	508,650	203,697
Finland	1	0	0	0	225,430	0
France	2	0	0	0	310,350	0
Germany	5	0	0	0	1,522,396	125,000
UNDP	18	0	0	0	2,827,530	1,463,820
UNEP	1	0	0	0	70,500	0
UNIDO	7	0	0	0	1,811,644	3,046
Grand Total	41	0	0	0	7,276,500	1,795,563

SUMMARY OF PROJECTS AND PCRs REVIEWED
(using data from PCRs)

Project No. (as per inventory)	Country/ Region	IA	Date Approved	Schedule Comple-tion	Date Completed	Amount Approved	Amount Disbursed	Title of Training Project	ODP to be phased out	ODP phased out	Rating High = 1 Unaccep table=5	PCR	Project Summary	Project Doc	Comments by Consultant
National Refrigerant R&R Projects, Sub-sector based Refrigerant R&R Projects (except MAC)															
AFRICA															
BEN/REF/ 22/TAS/04	Benin	UNIDO	May-97	May-99	Mar-99	114,000	113,414	Refrigerant recovery and recycling scheme	12.9		2	Yes	Yes	Yes	
BKF/REF/ 22/TAS/05	Burkina Faso	UNIDO	May-97	May-99	Mar-99	96,000	96,767	Refrigerant recovery and recycling scheme	15.5		2	Yes	Yes	Yes	
GAM/REF /22/TAS/5	Gambia	UNIDO	May-97	May-99	Mar-99	68,000	67,920	Refrigerant recovery and recycling scheme	7.74		2	Yes	Yes	Yes	
GHA/REF/ 08/TAS/04	Ghana	UNDP	Oct-92	Oct-95	Apr-97	328,000	328,000	Improved servicing and maintenance in the refrigeration sector	50		3	Yes	No	Yes	PCR says 32 m/c supplied, NOU says 16 - backed with UNOPS document.
GUI/REF/ 22/TAS/05	Guinea	UNIDO	May-97	May-99	Mar-99	80,780	81,049	Refrigerant recovery and recycling scheme	12.9		2	Yes	Yes	Yes	
MLW/REF /19/TAS/ 05	Malawi	UNDP	May-96	Nov-97	Dec-97	106,320	106,009	Implementati on of a national programme for recovery and recycling of refrigerant	7.155		2	Yes	No	No	
NAM/REF /20/TRA/ 03	Namibia	Finland/ UNEP	Sep-96			103,440		Implementation of a Training Programme for Recovery and Recycling of Refrigerants				No	No	Yes	Included as part of the ToT project in good refrigerant management practices.

SUMMARY OF PROJECTS AND PCRs REVIEWED
(using data from PCRs)

Project No. (as per inventory)	Country/ Region	IA	Date Approved	Schedule Comple-tion	Date Completed	Amount Approved	Amount Disbursed	Title of Training Project	ODP to be phased out	ODP phased out	Rating High = 1 Unaccep table=5	PCR	Project Summary	Project Doc	Comments by Consultant
SEN/REF/ 22/TAS/08	Senegal	UNIDO	May-97	May-99	Mar-99	136,250	136,005	Refrigerant recovery and recycling scheme	36.12		2	Yes	Yes	Yes	Consultancy and training not provided for in initial project proposal. Equipment reduced to make this funding available. No of eqpt supplied not given in PCR
TUN/REF/ 07/TAS/07	Tunisia	WB	Oct-92	Jun-97	Mar-98	379,969	332,835	Maintenance of Domestic, Commercial and Industrial Refrigeration Systems	42		2	Yes	No	Yes	Project part of capacity building project for CENAFFIF. PCR and WB Project Inspection Report do not detail no. of R&R eqpt. Procured, how distributed, quantities of refrigerant recovered and recycled.
UGA/REF/ 19/TAS/05	Uganda	UNDP	May-96	Nov-97	Dec-97	56,000	56,000	Implement-ation of a national programme for recovery and recycling of refrigerant	3.6		2	Yes	Yes	Yes	Equipment not distributed (March 2000). Funding for National Consultant not approved. 1 R&R m/c approved, PCR states 2
ZAM/REF/ 19/TAS/06	Zambia	UNDP	May-96	Nov-97	Dec-97	106,320	106,080	Implement-ation of a national programme for recovery and recycling of refrigerant	7.155		2	Yes	No	Yes	Funding for National Consultant not approved.
ZIM/REF/ 17/TAS/04	Zimbabw e	UNIDO	Nov-95	Jul-96	Dec-97	312,300	312,300	CFC refrigerant recovery and reclaim project	28.3		2	Yes		Yes	All lab. Equipment not identified in project. Project not started (March 2000) pending procurement of balance equipment for which funding released in late 1999.
ASIA PACIFIC															
CPR/REF/ 17/DEM/ 131	China	UNDP	Jul-95	Jul-96	Jul-97	76,000	65,882	Demonstration project to reduce CFC used in refrigeration in large food stores			3	Yes	Yes	Yes	UNDP procured equip. and EPA trained in project below. 9 recov. M/cs supplied, 0 approved, 2 recycling m/cs supplied, 4 approved.

SUMMARY OF PROJECTS AND PCRs REVIEWED (using data from PCRs)

Project No. (as per inventory)	Country/ Region	IA	Date Approved	Schedule Comple-tion	Date Completed	Amount Approved	Amount Disbursed	Title of Training Project	ODP to be phased out	ODP phased out	Rating High = 1 Unaccep table=5	PCR	Project Summary	Project Doc	Comments by Consultant
CPR/REF/ 17/DEM/ 135	China	USEPA	Jul-95	Jan-96	Jan-98	132,000	158,400	Demo Project (refrigeration - large food stores)	n/a	9.8	2	Yes	Yes	Yes	PCR does not provide basis for estimated reduction of 9.8 ODP Tonnes annually.
MAL/REF/ 18/TAS/77	Malaysia	WB	Nov-95					Reduction of consumption of ODS in the commercial air-conditioning sector via training, recovery and recycling of CFC-11 and CFC-12 in chillers at MASHRAE	105			No	No	Yes	Project involved supply of 30 R&R m/cs. And training by UNEP.
PHI/REF/ 22/TAS/49	Philippine s	UNIDO	May-97	Sep-98	Nov-99	557,500	556,612	Refrigerant Recovery and Recycling Scheme	60	n/a	3	Yes	Yes	Yes	Not clear how many recovery m/cs and how many R&R m/cs. Appears to be individual R&R. No. of days training for ToT not mentioned.
EUROPE															
TUR/REF/ 07/TAS/04	Turkey	WB	Jun-92	Dec-97 (Rev)	Dec-96	400,000	317,080	Recovery and recycling of CFC-12 in a network of service shops.			4	Yes	Yes	No	R&R was not found viable after 10 equip. supplied (90 approved). Instead, Co. procured HFC-134a filling stations with saved funds.
CARIBBEAN															
BAR/REF/ 18/TAS/04	Barbados	UNIDO	Nov-95	Nov-98	Jul-98	165,170	164,556	CFC-recovery, recycling and training in refrigeration	14.01	14	2	Yes	Yes	Yes	The PCR does not state what equipment and their numbers were delivered.

SUMMARY OF PROJECTS AND PCRs REVIEWED
(using data from PCRs)

Project No. (as per inventory)	Country/ Region	IA	Date Approved	Schedule Comple-tion	Date Completed	Amount Approved	Amount Disbursed	Title of Training Project	ODP to be phased out	ODP phased out	Rating High = 1 Unaccep table=5	PCR	Project Summary	Project Doc	Comments by Consultant
JAM/REF/ 18/TAS/03	Jamaica	UNDP	Nov-95	May-97	May-97	172,465	160,947	Implement-ation of a national program for recovery and recycling of refrigerant	16.7	16.7	3	Yes	Yes	Yes	Monitoring cost included but data not forthcoming. Reports indicate that recovered gas is not being recycled and sold as virgin gas. R-22 and R-502 also being recovered, though no recycling facility available. No legislation in place, low CFC-12 prices.
TRI/REF/ 23/TAS/09	Trinidad & Tobago	UNDP	Dec-97			213,990		Implement-ation of a national program for recovery and recycling of refrigerant	18.49			No	Yes	Yes	Monitoring budget not approved. PCR not yet submitted.
LATIN AMERICA															
CUB/REF/ 15/TAS/04	Cuba	UNDP	Dec-94	Dec-95	Sep-97	169,000	163,833	Implement-ation of a national program for recovery and recycling of refrigerant	49	49	4	Yes	Yes	Yes	Project evaluated in 1997. Data reported in PCR. No CFC prices or impact of pricing on success of project given.
DOM/REF /18/DEM/ 05	Dominican Republic	USEPA	Nov-95	Dec-96	Dec-97	74,000	74,000	Demo project in commercial refrigeration	7.6	6.5	2	Yes	No	No	EPA did training after equipment procured by UNDP in project below.
DOM/REF /18/TAS/ 06	Dominican Republic	UNDP	Nov-95	Nov-96	Apr-98	78,000	78,000	Demo project in commercial refrigeration (food storage, distribution and retailing)	7.6	6.5	3	Yes			EPA PCR (above project) states 29 electrical recovery m/cs, while UNDP states 31.

SUMMARY OF PROJECTS AND PCRs REVIEWED (using data from PCRs)

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URU/REF/ 12/TAS/04	Uruguay	UNDP	Mar-94	Mar-96	Dec-96	175,000	175,000	Technical assistance for the conservation and Demo Programme for domestic and commercial refrigeration and installation of equipment for recovery and recycling of CFC-12	22.5	25	2	Yes	Yes	Yes	Equipment reduced (100 recov. M/cs approved, 61 supplied; 10 recycling m/cs approved, 6 supplied) to procure tanks and cyclinders not included in proposal. Govt. comment that recovery not useful in domestic refrigerator service. Low price of CFC is a barrier also.
VEN/REF/ 09/TAS/17	Venezuela	UNDP	Mar-93	Mar-94	Dec-96	100,000	100,000	Pilot programme in recovery and recycling of CFC-12 in domestic refrigeration	7.56	0.313	4	Yes	No	Yes	Close supervision of project by national consultant. Results indicate CFC-12 used for flushing was primarily being collected and quantities were small.
VEN/REF/ 22/TAS/55	Venezuela	Canada	May-97	Oct-98	Sep-98	495,285	488,600	Implement-ation of a Centralized Reclamation Plant for Recovered Refrigerant in Commercial Refrigeration and Air Conditioning Sectors	250 - 350		2	Yes	Yes	Yes	Following start up in Sep-98 project has recovered 8,000 kg CFC-12.

SUMMARY OF PROJECTS AND PCRs REVIEWED (using data from PCRs)

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Recovery and Recycling Projects at Enterprises															
CPR/REF/ 17/TAS/ 130	China	Denmark	Jul-95	Jul-96	Dec-98	205,000	144,035	Establish-ment of a CFC Recycling Centre at Zhejiang Dongyang Chemical Factory	20			No	Yes	No	Secretariat move to send to Proj. Review sub committee. Not known what was approved. Project calls for recovery and reclaim of refrigerant from cylinders returned to co., which is a CFC manufacturer.
TUR/REF/ 07/TAS/03	Turkey	WB	Oct-92	Dec-96	Not implement ed			Recovery and recycling of CFC-12 in a production plant.				Yes	No	Yes	
MEX/REF/ 05/DEM/ 06	Mexico	WB	Nov-91	Nov-92	Dec-96	499,919	499,918	Demo Programme in CFC recovery and recycling of the Instituto Mexicano del Seguro Social (IMSS) refrigeration equipment	15	15	not given	Yes	No	No	Not clear how PCR states actual ODS phase out achieved, since data needed for evaluation not yet available and overall project performance cannot be evaluated.
MEX/REF/ 18/TAS/43	Mexico	UNDP	Nov-95	Nov-96	Oct-97	352,610	291,030	Recovery of CFC-12 in the servicing of domestic refrigerators at Vitromatic Commercial (VC) and at Servicios Integrados Fabriles (SIF) (85% of service co.s)	76	76 (11 from equip. balance from good practice s	3	Yes	Yes	No	No. of eqpt. Supplied not stated. Quimobasicos have own reclaim centre, hence no recycling m/cs given. UNIDO preparing RMP for Mexico to include recycling m/cs recommended by UNDP.

SUMMARY OF PROJECTS AND PCRs REVIEWED (using data from PCRs)

Project No. (as per inventory)	Country/ Region	IA	Date Approved	Schedule Comple-tion	Date Completed	Amount Approved	Amount Disbursed	Title of Training Project	ODP to be phased out	ODP phased out	Rating High = 1 Unaccep table=5	PCR	Project Summary	Project Doc	Comments by Consultant
MEX/REF/ 05/TAS/13	Mexico	WB	Nov-91	Nov-92	Jul-94	222,615	222,540	CFC recovery and recycling programme through Quimobasicos S.A. de C.V.	40	4	N/A	Yes	No	No	Co. is 49% foreign owned. Did not want to bear share of cost for recovery m/cs. PCR states distributors purchased own recovery m/cs. PCR not clear about type of equip. procured by co - whether recycle or reclaim, yet no explanation for high cost of project with undelivered component. No assessment given.
MEX/REF/ 05/TAS/08	Mexico	WB	Nov-91	Nov-92	Dec-95	29,328	29,328	Climas Jimenez S.A. de C.V.	3.27	4	1	Yes	No	No	Executive Summary states 4.0 ODP Tonne phase-out achieved. Section 3b states 500 kg. ODP consumed! No details of equipment supplied, most columns left TBD. Rated as Highly satisfactory, with comment that Consumption increase post project!
MAC R&R Projects															
CPR/REF/ 16/DEM/ 117	China	USEPA	Mar-95	Mar-96	Mar-96	172,500	165,833	Demo Project in MAC	5 to 10	11.4	1	Yes	Yes	No	PCR does not state no. of eqpt. Procured and distributed.
CPR/REF/ 19/DEM/ 163	China	USEPA						Refrigeration : MAC Servicing						Yes	Follow up to first project
MAL/REF/ 06/TAS/05	Malaysia	WB	Feb-92	Feb-93	Aug-95	910,000	880,855	Conservation, leakage control and recycling of CFC-12 and Demo Project in MAC sector	370	200 - 350	2	Yes			PCR, in Budget and Expenditure states Budget (Plan) is $910,000, Expenditure to date is $1,029,721, disbursed as $880,855 yet $338.10 returned to fund! The actual reduction in ODS consumed is based on assumption and is not correct.

SUMMARY OF PROJECTS AND PCRs REVIEWED (using data from PCRs)

Project No. (as per inventory)	Country/ Region	IA	Date Approved	Schedule Comple-tion	Date Completed	Amount Approved	Amount Disbursed	Title of Training Project	ODP to be phased out	ODP phased out	Rating High = 1 Unaccep table=5	PCR	Project Summary	Project Doc	Comments by Consultant
TRI/REF/ 23/DEM/ 08	Trinidad & Tobago	USEPA	Dec-97			117,000, from UNDP Global MAC: 80,000		Demo (MAC and RT)	10			No	Yes	Yes	
ARG/REF/ 16/DEM/2 2	Argentina /Uruguay	USEPA	Mar-95	Dec-96	Mar-96	170,000	170,000	Demo Project in Mobile Air Conditioning	??	23.3	1	Yes	No	No	PCR does not state no. of equipment procured and distributed. Equipment procured by UNDP.
CHI/REF/1 9/DEM/15	Chile	USEPA	May-96	Dec-97	Feb-97	140,000	140,000	Demo Project in the MAC servicing sector	10	10	1	Yes	Yes	No	
DOM/REF /17/DEM/ 03	Dominican Republic	USEPA	Jul-95	Dec-96	Dec-96	220,000	220,000	Demo Project in MAC	n/a	9.8	1	Yes	Yes	Yes	Novel project. NOU required beneficiaries to pay part of cost of equipment with which additional. 7 m/cs procured through UNDP. Shop owners were given 3 different choices of m/cs.
GUA/REF/ 19/DEM/1 0	Guatemala	USEPA	May-96					Refrigeration: Mobile Air Conditioning (MAC) and Refrigerated Transport (RT)				No	Yes	No	
MEX/REF/ 13/DEM/ 27	Mexico	USEPA	Jul-94					Demo Project (MACS)	25			No	Yes	Yes	
VEN/REF/ 8/DEM/06 and VEN/REF/ 13/DEM/ 28	Venezuela	USEPA	Oct-92 Jul-94	Jul-95	Jul-95	115,000 53,000	168,000	Technical assistance and Demo Project in CFC recycling in MAC, Demo Project in MAC	n/a	10.8	1	Yes	No	Yes	First MAC project by EPA. See lessons learnt.
VEN/REF/ 15/DEM/ 30	Venezuela	USEPA	Dec-94	Dec-95	Dec-95	67,000	67,000	Demo Project in the refrigeration sector: MAC	n/a	n/a	1	Yes	No	Yes	Follow up to Phase 1. Training and follow up. Not certain about equipment supplied.

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VEN/REF/ 15/TAS/32	Venezuela	UNDP	Dec-94	Dec-95	Dec-96	220,000	206,794	Pilot project for recovery/ recycling of CFC-12 in the mobile A/C sector	75	16.2	4	Yes	Yes	Yes	Despite refrigerant price increasing R&R still not profitable (at time of project completion)
LAC/REF/ 18/TAS/15	Regional	UNDP	Nov-95	Nov-96	Dec-96	207,000	207,000	Regional Latin America demonstration project in recovery of ODS in Mobile Air Conditioning: Phase I (ARG, COL)							
	Argentina					108,300	108,300				2	Yes	No	Yes	Although Uruguay included, costs (34,000) charged to Global MAC Phase I. Not clear why R-11 and R-13 equipment included for MAC project. Not clarified what heavy-duty equipment is and whether R&R stations are used for MAC instead of R&R and Recharge.
	Uruguay														
	Columbia					98,700	98,700								
Halon Recovery and Recycling Projects															
ARG/HAL /13/TAS/ 07	Argentina	UNDP	Jul-94					Technical assistance to prepare a national halon programme.	20.9			No	Yes	Yes	
MAL/HAL /06/INV/04	Malaysia	WB	Jun-92					Servicing, maintenance and recovery of portable extinguishers (halon-1211) and training programme	300 MT Halon 1211			No	Yes	Yes	Project proposal is for Halon 1211 only. Involves supply of 50 Halon 1211 kit charging eqpt, training and demonstration (to be done by UNDP) and a Central Recycling Plant.
GLO/HAL/ 07/DEM/ 25	Global (CPR, PHI, MAL, EGY, ARG, ECU, URU, VEN)	UNDP	Jun-92	Jul-93	Sep-93	250,000	250,000	Procurement of 40 Halon recycling machines for Demo	N/A		2	Yes	No	No	28 m/cs to CPR, 2 to PHI, 2 to MAL, 2 to EGY, 2 to ARG, 1 to ECU, 1 to URU and 2 to VEN. No report on utilization.

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BRA/HAL /19/TAS/ 47	Brazil	Canada	May-96	May-98	May-99	499,360	477,690	Halon Recycling and Bank Management	N/A		3	Yes	No	No	Project moderately successful. All activities completed but with delays. Not clear to what extent the recovery and reclamation facility established is actively being used to help Brazil reduce its needs for new halons.
VEN/HAL/ 19/TAS/47	Venezuela	Canada	May-96	May-98	Dec-98	352,220	276,595	Halon Recycling and Bank Management - Phase II	N/A		2	Yes	Yes	No	Project considered to be successful. Eliminated need of importing new Halon 1301. Halon bank provides Halons to ISO standards and charges a fee.
Solvent Recovery, Recycling and Reclaim Projects															
MEX/SOL /05/INV/12	Mexico	WB	Nov-91	Nov-92	May-95		295,302	Recovery, reclaim and recycling of CFC-113 and Methyl Chloroform through Quimica Omega S.A.	120 - 1,200	35 - 350		Yes	No	No	The PCR states expenditure to date as 176,000 to 1,404,000, yet disbursement as 295,302. No assessment made.