GEF IMPACT EVALUATION

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GEF Impact Evaluation of the Phase-Out of Ozone-Depleting Substances in Countries with Economies in Transition.

Volume Two: Country Reports

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List of acronyms and terms

A2	Article 2 Party of the Montreal Protocol, non-Article 5 Party, industrialised country
A5	Article 5 Party of the Montreal Protocol, developing country
CEIT	Country with Economy in Transition; plural CEITs
CFCs	Chlorofluorocarbons (ODS controlled by the Montreal Protocol)
CIS	Commonwealth of Independent States, a regional organization whose participating countries are former Soviet Republics.
Consumption	As defined under the Montreal Protocol, ODS consumption = production + imports – exports
CTC	Carbon tetrachloride (ODS controlled by the Montreal Protocol)
GDP	Gross Domestic Product (as a measure of the economy)
EUEs	Essential use exemptions, mainly relating to CFCs
F-gases	Fluorinated gases: HFCs, PFCs, SF_6 (greenhouse gases controlled by the Kyoto Protocol)
GEF	Global Environment Facility
GHG	Greenhouse gas
GWP	Global Warming Potential
HFCs	Hydrofluorocarbons (F-gases, greenhouse gases controlled by the Kyoto Protocol)
HCFCs	Hydrochlorofluorocarbons (ODS controlled by the Montreal Protocol)
IPCC	Intergovernmental Panel on Climate Change of WMO and UNEP (UNFCCC)
MB	Methyl bromide (ODS controlled by the Montreal Protocol)
MCF	Methyl chloroform, also known as 1,1,1-trichloroethane or TCE (ODS controlled by the Montreal Protocol)
MDI	Metered-dose inhaler, a pharmaceutical product for treating asthma
MLF	Multilateral Fund of the Montreal Protocol
Mt CO_2eq	Million tonnes carbon dioxide equivalent
ODP	Ozone Depletion Potential, an index of a molecule's impact on ozone in the ozone layer
ODP-t	Tonnes weighted by a chemical's ozone depletion potential
ODS	Ozone depleting substance
QPS	Quarantine and pre-shipment uses of methyl bromide
t	Tonnes
t.b.d.	To be decided
t CO_2eq	Tonnes carbon dioxide equivalent
TEAP	Technology and Economic Assessment Panel of the Montreal Protocol
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WMO	World Meteorological Organization

1 ARMENIA

1.1 BACKGROUND

1. Armenia declared independence from the former Soviet Union in 1991. After a difficult period from 1991 to 1993, during which time Armenia fought a war with Azerbaijan and began the transition to a market based economy, the Armenian economy grew at an average rate of 5.4[1] percent from 1994 to 2000 and at 12 percent from 2001 to 2007. Although Armenia's macroeconomic performance has been strong 49.1 percent of the population still lives below the poverty line.

1. Armenia became a Party to the Vienna Convention and the Montreal Protocol in October 1999. As a developed country that was formerly a part of the Soviet Union, Armenia was required to, *inter alia*, phase out the consumption of halon on 1 January 1994; and to phase out CFCs by 1 January 1996. In 2001 the XIII Meeting of Parties noted that Armenia was in non-compliance with data reporting requirement under Article 7. The Meeting of Parties recommended the Government of Armenia to ratify the London Amendment to qualify for assistance from international funding agency[2]. In 2002, the Parties to the Montreal Protocol noted that that Armenia has reported data on consumption of substances in Annex A to the Montreal Protocol in 2000 above control levels as provided in Article 2 of the Protocol, and therefore that Armenia was in non-compliance with the control measures under Article 2 of the Montreal Protocol in 2000[3].

2. The Government of Armenia initiated the process of ratification of the London Amendment in 2002 and requested assistance from GEF as a country with economy in transition.

3. The Country Programme (CP) was prepared by the Ministry of Nature Protection, UNEP and UNDP with financial assistance from the GEF. The CP evaluated the consumption of ODS, outlined the policy and an Action Plan to eliminate consumption of ODS and identified priority ODS phase-out projects. According to the CP, the total 2000 ODS consumption was 175 ODP tonnes subdivided between refrigeration sector (160 ODP tones) and aerosols (15 ODP tones). The Action Plan outlined the commitments of the Government as follows:

    1) To phase out the ODS consumption by January 2009;
    2) To support the industry conversion to non-ODS technology;
    3) To develop and establish appropriate legal and regulatory framework to ensure effective ODS phase-out process and mitigate the risk of illegal trade;
    4) To develop and establish the necessary monitoring and licensing systems to control the imports and exports of ODS.

1.2 INPUTS

4. The ODS Phase-out Project was approved by Council in October 2002. However, the project did not get CEO endorsement until November 2004, because Armenia changed status from

[1] World Bank country profile
[2] Decision XIII/18: Compliance with the Montreal Protocol by Armenia
[3] Decision XIV/31: Compliance with the Montreal Protocol by Armenia

Article 2 to Article 5 in 2002[4]. This caused policy conflicts since Article 5 countries are to be funded by the Multilateral Fund to the Montreal Protocol, while GEF funded Article 2 countries. Finally, however, a decision was reached to permit Armenia to proceed with GEF funding.

5. The project received CEO endorsement in October 2004. The project was designed to assist Armenia in meeting its phase-out obligations under the Montreal Protocol within a realistic time frame and ensure availability of technical assistance to expedite the implementation of the CP. The project targeted priority ODS phase-out activities in the refrigeration and aerosol sectors and proposes technical assistance at the institutional and enterprise levels to facilitate implementation of the country programme.

6. The project is formulated as a framework project consisting of a technology conversion component implemented by UNDP and a technical assistance and training component implemented by UNEP. Under the technology conversion component in the refrigeration sector: funding of $595,410 was allocated to the *Recovery and Recycling of Refrigerants and* $54,000 *for Monitoring activities* as part of a national Refrigerant Management Plan; funding of $482,369 for *Awareness and Incentive Program for End-users of Refrigeration Equipment;* funding of $170,716 for the conversion of *SAGA Commercial Refrigerator Manufacturing Facility.* The total ODS phase-out target in the refrigeration sector was about 39 ODP tones. In the aerosol sector, funding of $228,096 was allocated for conversion of Yerevan Household Chemistry Plant to phase out 14.33 ODP tones with co-financing from the enterprise of $35,200.

7. Under technical assistant and training component funding of $144,612 was provided for *Training the Trainers in Refrigeration* to train trainers in servicing, maintenance and repair in the refrigeration sector. Funding of $252,569 co-finance of $42,000 from the Government were *Institutional Strengthening* which was designed to provide assistance for co-ordinating the implementation of the Country Programme, including training of customs officers for monitoring and control of ODS. The GEF funding and ODS to be phased out are shown in Table 1.

Table 1: Sub-projects that contributed to the ODS Phase-out Project in Armenia

Programme	Executing Agency	ODP-tonnes	GEF budget ($)	Co-finance ($)
Country Pgm. & Project Preparation	UNDP/UNOPS/UNEP	n.a.	159,000	
Institutional Strengthening, including Customs Training	UNEP	n.a.	252,569	42,000
Refrigerant Recovery & Recycling Programme	UNDP/UNOPS	27.4	595,410	
Monitoring of RMP Activities	UNDP		54,000	
Training in Good Practices in Refrigeration	UNEP	3.0		
Financial Incentive	UNDP	5.0	482,369	

[4] Decision XIV/2. 2002. Application by Armenia for developing country status under the Montreal Protocol.

Programme	Executing Agency	ODP-tonnes	GEF budget ($)	Co-finance ($)
Program				
SAGA Commercial Refrigeration Manufacturing Facility	UNDPUNOPS	6.5	170,716	
Yerevan Household Chemical Plant	UNDP/UNOPS	14.33	228,096	**35,200**
Total		**56.23**	**2,086,772**	**77,200**

8. Armenia participated in two workshops organized under the GEF regional project: Promoting Compliance with the Trade and Licensing Provisions of the Montreal Protocol in CEIT's implemented by UNEP**.** Four regional training workshops for representatives from 21 CEITs aimed to train officers in ODS monitoring and control; and in the establishment, operation and enforcement of licensing systems to enable compliance with the Montreal Protocol trade and licensing provisions. From the NOU perspective workshops were useful; however, the training would have been more productive if participants having similar challenges in the same region were brought together in smaller groups.

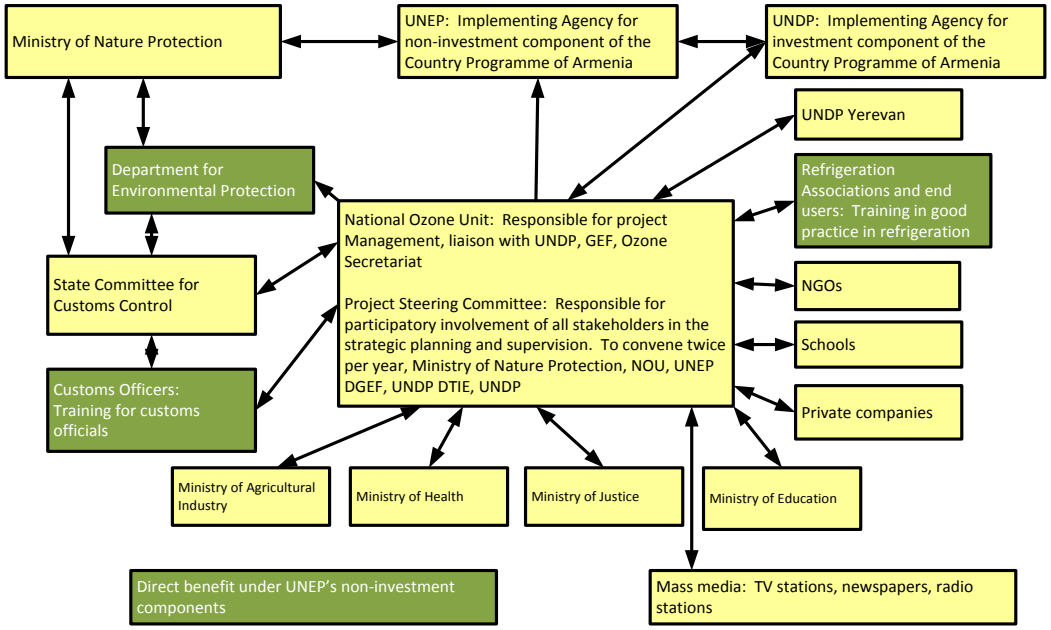
1.3 IMPACT DRIVER I: GOVERNMENT COMMITMENT

1.3.1 Institutional and legislative strengthening

9. The National Ozone Unit (NOU) was established within the Ministry of Nature Protection in the beginning of 2005. The head of Division of Land and Atmosphere Protection assumed the responsibilities of the NOU leader continuing to be a part time employee of the MNP. That ensured the NOU an adequate and well defined place in the national administration and access to decision makers. The NOU established working relationships with the State Committee for Customs Control and other ministries and national institutions concerned. The institutional framework and the position of the NOU within the Government structure are shown in Figure 1 on the next page.

10. The Institutional Strengthening component was initially approved for 2004 to 2007 duration and extended until March 2009 maintaining the same budget. The NOU funding included provision of computing and communications equipment, operating costs including telecommunications and office supplies, staff support for a national project coordinator, funding to raise the awareness of the need for ozone layer protection, and project support services.

Figure 1: The NOU in relation to the government institutions in Armenia



11. The drafting of the legislation started immediately after the first disbursement was channelled through the UNDP Country Office in March 2005. The draft of the Law on Substances that Deplete the Ozone Layer was prepared by the end of December 2005. The Law was passed through the Parliament and officially adopted on 27 November 2006. The Law bans the production of ODS in Armenia and the trade with non-Parties of Vienna Convention and Montreal Protocol. In 2007, five Governmental regulations were adopted by the Cabinet on specific aspects of licensing of ODS imports and exports and establishing the quota system.

1) The Ministry of Environment Protection was designated as a principal body to deal with ODS policy and specific regulations, including imports and export, accounting, distribution of quotas, and issuing permits[5]

2) The list of ODS controlled substances and the total import quota was established.[6]

3) The procedure on establishing of ODS import quotas was adopted[7]. The import quota has to be established for each individual importer and serves as a basis for issuing import permits that stay valid for one year. The importer has to inform MEP on actual imported ODS quantities by 25 February next year.

4) The format and procedure of issuing permits for ODS imports, exports and re-exports were approved[8].

5) The procedure of keeping record of ODS consumption and movement within the country was adopted[9].

12. Montreal and Beijing Amendments to the Montreal Protocol were ratified by the Government on 12 December 2008.

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5 The Cabinet Decree No 291-N of 15 March 2007.
6 The Cabinet Decree No 327-N o 15 March 2007.
7 The Cabinet Decree No 521-N of 17 May 2007.
8 The Cabinet Decree No-771 of 21 June 2007.
9 The Cabinet Decree of 20 March 2007

13. Since 2003, Armenia has been participating in UNEP Networking Activities for Eastern Europe and Central Asia region financed through the Multilateral Fund. There were six networking meetings organized for ozone officers from the region and two refrigeration contact group meetings. The NOU expressed its appreciation of having been invited to these meetings that greatly facilitated in obtaining knowledge and expertise on administrative and technical aspects of the Montreal Protocol. The NOU established a website which has been well maintained and regularly updated.

14. It appears that the NOU has an adequate and well defined place in the Government structure and access to decision makers that ensures the fulfilment of its role as defined in the Country Program and in IS sub-project. The MNP with the support from the NOU managed to create a solid legislative base that enabled the control of trade of ODS and created environment for successful implementation of investment ODS phase-out initiatives.

1.3.2 Customs and border security

15. The responsibilities of the State Customs Committee (SCC) and procedure on ODS control had been determined after the respective legislation was approved. The Training Manual for Customs Officers, leaflets "*Checking of Documentation*", "*Inspection of Goods*", "*Smuggling Methods*" and Customs Officer's Quick Tool for Screening ODS were adapted into Armenian, published and distributed to Customs Officers. . *National* Trai*n-the-Trainers Wo*rkshop for Customs Officers (Phase 1) was held in Yerevan, 22-24 May, 2007 resulting in training 13 customs officers who conducted Phase II training as instructors. The certificates were provided after the verification test at the end of the course.

16. Phase II of training was conducted in 2008 for 75 officers representing 7 entry points. The training curriculum covered issues on ozone layer depletion and the Montreal Protocol provisions, national regulations concerning ODS and requirements for documentation, methods of identification of ODS, illegal trade in ODS and reporting requirements. A practical session on identification of ODS using refrigerant identifiers was also part of the agenda. At the end of the workshop, each participant that passed test received a certificate. In total, 12 ODS identifiers were distributed among 7 regional entry points and 5 customs centres. One workshop was conducted for importers of ODS emphasizing enacted ODS import regulations and requirements for documentation.

17. The evaluation team met with the staff of the Supervision Department of the SCC who was very positive about the results of the training program. The customs officers focus primarily on the verification of documentation of the shipment that goes to the yellow corridor and take sample of about 10% of the bulk shipment for checking the refrigerant with ODS identifiers (red corridor). There were no cases of illegal trade since the existing import quota of CFCs of 29.5 ODP tonnes in 2007 – 2009 was sufficient in meeting the national needs. The data on imports of specific ODS and the country of origin has been collected using the internal computerized system and communicated to the MNP on the annual basis. The handling of data was not difficult since there are only major importers.

18. The customs will face the challenge of potential illegal trade starting from 2010 when no imports of CFC will be allowed in Armenia. It appears that the customs are well equipped to cope with this future challenge.

1.3.3 Awareness raising

19. The NOU implemented a comprehensive ozone depletion awareness program targeting general public, Government institutions and industry. The first category of awareness material was prepared for education of children and school students, including leaflets about the ozone layer, the poster "*Saving the Ozone Layer!*" , the calendar, copy-books

containing pictures, slogans and information on the ozone layer, the booklet "*Save the Ozone Layer!"* with children's pictures, the first three issues of the "*Ozzy Ozone*" comics (translated from the English original), *Ozzy Ozone Game* translated and reproduced in 3m x 3m format for making it playable on the ground, education pack for teachers "*Saving the Ozone Layer*" with related questionnaires for children (adapted from the English original), book "*Twenty Questions about the Ozone Layer*" (adapted from the English original).

20. The NOU organized about fifteen events such as awareness workshops related to the ozone layer and the Montreal Protocol in Yerevan and other locations, round tables associated with the celebrations of the International Ozone Day and related radio and TV broadcasts involving respective Government officials. Non-governmental environmental organizations have been frequently involved in organization of awareness workshops. The evaluation team met with the Environmental NGO "Khazer" that has a mandate to raise the awareness about environmental issues in Armenia, including the ozone layer. The focus of "Khazer" activities is on schools students. Two students of 5th grade participated in international environmental children forum "TUNZA" held in Norway in June 200. The issues related to the depletion of the ozone layer and Montreal Protocol have been covered in agendas and curricula of specialized training workshops.

21. The awareness campaign promoted a favourable public response on ODS legislation under development at the time, and it likely to have a sustainable impact on future generations that understand the need for ODS recovery. However, there was neither a baseline established, nor performance indicators developed, that could be used to monitor the impact of the awareness raising campaign on ODS phase-out activities in the country. Therefore, it was not possible to assess the impact of this awareness raising campaign.

1.4 IMPACT DRIVER II: RECOVERY AND RECYCLING PROGRAMME

22. The comprehensive national program for recovery and recycling of refrigerants in the refrigeration and air conditioning sub-sectors was designed as part of the Refrigerant Management Plan (RMP). The Program covers the provision of a number of refrigeration servicing kits, including portable refrigerant recovery machines, manual recovery pumps and plastic recovery bags. The project will also provide several sets of recycling equipment strategically distributed around the country. Training seminars for technicians performing repairs, maintenance and installation of refrigeration and air conditioning equi^{pm}ent have been held to familiarize all involved with the RMP, the National Recovery and Recycling Program and good servicing practices resulting in reduction of emissions of ODS refrigerants to the atmosphere. A system for monitoring the ODS recycling and recovery operations is also a part of the RMP to ensure the effective implementation of the Program. The Program was implemented by UNDP with assistance from the NOU and national consultants. The ODS phase out target of the program was determined to be 27.4 ODP tones.

Recovery, recycling and reclamation equipment

23. A survey, conducted by the Ministry of Nature Protection of the Armenian Republic in 2001, indicated that there were more than 750 refrigeration technicians in the country. The survey also indicated that there were 42 companies of different sizes in the country that carried out servicing, maintenance and repair of domestic, commercial and industrial refrigeration equipment, some of them also serviced air conditioning units. Through the funding provided by the GEF the following equipment was purchased: 5 sets of recovery and recycling machines; 70 sets of servicing equipment designed for servicing predominantly commercial refrigeration equipment, including 70 refrigerant recovery machines; and 100 sets for servicing domestic refrigeration appliances with 100 manual pumps and 400 plastic bags; and two recovery and recycling machines designed for

servicing mobile air-conditioners

24. Five recovery and recycling machines were installed in refrigerant reclamation centres established in major cities in Armenia: two in Yerevan, one in Gumri, one in Vanadzor and one in Ararat valley. The evaluation team visited two recovery and recycling centres: one in Yerevan and another in Ararat Valley as well as one beneficiary of the refrigerant recovery equipment. Both centres are strategically located and active. The Yerevan center is a multifunctional facility selling, all kind of refrigerants, spare parts, compressors and providing servicing. The clients bring CFC-12 or HCFC-22 refrigerants for reclamation once they need to buy something in the shop. The buy contaminated refrigerant for 250-300 drum for 1 kg (equivalent of $0.80) and sell reclaimed refrigerant for about 600 drums for 1 kg making profit about $1.00 per kg.

25. Another recycling centre is located in Artashat (Ararat Valley), where almost all households are engaged in growing apricots, apples and pears. Typically, a household has a cold room in the basement equipped with a refrigeration unit with a charge of about 2 to 6 kg of refrigerant. There about 2,000 refrigeration units around the place and about 80% of them are working with CFC-12 refrigerant. The centre is equipped with three recovery machines and one recycling machine. Typically, the cost of reclamation is about $0.30 per kg of CFC-12 or HCFC-22.

26. The evaluation team found that the recovery and recycling equipment is in place and in working condition. The owners are satisfied with the equipment except plastic bags and manual pumps that have not been used very much because of their low efficiency.

Monitoring the implementation of the recovery and recycling programme

27. The Ministry of Nature Protection assumed full responsibility for monitoring the recovery and recycling program. In particular monitoring had to ensure that: 1)The recovery and recycling equipment was distributed in the most effective way to maximize the quantities of recovered and reused refrigerant; 2)All the equipment is properly used, kept and maintained; 3) Proper records of the amounts of CFC recovered, recycled and reused are maintained. It appears that the funding allocated by the GEF has been sensibly used for establishing the monitoring system. With the assistance of the National Refrigeration Consultant the NOU distributed the R/R equipment in strategic locations in the country to ensure the most effective R/R operations in terms of recovered and reused refrigerant. The potential beneficiaries of equipment have been assessed through the survey conducted during preparation of the Project and on the basis of information available in the National Refrigeration Association. The major criterion was the volume of the refrigerant handled by the company. The equipment was distributed accordingly. All the equipment supplied under this project had been provided to the beneficiaries on a grant basis. The title of ownership of the machines and equipment provided under the GEF will be kept by the Ministry of Nature Protection of the Armenian Republic throughout the duration of the project and then transferred to the users. The transfer will be subject to final evaluation of the activities carried out by the individual users. The NOU has the complete inventory of beneficiaries with their address and phone number.

28. The beneficiaries of R/R keep records of the amounts of ODS recovered and recycled and report monthly to the national consultant. The consultant pays visits to beneficiaries and checks the reported data through verifying the reading of the time on the particular machine. The running time of a machine corresponds to the quantities of recovered or reclaimed refrigerant. The consultant registers also all the problems related to the operation of the equipment. A computer database has been set up to monitor the information received from the service centres. The consultant presents his report to UNDP quarterly. The data on the recovered and reclaimed CFC-12 and HCFC-22 refrigerants are

shown in Table 2 for 2006 to 2008.

Table 2: Quantities of recovered and reclaimed refrigerants in Armenia in 2006 to 2008 (kg)

Year	R12 Recovered	R12 Reclaimed	Percent R12 Reclaimed/ Recovered	R22 Recovered	R22 Reclaimed	% R22 Reclaimed / Recovered
2006	2,599	456	17.55	1,321	198	14.99
2007	2,198	1,355	61.65	1,387	880	63.45
2008	862	495	57.42	1,081	673	62.26
Total	5,659	2,306	40.75	3,789	1,751	140.70

29. The overall quantity of recovered and reused refrigerants is short of the target of 27 ODP tonnes to be recovered and recycled annually. It appears that the target in the project document was highly overestimated. No data are available on recovered contaminated refrigerants. There is no facility to collect and store not reusable refrigerants and usually they are vented to the atmosphere. Average prices for refrigerants in Armenia that have been provided by the NOU are shown in Table 3. The 2008 refrigerant prices correspond to those displayed in the shops visited by the evaluation team.

Table 3: Average Prices of the Refrigerants in 2006-2008

Refrigerant	2006	2007	2008
CFC-12	4.11	4.87	8.20
HCFC-22	3.60	4.22	5.90
HFC 134a	6.85	6.5	11.48
R-404A		13.0	16.39
R-407C			16.39
R-410A			16.39
Isobutane (HC -600a)			57.37

30. The program on the monitoring of 3R activities proved to be very effective tool to render judgment on the efficiency of the 3R program. The detailed quarterly reports have been regularly presented to the UNDP international consultant. It stems from the reports that the NOU monitored very closely operations of the owners of 3R equipment and provided viable assistance involving the Refrigeration Association. The data collected in the course of the monitoring demonstrate that recycling machines were actively used for reclamation of about 40% and 46% of recovered CFC-12 and HCFC-22 respectively. Table 3 shows that the price for CFC-12 almost doubled in 2008 creating more incentives for refrigerant recovery and recycling operations.

31. The 3R program was quite successful. The total of about 5.7 tonnes of CFC-12 and 3.8 tonnes of HCFC-22 have recovered and reused for the last three years avoiding emission of about 6 ODP tonnes into the atmosphere. The rate of utilization of recovery machines is about 63 kg per machine annually. The 3R equipment will be continuously used in future years recovery and reclamation of CFC and HCFC refrigerants.

32. The evaluation team was reported about the lack of servicing facility in Armenia dealing with repair of recycling and recovery machines and other refrigeration servicing equipment. UNDP needs to consider this factor in negotiating its future contracts with the suppliers of

3R equipment.

Training of refrigeration technicians

33. The aim of this component is to improve servicing and maintenance practices in order to prevent intentional and/or unintentional emissions of CFC refrigerant into the atmosphere and extend the life time of the equipment through better repair and maintenance. The target was the training of 750 servicing technicians. The training process was organized as Phase I train-the-trainers and Phase II training of the remaining targeted personnel. Two training centres were established: one in Yerevan and the other in Gyumri. The UNEP training manuals "Good Practices in Refrigeration" and "Natural Refrigerants as Alternatives to HCFC" were translated into Armenian, published and distributed to Refrigeration Technicians. The training programme covered the following areas: depletion of ozone layer, ODS control measures and provisions of the Montreal Protocol; appropriate servicing and maintenance practices, new drop-in refrigerants, leak detection; concepts of refrigerant recovery and recycling; proper handling of refrigerants; government regulations which will affect the refrigeration sector. Practical hand-on sessions were also included in the program

34. The train-the-trainer workshop was organized in Yerevan in October 2005 and 27 trainers had been trained. The Phase II continued in 2006 and 2007. Six training workshops were conducted resulting in training of 685 technicians that is very close to the established target.

35. The implementation of the Training and Refrigerant Recovery and Recycling Program was assisted by the Refrigeration Association which is active in Armenia. There are 55 active members of the Association that held 3 meetings. The Chairman is permanently in touch with the NOU and two national refrigeration consultants.

36. The training program was necessary to introduce the good servicing practice reducing emissions of ODS refrigerants during servicing operations. The training of 750 technicians meets the target established in the project. The availability of training manuals in Armenian will facilitate further training both at the enterprise level and centrally using the Refrigeration Association facilities.

37. The ODS phase-out target of the training program was determined to be 3.0 ODP tonnes. The introduction of good practices in the refrigerant management has definitely contributed to the ODS overall phase-out. However, it would be difficult to quantify this contribution.

1.4.1 Financial incentive and retrofit program

38. UNDP developed and implemented the concept of financial incentives for retrofit/replacement of refrigeration equipment in the commercial and industrial end-user sectors as a part of the implementation of RMP in several Article 5 countries, including Armenia In line with UNDP guidelines, commercial or industrial refrigeration end-user enterprises are considered under this incentive payment program that have to replace, or retrofit their existing CFC-12 or R-502 based refrigeration system with a non-CFC refrigerant-based system. The funding of "drop-in" conversions using HCFC ternary refrigerant blends has not considered the best use of available GEF funds because of sustainability problems

39. Upon receipt of an application for an incentive payment by an enterprise, 40% of the estimated cost can be paid up front if the documentation is found to be satisfactory and if the application itself is acceptable. The eligible balance is paid after: 1) the conversion to non-CFC refrigerant-based equipment has been completed; 2) the actual total cost data

have been reviewed and the International Consultant has made a formal recommendation on the level of the incentive payment; 3) the replaced baseline CFC refrigerant-based equipment has been destroyed/dismantled/rendered unusable. Incentive payments are to be provided according to a sliding scale from US $1,500 for 3 kg ODP up to 9 kg ODP of annual CFC consumption phased-out to US $15,000 for 200 kg or more of ODP consumption phased out against invoices confirming costs incurred. The balance of the cost of retrofit or replacement has to be paid by the end-user.

40. The awareness and incentive program in Armenia was designed as two component program. The first component focused on informing the end-users in Armenia about the existence of the incentive programme. The second component covers grant incentives to be provided to end-users that apply for incentive payments. End-user Awareness and Incentive workshops were held in Yerevan in June 2005 and in October, 2007. A special TV program was broadcasted raising awareness among end-users. A booklet "*Improve your production efficacy by switching to ozone-friendly technologies!*" was prepared and published to involve more end-users into the program. The refrigeration association was actively involved In total 39 enterprises applied for grant incentives against commitments to perform the retrofit or replace their ODS- based equipment. Four enterprises failed to complete the replacement activities due to financial problems and prepared to pay back the received up-front (40%) incentive payments

41. In total, 206 units of the refrigeration equipment have been replaced and 3 units were retrofitted at 35 enterprises. The initial cumulative charge of CFC-12 refrigerant in these systems was 5,570 kg. The total cost of the replacement and retrofits was assessed to be $710,268. The estimated total compensation amounts to $309,662 or about 44% of the total cost. The program is still on-going. So far, the sum of incentives paid to beneficiaries amounts to $240,234.

42. The evaluation team visited four enterprises where the incentive program played an important role in ODS phase out and at the same time promoting the technology advancement. The confectionery company "Daroink" founded in 1998 in Yerevan. "Daroink" brand is among the most popular ones in Armenia offering varieties of biscuits, wafers, chocolates and cakes. "Daroink" is among the few enterprises that have been honored with the governmental award for high quality. In 2003, "Daroink" was also awarded the International Quality Gold Star by the Board of the Business Initiative Directions in Geneva. Four CFC-12-based condensing units have been replaced with new Copeland units at the cost of $34,661. The documentation is under the evaluation process in the UNDP Headquarters. The compensation of $15,000 has yet to be paid.

43. *Khak Ltd* is located in Ararat Valley. Its major business is storing and selling fruits. The company completed the replacement of five CFC-12-based refrigeration units with new non-ODS equipment in August 2008. The total CFC-12 charge amounted to 79 kg. The company spent $11,000 for purchasing new equipment. The 40% advance of $2,000 was paid in March 2007. The balance of $3,000 is yet to be paid upon completion of the evaluation of invoices.

44. "Linda Ltd" *i*s a leading meat processing enterprise in Armenia. The company was established in 1995. It is developing its retailing network. The products of "Linda Ltd" were awarded with several diplomas and have been exporting to Ukraine, Russia and Georgia. "Linda Ltd" was one of the first beneficiaries of the program. The replacement of nine CFC-12 units was completed in June 2007. The full compensation of $10,000 was paid in August 2007. In total, 209 kg of CFC-12 was phased out.

45. *"Vostan Ltd*", the restaurant and food processing enterprise completed the replacement of six CFC-based refrigeration units within 5 months resulting in the phase-out of 80 kg of

CFC-12. The full compensation was paid in November 2006.

46. The management of visited companies expressed its satisfaction in regard to the objectives and implementation modalities of the program. The replacement equipment is mainly based on R404A and HCFC-22 with only a few based on R407C. The new HCFC-22-based equipment is still available and popular because of advantages in price of the refrigerant ($5.00/kg for HCFC-22 vs $16.00/kg for R404A). The major driving force for the replacement of CFC-12 based equipment is the future unavailability of the refrigerant not its increasing price. There are additional benefits associated with replacements such as lower cost of energy and maintenance. The new equipment is virtually leak proof and do not require a permanent supervision by servicing personnel. The program facilitated the propagation of information on new technology. Completed conversions demonstrated new technological solutions to the refrigeration community providing a catalyzing and cascading impact, which indirectly also contributed to the achievement of 2005 and 2007 control targets.

47. The direct CFC phase-out in completed end-user conversions of about 5.5 ODP tonnes represented a tangible direct contribution to the overall reduction in CFC consumption in the country slightly exceeding the established target. The incentive program was well designed and implemented under the supervision of a national consultant.

Halon

48. Upon a request from the National Ozone Unit of Armenia, a technical assistance mission on status of halons management was carried out in Armenia in July 2007 in coordination with the Regional Network Coordinator of the Central Asia and European Network. The mission commenced with a one day roundtable exploratory meeting to raise and discuss issues related to the status of halons and halon management in Armenia. Representative from the Armed Forces, the Fire Service, the Civil Aviation and Fire Systems Supplier were invited to the meeting. The National Ozone Unit and the Halon Officer delivered a number of presentations aiming to raise the awareness of the participants and laying the ground for discussions. It was the first time when issues related to halons were discussed and the participants expressed interest in the subject, raised many questions and the discussions appeared to be fruitful. The participants requested the NOU to hold more of such meetings and invite a wider audience that could benefit from the information provided. Subsequently, a site visit to a fire system supplier was carried out.

49. The technical assistance mission demonstrated that there was a clear lack of awareness concerning halon management and available alternatives among the main halon stakeholders and parties with critical uses/applications of halon such as the Armed Forces, the Fire Service and the Civil Aviation. The Armed Forces, the Fire Service and the Civil Aviation expressed their concern and need for further capacity building and technical awareness relating to halon management and suitable available alternatives. The last survey of installed capacity of halon was carried out in 2005. Since then, the data have not been updated. The bulk of quantities of installed halon have not been identified and updated to provide a clear picture of the installed capacity in the country.

50. The Government and the NOU have to take urgent measures in formulating a national plan of action in the halon sector.

1.5 IMPACT DRIVER III: ENTERPRISE SUSTAINABILITY

51. There were two companies that received funding to convert their production processes to non-ODS technologies: SAGA Commercial Refrigeration Plant Ltd. and Household Chemistry Plant manufacturing aerosols product. Both investment projects were implemented by UNOPS/UNDP. No economic and financial viability study was conducted

by the implementing agencies on these two enterprises

SAGA commercial refrigeration equipment manufacturer

52. SAGA Ltd was founded in 1995 as a refrigeration equipment trading company. Later the company expanded its activities into manufacturing of commercial refrigeration equipment. At the time of the project formulation in 2001, the company manufactured display cases, chest freezers, bottle coolers and visi-coolers with production of 6000 units per year. CFC-11 was used as the polyurethane (PU) foam blown agent and CFC-12 as the refrigerant. The GEF grant of $170,716 was utilized to phase out the total annual consumption of 6.5 ODP tonnes. The new production equipment has been provided by UNDP and UNOPS that allowed SAGA Ltd. to adapt the new water-based PU foam formulation in manufacturing insulation panels. The high capacity 80 kg Cannon foam dispenser replaced manual foam mixing and pouring operations. New HFC-134a-based refrigerant charging equipment, new vacuum pumps and leak detectors provided for assembly line enhanced the production capability of the company. The company purchased and installed a new 6 meter hydraulic press in new production facility that enabled the company manufacturing high quality insulation sandwich panels. This equipment in couple with Cannon dispenser significantly increased both productivity and quality of "SAGA" manufacturing operations.

53. Presently, the company is one of the most important manufacturers of commercial refrigeration equipment in the Caucasus region producing about 3,000 units in 2007 and exporting its product to Georgia, Kazakhstan and Russia. The management of the company is planning new investments in expanding the production. Overall, the project was a success story. Through the conversion of SAGA ltd., the national ODS consumption was reduced by 6.5 ODP tonnes.

1.5.1 Yerevan aerosol manufacturer

54. Yerevan Household Chemistry Plant (HCP) was one of the largest producer of household chemicals in Armenia, which fully satisfied the demand of the population of the republic. Earlier its products were popular also in other republics of the former Soviet Union and in Eastern Europe in Poland, Hungary and Czechoslovakia. Factory produced more than 30 items of household chemical industry such as synthetic washing pastes, laundry detergents, scouring liquids, kitchen and bath room cleaning agents, aerosol products, car care products.

55. In 1995, the plant was privatized and "Yerevan Household Chemistry Plant" OJSC was established. The factory was manufacturing aerosol products (hair spray, insecticide, technical silicone and deodorants), cleaning agents, laundry detergents and other household chemicals. A UNDP consultant visited the enterprise in February 2002, found that the plant was in full operation and that the company was financially sound. Yerevan Household Chemistry Plant had 25 employees. About 50 % of its produce was for national consumption and remainder was exported to Russian Federation, Ukraine and Georgia. At the time of the formulation of the project, the plant was operating with three aerosol filling line (one Latvian made and two Armenian made).

56. The management of the company having been aware of the Government commitments to phase out ODS in Armenia agreed to participate in the conversion of the aerosols operations to hydrocarbon propellant. The project envisaged the installation of the filling room outside of the production area equipped with two conveyors and installation of a fenced hydrocarbon propellant cylinder storage farm with related piping.

57. The evaluation team visited the plant in once to be a very important producer of household chemical products. Currently, there have been minimum signs of activities. Large premises

were half empty and not heated although the outside temperatures were below zero in Yerevan area. The production set up was not in conformity with the project document. In particular, the gassing room was not located outside of the main building. Changes have been made in the set up in the course of the implementation of the project. Due to low production volume all the new equipment has been provided and installed in the large existing production area, including destenching columns, Coster gassing and crimping units and the necessary ventilation and safety equipment. The hydrocarbon propellant is supplied from cylinders installed in the same premises near the destenching columns.

58. The aerosol production was not in operation. The company experiences shortage of liquidity and the production of aerosols has been limited to engine cleaning degreasers being produced by a single round of a campaign production usually in summer time when there is a demand for such product. The company stopped production of aerosol air refresheners because the destenching columns have not sufficient capacity and the company cannot afford frequent replacement of costly ceolyte in adsorption columns. The company experiences problems with supply of hydrocarbon propellant due to high customs expense. Maintenance of the Coster equipment is difficult because of the supplier of technology is not always responsive and cost of spare parts is high. The company does not appear having both short term and long term strategy.

59. The company discontinued using CFCs and the ODS phase-out target was achieved. However, based on observations of the evaluation team, the company is not sustainable. UNDP did not undertake the financial viability tests that should have taken into account the business plan of the company and macro-economic conditions that prevailed in Armenia at the time of the Project.

1.6 IMPLEMENTING AGENCIES

60. The division of responsibilities among the implementing agencies was shown in Table 1 above. The UNDP country office managed the finance for sub-projects implemented by UNEP. UNDP and UNEP officers visited Armenia which had a very positive impact on the smooth implementation of the Project. International experts supervised the implementation of the investment components conducted by UNDP/UNOPS. The NOU fully benefited from services provided by networking organized by UNEP for developed countries in Eastern Europe and in Central Asia. Since 2003, the NOU has attended six Network meetings. The refrigeration experts actively participated in the refrigeration contact group organized within the Network. The NOU received assistance from the UNEP Compliance Assistance Programme for halon and methyl bromide management.

1.7 IMPACT THREATS / RISKS

1.7.1 Illegal trade

61. There is no imminent threat of illegal trade of CFCs because Armenia can legally import up to 25 ODP tonnes in 2007 to 2009. In 2008, Armenia reported CFC imports of 13.6 ODP tonnes that is by 11.4 ODP tones lower than the allowable quantity. The threat of illegal trade might pronounce itself in 2010 and onwards since the CFC-based refrigeration equipment will continue to exist and demand for CFC-12 refrigerant will remain. The NOU and the Government of Armenia have to be vigilant in their assessment of the potential illegal trade and take the necessary measures on continuing training of the customs officers.

62. The training of refrigeration servicing technicians has also to be continued in order to limit the potential for the illegal trade by emphasizing the availability of non-CFC servicing blends and retrofits. The importance of these options will be growing with short or zero supply of CFC refrigerant

63. Once the Institutional Strengthening (IS) support from the GEF is over, Armenia as Article 5 country will be eligible for continuation of assistance for IS activities from the Multilateral Fund and will be able to implement measures reducing a potential for the illegal trade.

64. The GEF project did not address consumption of methyl bromide in agricultural sector and halon used in the fire-fighting applications. The issues with these two control substances remain unresolved and put a pressure on the NOU and the Government.

1.8 IMPACT ON THE PHASE OUT OF OZONE-DEPLETING SUBSTANCES

65. The GEF financial assistance was crucially important for Armenia to achieve the Montreal Protocol targets. The CFC consumption was reduced from 172.7 ODP tones in 2002 to 13.6 ODP tones in 2008. The 50% (2005) and 85% (2007) CFC consumption reduction targets have been met. The import quota and licensing systems are in place and reinforced in the country that is a good indicator that the CFC zero consumption target mostly probably will be met as well.

66. Armenia developed a working refrigerant recovery and reclamation program resulting in the reuse of 5.7 CFC-12 refrigerant and avoiding imports of equivalent quantities of new CFC refrigerant.

67. Armenia successfully implemented the financial incentive program for retrofitting and replacing 206 refrigeration units based on CFC-12 refrigerant with non-CFC equipment resulting in reducing the demand in CFC-12 refrigerant by 5.6 ODP tones

68. Armenia phased out about 6.5 ODP tonnes in investment project in SAGA commercial refrigeration company, enhancing its production capability and competitiveness

69. Armenia phased out about 14.3 ODP tones of CFC-12 and CFC-11 in production of aerosols at HCP. From socio-economic prospective, the project was not very successful since the enterprise is not sustainable

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2 AZERBAIJAN

2.1 BACKGROUND

1. Azerbaijan declared independence from the former Soviet Union in August 1991 and became a republic in April 1992. Azerbaijan is rich in mineral resources including oil and gas, which were largely responsible for promoting its annual average growth for the past 5 years to 21%. As a result of its improved economic performance, the percentage of the population in poverty was reduced from 39.7% in 2003 to 20.8% in 2006. Gross national income per capita was $2,600 in 2007. Poverty reduction continues to be one of the challenges for Azerbaijan.

2. The initial country programme for the phase-out of ODS was compiled in 1997 at the initiative of the UNEP/IE, based on the data survey of ODS consumption in various sectors, conducted by the National Ozone Team. In 1996, Azerbaijan used ODS in the refrigeration (CFCs), fire-fighting (halon), solvent (CFCs, methyl chloroform) and foam blowing (CFCs) sectors. Refrigeration accounted for little less than half of the total, fire-fighting for slightly more than half. Azerbaijan reported halon consumption of 501.2 ODP-tonnes, but UNDP later determined that this might be installed in equipment rather than consumed.

3. Azerbaijan acceded to the Vienna Convention, the Montreal Protocol, the London and Copenhagen Amendments in 1996. As a developed country that was formerly a part of the Soviet Union, Azerbaijan was required to, *inter alia*, phase out the consumption of halon on 1 January 1994; and to phase out CFCs by 1 January 1996. Azerbaijan approved the Montreal Amendment in 2000.

4. In 1998, the Parties to the Montreal Protocol noted that Azerbaijan was in non-compliance with its control obligations as consumption of 456.5 ODP-tonnes of CFC and 501.2 ODP tonnes of halon[1] was reported in 1996[2]. About 93% of CFC consumption was in the refrigeration sector, 6% in the foam blowing sector with remaining 1% in the solvent sector. Azerbaijan believed that this situation would continue to at least 2000. Based on its Country Programme, Azerbaijan committed to:

    1) Establish a system for licensing operators in the refrigeration servicing sector in 1999;
    2) To consider by 1999, a ban on the import of ODS-based equipment.
    3) Apply a tax to ODS imports;
    4) Phase out CFC consumption by 1 January 2001; and
    5) Ban on all imports of halon by 1 January 2001;

5. The Parties specifically urged Azerbaijan to work with the relevant Implementing Agencies to implement non-ODS alternatives, and to quickly develop a system for managing banked halon for any continuing critical uses. The Government of Azerbaijan requested GEF assistance to enable it to comply with provisions of the Montreal Protocol.

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[1] Later UNDP identified only about 100 ODP tonnes of halon consumption

[2] Decision X/20: Compliance of Azerbaijan with the Montreal Protocol.

2.2 INPUTS

6. The GEF Council approved GEF Projects in March 1998 and the grant agreement was signed in February 1999. The objectives of the Project were to assist Azerbaijan to phase-out its ODS consumption by providing financial support to a series of sub-projects. The project is formulated as a framework project consisting of a technology conversion component implemented by UNDP and a technical assistance and training component implemented by UNEP. Under the technology conversion component UNDP provided the recovery and recycling equipment to establish the system of recovery, reclamation and reuse of CFC refrigerants avoiding imports of new CFC refrigerants for servicing the existing refrigeration equipment. Two investment sub-projects were to convert: *Chinar domestic refrigerator manufacturer* from using CFC-12 in the refrigerant cycle and CFC-11 in foam blowing operations to HFC-134a/iso-butane and cyclopentane technology respectively, and *Sumgayit compressor manufacturer* to enable production of HFC-134a and iso-butane compressors to be used by Chinar and exported to other countries in the region. Under UNEP technical assistant and training component funding was provided for *Training the Trainers in Refrigeration* to train trainers in servicing, maintenance and repair in the refrigeration sector and for *Institutional Strengthening* which was designed to provide assistance for co-ordinating the implementation of the Country Programme, including training of customs officers for monitoring and control of ODS . The summary of GEF funding and associated ODP to be phased out is shown in Table 4.

Table 4: Sub-projects that contributed to the ODS Phase-out Project in Azerbaijan

Title	Executing Agency	Years	ODP Phase-out (Tonnes)	GEF budget* ($)
Country Programme & Project Preparation	UNDP/UNOPS / UNEP	1	N/A	117,500
Conversion of manufacturing facilities at Sumgait compressor plant	UNDP/UNOPS	2	N/A	2,399,738
Elimination of CFCs in the manufacture of domestic refrigerators at Chinar	UNDP/UNOPS	2	122.4	2,906,496
Recovery/ Recycling	UNDP/UNOPS	2	85.0	1,106,401
Halon management and banking national recovery/recycling centre	UNDP/UNOPS	2	100	135,259
Institutional Strengthening	UNEP	3	N/A	267,000
Training of trainers for use of ODS-free refrigerants	UNEP	1	N/A	114,900
Total			**307.4**	**7,047,294**

* This amount includes UNOPS / UNEP Executing Agency Support Cost and Cost of the Project Support Services provided by the UNDP country office. N/A = not applicable.

2.3 IMPACT DRIVER I: GOVERNMENT COMMITMENT

2.3.1 Institutional and legislative strengthening

7. The Country Programme, which included key policy actions and identified priority investments, received wide support from Government departments such as the State Committee of Ecology and Nature Management Control (SCENM) of Azerbaijan. The National Ozone Centre was established in the SCENM. The NOU had a core staff and a

number of specialized consultants. The chairman of the SCENM was the project manager for all activities at the country level. The ODS phase out was one of the priorities in the Government environment strategy.

8. A framework regulation on a licensing system to monitor and control ODS imports was approved in December 2000. The taxation system regulating imports of ODS was introduced in 2001. The licensing system was coupled with the Recovery and Recycling sub-project and with training in good refrigeration practices. Azerbaijan banned the import of halon in 1997. Quotas for CFC import were established from 1997 to the phase out on 1 January 2002[3].

9. In developing its regulatory framework, Azerbaijan officials took an active part in, and benefited from, the regional activities organized by UNEP DTIE Ozone Action Programme, which were financed by the GEF[4].

10. At the time that the Project was financed, there was a strong government commitment to ozone layer protection. However, this commitment ended once the Project was completed in 2002. The lack of a sense of urgency by the GEF, UNEP and the Government contributed to the continuing non-compliance of Azerbaijan with the requirement of the Montreal Protocol in 2001, 2002, 2003, 2004[5], and 2005[6]. The key legislation was adopted in 2005 providing the necessary authority to MENR to control the imports and exports of CFCs and equipment containing CFCs.[7] Azerbaijan reported zero CFC consumption only in 2006.

11. The NOU was disbanded and the Government structure was re-organised. The SCENM was transformed into the Ministry of Environment and Natural Resources (MENR). The National Department on Hydrometeorology (NDH) was incorporated into the MENR. In 2003, the Centre on Climate Change and Ozone (CCCO) was established within the NDH. The head of the CCCO was assigned as a focal point on issues related to the Montreal Protocol. There was no continuity in transition from the NOU to the CCCO. The CCCO is located in the building occupied by the National Department on Hydrometeorology. The building has been under renovation for several years. The computer in the CCCO office was outdated and has not been connected to the internet.

12. In 2008, the new head of the CCCO was appointed together with an Ozone Officer. The Ozone Officer is mainly responsible for the collection of data on ODS consumption from Government agencies, and the preparation of the annual report to the Ozone Secretariat in accordance with Article 7 of Montreal Protocol. The Ozone Officer speaks only Azeri which limits communication with personnel outside of Azerbaijan. The low salary for the government employees increases the risk that they will resign, leaving a vacancy in the CCCO.

2.3.2 Customs and border security

13. The **State Customs Committee (SCC)** was involved in the ozone-related activities at the initial phase of the Project and participated in the preparation of the legislation. The training workshop for the customs officers was held on May 2001 in Baku which was attended by 250 participants, including representatives from other Government institutions concerned. There were also participants from other institutions. The participants were trained to work with the ODS identifiers to enable ODS to be identified

[3] 306.3 ODP-tonnes (1997); 204.2 (1998); 136.1 (1999); 90.7 ODP (2000); 57.1 (2001) and none in 2002

[4] Regional workshops in Tashkent (May 1997) and Kiev (December 1998), Baku (June 2000) and Almaty (April 2001)

[5] Decision XVI/21. Non-compliance with the Montreal Protocol by Azerbaijan

[6] Decision XVII/26. Non-compliance with the Montreal Protocol by Azerbaijan

[7] Decree of the President of 12 September 2005 " Additional measures regulating the trade"

cylinders and equipment. The customs officials had been also instructed on the implementation of the national import and export licensing systems. The NOU produced brochures and books for the workshop that included: "*The Montreal Protocol and responsibilities of customs organizations*"; "*ODS imports/exports and licensing systems*"; and "*The implementation of the Montreal Protocol in Azerbaijan*". Most of the trained officers worked at the entry checkpoints.

14. The momentum was lost after the closure of IS component. The regular training on ODS related issues was discontinued. Due to the high rotation of personnel the share of new untrained staff has increased. The training program has been resumed on the initiative of the SCC. For the last three years, 180 customs officers were trained on ODS control and management.

15. During the evaluation mission, the meeting was organized in the Central Laboratory of the SCC. The Laboratory was well equipped with modern equipment. ODS detection equipment was envisaged in the Project budget, but this did not eventuate. Recently, 13 "Neutronic Ultima ID" detectors were purchased. All eleven checkpoints were equipped with the new detectors. The laboratory plans to purchase identifiers capable of detecting components of HFC blends.

16. It appears that the staff of the SCC and officers at checking points have been trained and provided with the necessary equipment in order to ensure the control of the illegal trade of ODS. The leadership of the SCC is well informed about the border security issues associated with ODS and committed.

2.3.3 Awareness raising

17. During the three-year period many activities aimed at improvement of public awareness of ozone layer depletion was carried out by the NOU. The public has been informed about negative consequences for health and environment and about actions aimed at fulfilment of obligations under the Montreal Protocol through publishing articles in mass media, in particular in the journal of "Nature of Azerbaijan"; broadcasting radio and TV shows; printing booklets and periodical bulletins. Other activities undertaken include: Workshops on public awareness on ozone issue in Azerbaijan, covered by National TV, and distributed printed material; the content on the best children's drawing dedicated to the International Ozone Day; Many meetings with students of technical universities; etc. Additionally several seminars have been organized on dissemination of information on new technologies and ODS substitutes. There was no information on awareness raising activities once the IS project was completed and the NOU disbanded.

18. The dissemination of information on new technologies and ODS substitutes among professional groups facilitated implementation of ODS phase out activities. For the other activities in the Awareness Campaign, there was neither a baseline established, nor performance indicators developed, that could be used to monitor its impact. Therefore, it was not possible to assess its impact in these areas not related to refrigerator recovery.

2.4 IMPACT DRIVER II: RECOVERY AND RECYCLING PROGRAMME

19. This programme aimed to recover and recycle as much refrigerant as possible during the transition period between CFCs and CFC-free technology, at a time when the importation of CFCs was restricted and then banned in Azerbaijan. This programme consisted of two parts: i) Training of technicians in refrigeration management; and ii) Training and distribution of equipment for ODS recovery and recycling activities

2.4.1 Recovery, recycling and reclamation equipment

20. The UNDP established 85 ODP tonnes of recovered and reused refrigerants annually as a

target for its recovery and recycling program in Azerbaijan. The target was based on a calculated quantity of 1 kg of the refrigerant to be recovered by one machine per day. The project provided 300 recovery and 50 recovery and recycling machines that were distributed to the larger users around the country. These recycling machines have been used in 32 centres. Out of 32 recovery, recycling and reclamation centres, eighteen centres are located in the capital Baku. Unfortunately, it was not possible to obtain any information on the number of 3R equipment that is still operational. Nor, any information could be provided on historical performance of the 3R system in the country in terms of recovered and reclaimed refrigerant. All the files of the former NOU related to the operation of the 3R system in 2000 to 2002 have been supposedly kept in MENR premises since the NOU was disbanded and could not be made available by the time of the evaluation mission. Since then, no monitoring of the 3R activities has been undertaken. The only document in Azeri contained data on recovered CFC-12 from 32 companies, located in Baku and other regions. The total quantity reported was 600 kg. The document, however, did not indicate when the data were collected. The NOU had not visited any of these companies to verify these data after the project was closed in 2002. The staff at CCCO has no information on the current status of the 3R system established under the recovery and recycling sub-project. The monitoring of the operation of 3R system requires outside expertise that is not in the budget of the ozone office.

21. In the absence of 3R monitoring data it was not possible to make a judgement on whether the target of the sub-project was achieved. On the basis of information provided by Titan Group it appears that 3R system was a useful mechanism in reducing dependency on CFC-12 refrigerant in the refrigeration servicing sector. Nowadays, the availability of CFC-12 is rare in existing refrigeration systems that makes the recovery and recycling not cost-effective.

22. The absence of information on 3R activities in the ozone office demonstrates the lack of ownership of the Government in the ODS phase out program and the importance of the GEF support for the continuation of institutional strengthening.

2.4.2 Training of technicians in refrigeration management

23. This sub-project aimed to train technicians in good servicing practices that would reduce emissions of ODS refrigerants to the atmosphere; to introduce best practices in handling new non-ODS refrigerants; to train technicians on the proper use of the recovery and recycling equipment; and to assist Azerbaijan to minimize uncontrolled emissions of CFC into atmosphere and eventually to reduce ODS consumption in the country.

24. The training centers were established and equipped with suitable equipment. The NOU Coordinator and an NOU assistant officer (both refrigeration specialists - teachers at the Technical University of Azerbaijan) prepared appropriate training modules for both service technicians and engineers. UNEP's Training Manual on "*Good Practices in Refrigeration*" was used as a resource document. This book was translated to Azeri and was given to every participant in Phase I (Train the Trainers).

25. The Phase I workshop was held in May 2000 in Baku with the participation of an international consultant, where 90 refrigeration technicians were trained. Many of them were accepted as trainers for Phase II.

26. The phase II training of the rest of the service technicians was carried out in 2000-2001 across the country. Ten training seminars were delivered for technicians performing repairs, maintenance and installation of refrigeration and air conditioning equipment. They aimed to familiarise them with the National Recovery & Recycling Programme and to explain the different methods and techniques for recovering and recycling refrigerants.

These seminars included practical demonstrations of the equipment and emphasized good practice. Ongoing training had been carried out by the larger repair and maintenance workshops that cater to the refrigeration industry. In total, 1,011 servicing technicians were trained. Since then, there have been no further training activities organized by the Ozone Office.

27. The training program proved to be successful in terms of the number of trainees, the geographical coverage and the content of the curricula. Training was not carried out after the Project finished in 2002. Since then, a great number of new technicians has entered the refrigeration servicing business who needs to be trained of new servicing practices and non-ODS alternatives. Large refrigeration companies organize team training involving suppliers of new equipment. SMEs are in a disadvantage and the Government has to take initiative. However, the ozone office does not have the capacity to organize the training on a continuing basis. The extension of the institutional strengthening funding opens the avenue to fill this gap.

2.4.3 Halon management

28. The GEF paid $135,000 of financial assistance to establish a Halon Bank and to implement halon recovery and recycling. The Fire Department was identified as being the operator of the national facility, and was allocated a 16 hectare site for the construction of the facility. The facility was designed to be operated under the guidelines that were to be developed by the Fire Department as part of the Azerbaijan Country Programme, with the assistance in the beginning from UNDP.

29. It was not possible to obtain any meaningful information on the outcomes of this sub-project. Neither the former nor the acting head of CCCO were familiar with the activities undertaken in this sub-project. The project implementation report prepared by UNDP contained very brief information indicating that "*The objective of the project was to set up a national halon product R/R centre to provide a basis by which access to halon can be made available to service and maintain fixed flooding fire protection systems and fire extinguishers*". The project was completed in June 2001.

30. The sub-project document referred to ODS estimated to remain in the sector as follows: 12 tonnes of Halon 1211, 53 tonnes of Halon 2402, in total 351 ODP-tonnes. The impact of the project was recorded as the phase-out of 3 tonnes of Halon 1211, 15 tonnes of Halon 2402, in total 100 ODP-tonnes.

31. The CCCO received information from the Caspian Sea Navigation indicating that the total quantity of fire fighting agent was 40,316 kg installed in fire suppression systems on 40 ships, including 10,885 kg of Halon 2402. The communication from the Force Major Ministry which is responsible for the Fire Fighting Service reported that no halon was used in fire fighting systems in Azerbaijan. The evaluation team was unable to verify the present situation with regard to halon use in ships.

2.5 IMPACT DRIVER III: ENTERPRISE SUSTAINABILITY

32. There were two companies that received funding to convert their production processes to non-ODS technologies: Sumgait Compressor Manufacturing Plant and Chinar Domestic Refrigerator Manufacturing Plant. Both investment projects were implemented by UNOPS/UNDP. No economic and financial viability study was conducted by the implementing agencies on these two enterprises.

2.5.1 Sumgait compressor manufacturer

33. Sumgait Compressor Manufacturing Plant (SCMP) was the only manufacturer of hermetic, refrigeration compressors in Azerbaijan. It was founded in 1972 and employed almost

1200 workers. All of the compressors manufactured by SCMP were sold in the CEITs[8]. SCMP was the major supplier of hermetic compressors for Chinar domestic refrigerator manufacturer (see below). The installed production capacity of SCMP was about 1 million compressors per year. Total annual compressor sales declined from 976,000 (1993) to 100,000 (1996) units; and sales during the first six months of 1997 were 107,800 units. The reason for decline was attributed SCMO's major clients moving to non-CFC compressors, compelling SCMP to develop their own manufacturing process based on HFC-134a and HC-600a (isobutane) technology.

34. At the time of the formulation of the project SCMP had already designed HFC-134a and HC-600a compressors itself. The plant invested $2.2 million to start trial production. UNDP and a national refrigeration expert assessed additional investment that would allow SCMP to reach the necessary quality standards and production levels that existed in 1993. The necessary capital cost items amounted to additional $2.4 million, which was provided by the GEF. The project started in March 1998 and was completed in March 2002.

35. SCMP commenced the production of non-ODS compressors. The SCMP product did not prove to be competitive on the market. The company tried to restructure its operations but it incurred debts and cash flow problems because of low sales. The manpower was reduced to 212 persons. SCMP was forced into receivership and has been under bankruptcy protection since the spring of 2007. There were several tender attempts to sell the troubled firm's assets. The plant was sealed at the time of the evaluation mission which prevented access.

36. The UNDP analysis of SCMP problems in 1996 seems not to be complete. SCMP compressors were not competitive in the past when high production volume was maintained mainly because of the state planning economy in the former Soviet Union. The quality, noise level, efficiency and reliability of SCMP product were inferior that compressors produced by Baranovichi Plant (Belarus) and Oruva (Lithuania) but end-users had been forced to buy SCMP product. When the market was opened major international brands appeared as competitors to SCMP. Additionally, migration of qualified personnel (mainly Russian) out of Azerbaijan was also a factor.

2.5.2 Chinar domestic refrigerator and freezer manufacturer

37. Chinar manufactures domestic refrigerators and freezers which used 122.4 ODP tonnes CFC - 11 as a blowing agent in the production of rigid polyurethane insulation foam for the refrigerator cabinets and doors, and CFC-12 as refrigerant. Funds of $2.9 million were requested from GEF to replace the ODS with cyclopentane and HFC 134a / HC-600a as the blowing agent and refrigerant respectively. The GEF assistance was necessary to modify the existing production lines, and to cover technology transfer, technical assistance, re-design, testing, pre-production trials and training. The annual production capacity of domestic refrigerators was assessed to be about 350,000 units with two shifts. Almost all production was sold in Azerbaijan with a small export volume to other CEITs. The project started in March 1998 and was completed in March 2002.

38. Currently, the plant is 51% State-owned. In 2008, the production in Chinar was 15,000 units. The evaluation team saw that only a portion of the heavy metal processing equipment was active. Some of refrigerator production machines were dismantled. Only two of four assembly lines were working. The management explained that the enterprise experienced serious difficulties with cash flow and could not afford to purchase raw materials and components. There were difficulties with payments for routine maintenance of imported foam equipment. About $56,000 was urgently needed to purchase essential spare parts.

[8] Azerbaijan, Russia, Ukraine, Uzbekistan, Tajikistan, Moldova and Bulgaria

39. The isobutane refrigerant line had not been fully commissioned and had remained idle for about 10 years. It is foreseen that no use for the line will continue, given the low production and problems in handling two types of refrigerant and compressors. It appears that $300,000 spent on the isobutane equipment was inappropriate. The future of the enterprise is uncertain. The company estimated that investment capital of $5.0 - 6.0 million was needed to bring the company back to full performance.

40. The UNDP decision to invest into Chinar conversion and the cost of investment was based among others on the average 1994-1996 ODS consumption of 122.4 ODP tonnes and production that was determined to be 116,849 units in the project document. The report of the 1995 TEAP Ad-Hoc Working Group on CEIT Aspects[9] indicated that "*The capacity of the (Chinar) refrigerator manufacturing is 350,000 pieces per annum. This year (1995) the factory could continue its production processes until October. Due to economic difficulties and the lack of imported raw materials, only 21,000 pieces could be produced, after which the factory had to close down*". Then, the production in 1994 and 1996 would have to be about 165,000 to come to the three year average of 116,849. It is questionable that production could be at such a variance in three consecutive years and, therefore, the claimed ODS consumption appears to be highly debatable.

2.5.3 Titan Group commercial refrigeration equipment

41. Titan Group[10] manufactures commercial refrigeration equipment, cold rooms and display cabinets. The company is also engaged in the sale and servicing of imported refrigeration equipment. Titan uses about 30 tonnes per year of polyurethane insulation foam and about 10 tonnes of R-404, R-134a, R-22 (about 3-5%). The company's foam production was initially considered as eligible for GEF funding because of its intention to discontinue the use of CFC-11 and HCFC-141b and to convert its foam production to the non-ODS blowing agent. However, the company decided to continue its production using HCFC-141b replacing CFC-11 operations and the sub-project did not materialize. At the time of the evaluation, Titan has been still using a pre-blended imported foam formulation based on HCFC-141b.

42. The refrigeration servicing department of Titan comprised 20 technicians that participated in the training and recovery/recycling of refrigerant. Titan reported that the training workshops and servicing manuals provided to them were very useful. In total, about 1,200 kg of CFC-12 were recovered and reused. However, Titan discontinued its recovery and recycling operations because their clients ceased to use CFC-12 equipment. Moreover, R-12 was still available on the market at a moderate price that undermined any recovery and recycling operations.

Summary of enterprise sustainability

43. UNDP did not undertake the financial viability tests in case of SCMP and Chinar. Its analysis of SCMP technical capability was not complete. The macro-economic conditions that prevailed in the refrigerator and compressor manufacturing industry had not been taken into account when the judgement was made to invest $2.4 million to SCMP and $2.9 million to Chinar. As a result $2.4 million is lost and $2.9 million are at risk to be lost that cumulatively represents 75% funds allocated to Azerbaijan.

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[9] Assessment of basic problems confronting CEIT in complying with the Montreal Protocol, UNEP, November 1995, Page 54

[10] http://www.worldfood.az/en/2004/oview/1711014531/

2.6 IMPACT THREATS / RISKS

2.6.1 Illegal trade

44. The evaluation team has been advised while visiting the SCC that in 2007, three mislabeled shipments of blends containing CFC-12 were intercepted by SCC. One hundred CFC-12 cylinders were seized from a ship in the Caspian Sea.[11] The detained ODS were kept in the customs warehouse as there are no destruction facilities in the country.

45. The SCC cooperated routinely with the World Customs Organisation. Recently, 10-digit codes were introduced enabling the identification of refrigerant blends. In 2007, codes were assigned to all the known new blends and MENR was advised accordingly. The NOU was not aware that new codes had been assigned, suggesting that communication is limited within MENR on ODS-related issues. In spite of control measures undertaken by the Government CFC-12 refrigerant is still available on the market.

2.6.2 Government commitment

46. The lack of government commitment has affected progress in a number of projects, which could increase the risks of non-compliance. As examples:

- The delay in adoption of legislation providing the authority to MENR to control ODS;
- The delay in providing gas identifiers to the Customs increased the risk of illegal trade;
- Absence of legislation that requires refrigeration technicians to be certified increased the risk of bad practices in refrigerant servicing and increased the risk of emissions and illegal trade;
- Lack of continuing training of refrigeration technicians on new refrigeration technologies and alternative increased the risk of unskilled technicians entering the workforce;
- The lack of a Refrigeration Association increased the risk of unskilled technicians;
- The lack of monitoring and data on the work undertaken in the recovery and recycling operations increased the risk that policies are not being adapted to combat illegal trade;
- The adoption of legislation has been delayed, such as the ratification of the Beijing Amendment which was submitted to the Cabinet of Ministers in 2008.

2.7 IMPLEMENTING AGENCIES

47. The Meeting of the Parties considered the issue of IS renewals for the Central Asian countries and Azerbaijan on several occasions in conjunction with non-compliance issues[12] [The Parties acknowledged the economic hardship in these countries and urged the GEF to accelerate its decision on funding. The GEF approved the project Continued Institutional Strengthening Support (CISS) for CEITs to meet the obligations of the Montreal Protocol for four CEITs, including Azerbaijan. The expected date of the commencement of the project was June 2007. In March 2009, discussions were still on-going between the CCCO and UNEP regarding the practical aspects of the implementation of the project.

[11] Information was provided by the State Customs Committee to the evaluation team

[12] Decision XV/51: Institutional strengthening assistance to countries with economies in transition; Decision XVII/26: Non-compliance with the Montreal Protocol by Azerbaijan, Item 4

48. The project was completed in 2002. Azerbaijan was in non-compliance since then for the next three years. It appears that the ODS phase-out targets established in UNDP/UNEP CFC recovery and recycling and training components were highly overestimated and, therefore, have not been met.

49. The implementing agencies were not proactive enough in promoting the important legislation providing the necessary authority to MENR to control ODS in the country.

2.8 IMPACT ON THE PHASE OUT OF OZONE-DEPLETING SUBSTANCES

50. The Parties noted that Azerbaijan was in non-compliance in 2001, 2002, 2003, 2004 and 2005 due to the reported consumption of CFCs and had not banned the import of halon and CFCs according to its commitment to the Parties[13]. In 2005, Azerbaijan believed that its lack of expertise impaired its ability to meet its agreed commitments. In an effort to assist Azerbaijan to meet its commitments, the Parties in 2005 were requested to halt all exports of CFCs to Azerbaijan. The Parties cautioned Azerbaijan that further action would be taken unless the country phased out CFCs by 1 January 2006.

51. The GEF finance provided Azerbaijan with assistance to promote compliance with the ODS phase out requirements of the Montreal Protocol. The Project was late being formulated and implemented in Azerbaijan as non-compliance with the Montreal Protocol persisted until 2005, some 3 years after the Project was completed. Based on consumption data reported by Azerbaijan to the Montreal Protocol, Azerbaijan was compliant with the phase out schedules for all ODS from 1 January 2006.

52. The implementation of R/R and training programs resulted in enhancement of knowledge and skills of servicing technicians and eventually in reduction of ODS emissions to the atmosphere. The management of Chinar acknowledged that without the sub-project the refrigerator manufacturer would have been forced to close as soon the supply of CFCs from the Russian Federation ended in 2000.

[13] Decision XV/28; Decision XVI/21; Decision XVII/26: Non-compliance of Azerbaijan with the Montreal Protocol.

3 BELARUS

3.1 BACKGROUND

1. Belarus declared independence from the Soviet Union in 1991. Since getting its independence, Belarus has faced challenges similar to those faced by other CIS countries: the transition from a planned to market economy, the opening of the political process, and the continued delivery of basic services in an environment of enormous change. Belarus undertook limited, yet initially sufficient reforms, in an increasingly benign external environment, achieving significant economic growth and avoiding the sharp drop in per capita incomes experienced by many of its neighbours. The country has now one of the highest income levels among CIS countries and the poverty rates among the lowest in ECA region[1].

2. In 1994, Belarus consumed 1,043 tonnes of ODS, as compared with 2,773 tonnes in 1986. Reductions during this period were attributed to the conversion of aerosol manufacturers to hydrocarbon propellants and reflected difficult and changing economic conditions. The refrigeration sector was the dominant consumer of ODS, accounting for approximately 80% of use. The solvent sector accounted for 13% of consumption, while fire protection accounted for 2%. Residual aerosol sector use, largely for medical applications, accounted for the remainder.

3. Due to the current economic situation, Belarus has not been able to meet the most accelerated phase out dates under the Copenhagen Amendment. The Parties to the Montreal Protocol endorsed the provision of the international assistance to Belarus at its 7th Meeting.[2] The Tenth Meeting of Parties recognized the plan of action and relevant benchmarks established by the Government of Belarus in its Country Program to phase-out CFCs and halons by 1 January 2000[3].

3.2 INPUTS

3.2.1 World Bank ODS Phase-out Project

4. The Global Environment Facility (GEF) provided financial assistance to Belarus. The ODS Phase out Project was prepared by the World Bank and approved by the GEF Governing Council in May 1997. The project was financed by a $6.9 million GEF grant (44%) and $8.8 million in contributions from the beneficiary enterprises (56%).The projects main objective was to assist Belarus with of ODS consumption in accordance with internationally agreed timeframes. Policy reforms in the ODS Phase out Project were limited to adoption of environment laws and treaties concerning ODS production consumption, custom controls, and adoption of rules to alter enterprise and consumer behaviour. The project was designed to help provide assistance to high consumption enterprises in Belarus to enable them to make the transition to non-ODS materials before supplies diminish. The project

[1] World Bank country brief
[2] Decision VII/17: Compliance with the Montreal Protocol by Belarus
[3] Decision VII/17: Compliance with the Montreal Protocol by Belarus

provided needed technical assistance and institutional strengthening to an Ozone Office established on July 1, 1996 in the Ministry of Natural Resources and Environmental Protection (MNREP). The project was closed in December 2000.

5. The Project was comprised of several sub-projects: 1) *Refrigeration Manufacturing Sub-project* ($4.3 million) was designed to complete a large refrigerator manufacturer (Atlant[4]) conversion to non-ODS materials. Additionally, it financed equipment and training for the enterprise's refrigeration servicing business which dominates the local market. An estimated 282 tons/year of ODS used in manufacturing and 62 tons/years from servicing requirements were targeted for phase out; 2) *Commercial Refrigeration Servicing Sub-project* ($1.5 million) was designed to support training and investment in equipment to establish a national capacity for recovering, recycling, and reclaiming refrigerants in the industrial, commercial, and transportation refrigeration servicing sector. It also provided funds to retrofit refrigeration units to operate with non-ODS materials. A national servicing network lead by the enterprise Beltorgprogress was the key executing organization. An estimated 256 tons/year consumed in servicing of ODS was targeted for phase-out. 3) *Solvent Sector Sub-Project* ($0.7 million) targeted conversion of four enterprises in the electronics and consumer products manufacturing businesses to non-ODS technologies (Belvar, Minsk Computer, Kamerton, and Tsvetotron). An estimated 15 tons/year of CFC-113 and 75 tons/year of TCA was targeted for phase out. 4) Technology Transfer and training Sub-Component in the Halon Sector ($30,000); and 5) *The Institutional Strengthening Component* ($154,000) provided support to the Government's Ozone Office in its role of carrying out the objectives of the Belarus ODS Phase out Country Program.

3.3 IMPACT DRIVER I: GOVERNMENT COMMITMENT

3.3.1 Institutional and legislative strengthening

6. An inter-agency commission for the fulfilment of provisions of the Montreal Protocol, making on environmental and formally established in 1993, that was used as a mechanism for better the coordination of the implementation of the ODS Phase out Country Program (CP). The Government has assigned the Ministry of Natural Resources and Environmental Protection (MNREP) as executing agency for the project and overall implementation of the CP. Within MNREP, project implementation responsibility has been assigned to the Ozone Office established with financial assistance through the project grant.

7. The Office was staffed by three full time personnel recruited from and paid for by MNREP, and two independent full-time local staff specializing in accounting and procurement funded under the project. As a permanent structure within the Ministry, the Ozone Office has overall responsibility for ODS matters including: 1) acting as secretariat to the Interagency Commission which oversees the CP; 2) coordinating implementation and updating the Country Program; 3) collecting and reporting ODS consumption data to the Government and international bodies; 4) monitoring and reporting on the financial performance of beneficiary enterprises; and 5) preparing legislative and regulatory initiatives such as ODS import licensing, sector specific bans Assistance under the project for the Ozone Office enabled the Government to provide a sound institutional and policy framework including finalizing and implementing ODS legislation. The country introduced licensing of activities related to ODS production, storage, industrial consumption, recycling and disposal.[5]

8. The Government has shown its commitments to the project by accepting the ODS Phase-out

[4] http://www.atlant.by/index.php?r=421&p=1112&la=e

[5] Decree of the Council of Ministers #1038, August 8, 1997

Country Program, committing funds for the operation of the Ozone Office under MNREP, and issuing a parliamentary order for a VAT and tax exemption needed for GEF grant funds.

9. As part of the Country Program development, MNREP undertook consultations with a broad spectrum of enterprises and interested parties: other ministries (including Industry, Economics, and Finance), NGOs, industry associations and others. Enterprises were given the opportunity to participate in the project as long as they could provide the necessary data for project staff to evaluate their financial viability, technological capabilities and eligibility for financial assistance.

10. The NOU ceased it operations in 2002. In interim, between 2002 and 2004, the issues related to the protection of the ozone layer and the Montreal Protocol were under supervision of the Department of Air Protection in the MNREP without distinct leadership. Since 2004, all the activities related to the control and monitoring of ODS in Belarus have been assigned to the Department of Air and Ozone Layer Protection established in MNREP. The department was staffed by four experts, including the Head of Department. The Department is closely linked with regional ecological inspectors in undertaking its control and monitoring functions. About 50% of the working load of the Department is related to control and monitoring of ODS.

11. In 2000, the Inter-Ministerial Commission on the ozone layer protection and associated issues in the refrigeration sector was created by the Decree of the Prime Minister[6]. The Commission *inter alia* drafted a law on the protection of the ozone layer. In November 2001, the State Law on the Protection of the Ozone Layer was adopted by the Parliament that ensured the fulfilment of provisions of the Montreal Protocol in Belarus[7]. The Article 8 of the Law stipulates a mandatory licensing of activities associated with the handling of ODS. The Law established requirements for mandatory training of personnel and the use of certified equipment and tools in dealing with ODS. The law established the requirements and procedure for imports and exports of ODS by assigning to the MNERP responsibilities for issuing the necessary permits. The Law recommends development of specific activities on reduction of emissions of ODS to the atmosphere.

12. The Law on the Protection of the Ozone Layer has been further advanced and reinforced through the adoption of a series of legislative instruments on: licensing procedures[8]; accounting and reporting of ODS consumption[9]; nomenclature of material and goods banned for imports to Belarus[10]; imports and exports of ODS and products containing ODS[11] ; format of reporting of recovered and reclaimed ODS[12]. The customs duties on imported ODS have been introduced by the Decree of the President of 19 April 2006[13].

13. After the completion of the GEF institutional strengthening component the Government assumed full responsibility for the continuation of the institutional support of the ODS phase-out programme in the country. The adoption of the comprehensive legislation package in the great extent was made possible because of the active NOU and the responsiveness of the Government to the needs of the Project and follow up measures. The adopted regulations laid the groundwork for the smooth implementation of industrial conversion and the refrigeration servicing sub-projects.

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6 Decision of the Prime Minister No 143p of 22 May 2000
7 Law No 56-3 of 12 November 2001 " On the Protection of the Ozone Layer"
8 Decree of the Cabinet of Ministers No 1371 of 20 October 2003
9 Decree of MNERP No 47 of 30 December 2004
10 Decree of State Customs Committee No 64 of 16 September 2005
11 Decree of MNERP No 44 of 16 September 2005
12 Decree of MNERP No 59 of 8 November 2005
13 Decree of the President No 261 of 19 April 2006

14. During the Project and since that time, the government of Belarus has maintained the appropriate level of institutional strength and ownership to address ozone layer protection issues across a range of ministries and departments. Legislation in Belarus, which was established by the initiative of the MNREP and the NOU, now even without the NOU involves different authorities, services, departments and Ministries who monitor and report on the compliance of companies with ODS legislation. The Government of Belarus is committed to undertake activities that continue to reduce ODS.

Customs and border security

15. The MNREP has been closely co-operating with the State Customs Committee (SCC). There are several legislative acts that have been jointly developed and put in place in the last several years. The most recent piece of legislation regulating imports and exports of products containing ODS was adopted by the Cabinet of Ministers in September 2008[14]. Imports of CFCs and halons, and products containing these substances are completely banned. Importers have to present permits issued by the MNREP at the customs check point. There is a system of custom duties that are proportional to the size of the ODS charge in the system (about $7.00 per kg of charge). The fine is established to be about $7,000 for the first attempt in bringing undeclared ODS. The second violation has to be considered in the criminal court.

16. While the legislative regime appears to be strong, the reinforcement at the customs check points is not. Customs check points have not been equipped with refrigerant identifiers. Neither, customs officers have been formally trained. The customs control on the border with Russia is relaxed due to the special border control regime established between these two Union States. The focus of customs officers is not on physical inspection of the shipment of ODS or ODS containing equipment but rather on checking MNREP permits, custom declarations and shipment documentation.

3.4 IMPACT DRIVER II: RECOVERY AND RECYCLING PROGRAMME

17. In the recognition of the importance of the refrigeration servicing sector in Belarus, the Project initiated training and infrastructure investments to recover, recycle, and reclaim refrigerants from the industrial, commercial and transportation refrigeration servicing sector, and provided funds for handling and retrofitting requirements associated with the substitute materials. This initiative was undertaken by a local technical institute involved in ODS Phase out Country Program implementation (BSRC "Ecology") in co-operation with the industrial refrigeration servicing organization (Beltorgprogress). Support to this sub-project, which builds servicing capacity for commercial refrigeration sector in each region was essential to ensure country-wide phase out of ODS. The sub-project was expected to eliminate 256 tons/year of ODS consumption for commercial/industrial refrigeration servicing by 1999, or approximately 86% of the total consumption for this sector.

18. Additionally, funds were provided to the Atlant Domestic Refrigerator Manufacturer to upgrade its refrigeration servicing operations which has been handling most of the country's household refrigeration servicing requirements.

3.4.1 Recovery, recycling and reclamation equipment

Beltorgprogres servicing

19. The Beltorgprogress is the branch of the Ministry of Trade responsible for servicing and maintenance of commercial refrigeration in urban areas all over the country through its regional servicing outlets. Beltorgprogress has seven regional service centres with

[14] Decree of the Cabinet of Ministers No 1397 of 23 September 2008

approximately 500 refrigeration technicians. Belcorpsojuz operates in the rural areas and it is approximately 20% of the size of Beltorgprogress. The Beltorgprogress sub-project consisted of the establishment of a scheme for Refrigerant Recovery Recycling and Reclamation (3R). This involved provision of technician training, servicing equipment, recycling and reclaim equipment, and refrigerant analyzers.

20. The company was provided with 50 recovery, 5 recycling and one reclamation machines. Currently, all equipment provided by the project is still in operational condition except 23 portable recovery machines that have reached their end of life time. The MNREP obtained information from Beltorgprogress regarding the performance of the 3R scheme. Table 5 shows the quantities of recovered and reclaimed CFC-12 and HCFC-22 refrigerant for the last 10 years. Data from Belcorpsojuz has not been made available.

Table 5: CFC-12 and HCFC-22 refrigerant recovered and reclaimed in the commercial refrigeration sector from 2000 to 2009

Year	CFC-12		Percent	HCFC-22		Percent
	Recovered	Reclaimed	Reclaimed & Recovered	Recovered	Reclaimed	Reclaimed & Recovered
2000	1,714.3	1,689.2	98.5	853.6	842.3	98.7
2001	1,226.5	1,215.3	99.1	842.5	835.2	99.1
2002	3,810.1	3,787.6	99.4	512.2	501.3	97.9
2003	2,364.4	2,354.5	99.6	284.6	276.6	97.2
2004	1,038.6	1,017.2	97.9	168.2	159.9	95.1
2005	442.8	412.3	93.1	186.3	175.2	94.0
2006	137.3	124.7	90.8	116.7	100.4	86.0
2007	8.2	7.8	95.1	30.0	24.7	82.3
2008				26.8	19.1	71.3
2009				17.3	11.8	68.2
Total	**10,742.20**	**10,608.60**	**98.8**	**3,038.20**	**2,946.50**	**97.0**

21. The annual demand in CFC-12 of Beltorgprogress was estimated to be about 70 tonnes in 1999. The original project document estimated financial viability of the recycling and recovery scheme at about 20% of the service use recycled. Table 5 demonstrates that the maximum was reached in 2002 representing about 5% of the annual demand. The Beltorgprogress indicated that the use of recovery and reclamation equipment was not especially economically attractive because of labour involved.

22. Table 5 indicates that about 98.8% of the recovered registered refrigerant has been delivered to the processing centres recycling and reclamation. The experience of refrigerant recovery operations in other CEITs shows that the significant portion of refrigerant recovered from the equipment has been reused on site by servicing personnel unless the refrigerant was contaminated and required reclamation. The refrigerant recovered and reused on site has not necessarily been registered in the books of recycling centres. Therefore, in reality the total quantities of recovered refrigerants might be higher.

23. The recovery and recycling operations stopped with CFC-12 refrigerant in 2008 indicating

that transition to non-CFC refrigerants was virtually completed in the commercial refrigeration sector. The 3R equipment has been continuously used in 2008 and 2009 for recovering and reclamation of HCFC-22 refrigerant contributing to the HCFC phase out program in the country.

Atlant domestic refrigerator manufacturer

24. Servicing of domestic refrigerators and freezers is implemented by Atlant's service department and 120 other service enterprises, all of which have a service contract with Atlant.

25. The provision of refrigerant recycling and recovery machines and toolkits to Atlant's service network to establish a recovery, recycling, and reuse (3R) scheme for the domestic refrigeration sector. Refrigerant recovery from refrigerator repair established under the project has proceeded well. From 1999 to 2008, 13,267 kg of CFC-12 were recovered in total and most of this (about 98%) was re-used by Atlant's service network. In addition, during the period from 2001 to 2007, 898 kg of HFC-134a were recovered. Atlant's refrigeration servicing networks did not purchase any new CFC-12 in 2000, and thus the recovery scheme objectives had been fully met. About 30% of the demand for refrigerant to charge repaired refrigerators had been met by recycled product. The rest was met using a Russian S-10 HCFC-blend as a substitute for CFC- 12.

3.4.2 Training of technicians in refrigerant management

26. The implementation of 3R sub-projects preceded by training of service technicians in leak detection and repair, handling of non-ODS refrigerants, retrofitting existing appliances, and methods of recovery, recycling, and reclamation of CFC-12. Servicing organizations has been supplied with necessary equipment servicing tools, such as leak detectors, acid testing kits and Approximately 1000 service technicians have been trained in servicing of ODS-free equipment. Investments related to this component covered the establishment of training facilities and for the development of a compendium for service technicians.

27. Training for servicing domestic appliances was organized and implemented by Atlant using the available training facilities. Training in the commercial refrigeration sector started with establishing the training centre. The training equipment has been transferred to the Agricultural Training Institute at Sennista (Minsk region) and has been used as a training facility to carry out refrigeration courses.

28. Since completion of the project, the centralized training has not been renewed. The existing Refrigeration Association has shown its interest in establishing the permanent training program in the country. However, these attempts have not materialized yet. The training is on-going on the-enterprise-by-enterprise basis.

29. The GEF funded 3R project in Belarus was the first implemented in the Commonwealth of Independent States (CIS) and had the significant demonstration value for similar projects in Ukraine and Russia. The objective of setting up a viable 3R scheme has been met. Over the next several years, the bulk of Belarus servicing demand has disappeared through 3R operations and the retrofit activities that this project has encouraged. The 3R scheme reduced the direct economic cost of the transition to non-ODS refrigerants to the country. The training scheme reduced indirect costs by ensuring that service technicians are trained in refrigerant retrofit techniques. Preventable system failures resulting from better servicing practices and retrofitting to non-ODS fluids have also been minimized.

3.4.3 Awareness raising

30. The NOU and MNREP focused its awareness activities on the dissemination of information on the provisions of the Montreal Protocol among professional groups primarily in the

refrigeration sector involving the Refrigeration Association. Several specific outreach and public awareness activities were undertaken by the NOU[15]. The MNREP has regularly published materials on the ozone layer and the implementation of the National ODS Phase out Program and the GEF ODS Phase- out Project in the Ecological Bulletin. MNREP published two brochures on the occasion of 20th Anniversary of the Montreal Protocol. Annually, the media covers the celebration of the International Ozone Day with assistance from the MNREP.

31. The MNREP has not made attempts to assess the impact of awareness activities on the achieved results in ODS phase-out by means of baseline surveys or attitudes and behavior, and monitoring questionnaires or otherwise. Although awareness raising may have played a part in changing the behavior of companies and individual the lack of baseline and monitoring data means it was not possible for the evaluation to assess the impact of awareness raising activities

3.4.4 Halon

32. The small technical assistance sub-component financed a national workshop of stakeholders in the fire protection sector to discuss technology options for conversion of halon-based fire protection systems. The workshop was useful and well-attended however occurred later than originally planned. One of the main conclusions of the workshop was that Belarus needs to develop a system to recover, reclaim and recycle halon. The cost of this was outside of the current project's scope and a halon recycling system has not yet been established with national funds. This was a clear gap in the project design and implementation and it has subsequently reduced the overall impact of the project.

3.5 IMPACT DRIVER III: ENTERPRISE SUSTAINABILITY

33. There were five more companies that received funding to phase out ODS in the World Bank sub-projects. The World Bank analysed the financial viability of selected enterprises in Belarus to try to ensure that funding was only provided to those that were technically viable, competitive on the market and likely to be sustainable in the longer term.

3.5.1 Atlant household refrigerator and freezer manufacturer

34. The company completed conversion from CFC-12 to HFC-134a refrigerant using its own resources prior to the GEF intervention This sub-project on Atlant Household Refrigerator and Freezer Manufacturer completed the conversion of the enterprise to non-ODS materials. The grant financed Atlant's two out of three door foaming lines conversion from CFC-11 to cyclopentane. The sub-project involved the installation of new foam insulation blowing equipment and the provision of supporting storage, production, testing and safety infrastructure. The project phased out an estimated 282 ODP tonnes/year by the end of 1999.

35. The refrigerator doors produced with ozone free chemicals have allowed the company to market their products with an ozone-friendly "green" label that are particularly important in western European markets. The improved product quality has increased the company's

[15] A booklet- *Protecting the Ozone Layer: Belarus' Viewpoint, 1997; a* video on ozone layer protection, 1997; a workshop at Atlant enterprise -*Measures Taken By Belarus To Protect The Ozone Layer,* 1998; a workshop at the Academy of Sciences on Ozone Layer Protection Problems, 1998; an informational bulletin titled, *Some Problems of Ozone Layer Protection,* V. Minchenya and N. Kryzhanovsky, 1999; an educational manual for service technicians focused on the protection of the ozone layer *Refrigerants and Oils for Refrigeration Equipment,* V. Minchenya, 2001; a consumer educational brochure *What you Should Know About Refrigerants,* V. Minchenya, N. Kiryzhanovsky and G. Chernyak, 2001; and a workshop on problems of control over ODS trade and possible solutions, 2000.

competitiveness and enabled it to increase exports to western European markets at a time when traditional CIS markets were weakening. The company is also manufacturing good quality energy efficient compressors. Recently, the enterprise has developed compressor models for refrigerators, based on iso-butane refrigerant.

3.5.2 The Minsk computer company

36. The Minsk Computer Company (MCC) used CFC-113 vapour defluxing in two facilities to clean printed circuit board (PCB) assemblies. Consumption of CFC- 113 was approximately 6 tonnes in 1994. The enterprise also used 43 tonnes of 1.1.1.trichloroethane (TCA) (or methylchloroform) annually in photoresist development in the process of producing PCB for electronic products. The sub-project at MCC involved the partial funding of a no-flux wave soldering machines to replace a process that required washing of PCBs with CFC- 113. It also financed an aqueous cleaning process to replace (TCA) used in a photoresist process; a water de-ionizer; and a wastewater treatment unit.

37. Thus MCC's use of ODS has been eliminated and the sub-project objectives were fully met. A main secondary benefit was a significant increase in product quality which improved competitiveness of the company. The elimination of the use of expensive solvents brought operating savings to the company. At the same time, an increase in energy and water treatment related operating costs partially off-set these gains. Health and safety improved with the elimination of CFC-113 and TCA vapours in the workplace. A fire hazard associated with TCA use was also eliminated. The company is still in business and remains competitive. The only downside of the conversion is that the new wave soldering machine requires an excessive load of soldering tin.

3.5.3 Tvetotron printed circuit boards

38. The sub-project in Tsvetotron eliminated the use of 32 tonnes of 1,1,1,-trichloroethane (TCA) in photoresist development in the process of producing printed circuit boards for electronic products. An alkaline development of photoresist replaced the TCA-based processes, involving investment in process design, developer equipment, installation of wastewater treatment systems equipped with filters and reverse osmosis, and upgrading of ventilation systems, and training. The company was actively involved in the modification of the wastewater treatment system.

39. The investment improved the competitiveness of Tvetotron's product, and the procurement process exposed staff to a wide range of technologies in the PCB manufacturing industry. The increased safety was a secondary benefit of the technology conversion. Workers are no longer exposed to the hazardous TCA fumes. Management and workers have increased their level of environmental awareness as a result of these improvements, and have begun a program to implement energy efficiency measures at the plan. The company has reported that the production cost of PCPs has decreased and the company still remains to be competitive in the market.

3.5.4 Kamerton electronic products

40. Kamerton[16] produces wafers for the manufacture of semiconductors, and electronic products such as watches, electronic games, and medical devices. The company used 3.2 tons CFC- 113 as a cleaning agent to remove synthetic resin-based wax, polishing slurry, and finger prints after the final polishing of the silicon wafers. This sub-project eliminated the use of CFC- 113 replacing this cleaning process by a multi-stage acid-alkaline technology using ammonia-peroxide, nitric acid and de-ionized water.

[16] 225710 Brest Region, Pinsk-city ,137 Brestskaya Str; Phone (+375) 165-34 16 01; Fax (+375) 165-34 18 84

41. Kamerton reported many secondary benefits from the ODS project. Awareness of environmental issues at the plant has increased, and some work-related health hazards reduced (elimination of CFC-113 hazardous fumes). Kamerton initiated procedures for an independent ISO 14001 certification due to the improved environmental management practices introduced in the plant by the ODS conversion investment. The quality of the finished product is fully satisfactory and has allowed the enterprise to compete on western markets. Kamerton is now part of a joint-venture with a German firm which purchases the silicon wafers as components for its electronic products

42. The sub-project resulted in incremental operating expenses because the aqueous-based cleaning system requires multiple steps and produces wastewater which must be treated before discharge. The increased water consumption has been counter-balanced by several cost reduction measures, such as reorganization of its production lines to better match market demands, and introduction of a plant-wide energy saving program. The company remains to be competitive.

3.5.5 Minsk Instrument Building Company

43. Minsk Instrument Building Company (Belvar) is an open joint stock enterprise, manufacturing a big variety of radio and electronic devices, medical and dosimeter equipment, and related systems. In 1996, Belvar employed 4920 people in its Minsk plant, down from 7000 in 1994. The sub-project eliminated the use of 6.2 tonnes of CFC- 113 in de-preservation, cleaning and degreasing of printed circuit board assemblies. CFC-113 is used to remove grease, wax, resin, micro-resin particles, and polishing slurry from the circuit boards. This system was replaced by a high volume aqueous cleaning process and low solid content fluxes through the installation of a new wave soldering line, a high volume aqueous cleaning line, a deionization system, wastewater pretreatment improvements, and drying equipment. Upgrading of plant ventilation-systems and training was also included under the sub-project.

44. This sub-project was rated satisfactory by the World Bank. The World Bank ICR reported that the phase out objective of the sub-project was fully achieved. The old ODS-related washing equipment was physically destroyed. Prospects for sustainability were determined as good. Belvar's production levels as a company are a fraction of what they once were but the enterprise showed significant improvement in 1999. Higher operating costs of the new technology, was largely offset by the higher quality products achieved. The company reported significant commercial benefits as a result of the higher quality achieved by the new equipment. Previously Belarus' two TV producers had sourced their tuners abroad, buying from Belvar only when they lacked foreign currency. Now they are sourcing all tuners from Belvar. A secondary benefit was the improvement of health and safety conditions in the workplace. With the old technology, Belvar staff were exposed to CFC-113 vapours whereas the new process uses no volatiles.

45. The management of Belvar responded to the questionnaire sent by the evaluation team. The reaction is positive regarding the quality of the equipment provided to the company under the sub-project. In its response to the question whether the installed equipment was in use, the company indicated that the de-ionizing water system is currently utilized. It is not clear whether the rest of PCB production equipment is utilized. The company pointed out that their competitiveness has not changed with introduction of equipment provided by the project

46. The current Belvar situation was in the focus of the wide media coverage in relation to the report of the State Auditing Committee (SAC). The report specified that the company is in a deep economic and financial crisis due to poor management. Low sales could not cover the expenses. The company tried to cope with huge debts by selling its assets including

valuable premises located in the centre of Minsk bur it did not work . According to the SAC report, about 90% of qualified personnel left the company in recent years. It appears that the sustainability of the company is problematic.

3.5.6 Summary of enterprises sustainability

47. The importance of the Project extends beyond the direct ODS phase out through changing the production processes at the enterprises involved. Health and safety of workers at the Atlant plant has improved by reducing CFC- 11 vapours in the door foaming workshop and at MCC, Tsvetotron, Kamerton and Belvar by eliminating CFC-113 and methyl chloroform hazardous fumes. The fire hazards have also been reduced at Tsvetotron and MCC since methyl chloroform is highly flammable.

48. Reportedly, the competitiveness of all companies (except Belvar) has improved not only because of newly introduced technologies but also through the development of procurement skills and environmental safety concerns at the enterprise level. Beneficiary enterprises were exposed to the World Bank procurement practices, and adopted Bank procurement procedures that assisted them in locating the most attractive suppliers in terms of quality and price, and further reinforced their preference for commercially based procurement practices versus central government specified procurement.

3.6 IMPLEMENTING AGENCIES

49. MNREP and enterprises involved indicated that they were mostly highly satisfied with the outcomes of the sub-projects. They considered the GEF funding as essential for achieving the phase out of the total quantity of ODS assumed in the Country Programme.

50. MNREP expressed an opinion that the duration of the institutional support was too short. This support discontinued in 2002 when the work on monitoring of enterprises and development of new legislation was very intense. The shortage of resources seriously complicated the work of the Department of Air and Ozone Layer Protection.

3.7 IMPACT THREATS / RISKS

3.7.1 Illegal trade

51. As described in Paragraphs 13 and 14, there are weaknesses in reinforcement of existing imports regulations. The weakness of the border control manifested itself in the case of confiscation of significant quantities of CFCs that have been smuggled in to the country being unidentified at the border check points. In 2003, the infringement was discovered by ecological inspectors and after hearings in the criminal court the perpetrator was sentenced to jail. It appeared that the importer had been bringing ODS illegally for quite a long time using mislabelling.

52. Since then the situation with the border security has not changed much. However, CFC-based refrigeration equipment has been mostly replaced by non-ODS equipment or retrofitted using HCFC-based servicing blends. Subsequently, the demand in CFC refrigerants has been sharply diminished. The demand in CFC-12 for servicing of the remaining refrigeration equipment has been met through well established recovery and recycling system (see Paragraphs 16 to 24) and using strategic stock of 400-500 kg of CFC-12 that is still available in the country. Therefore, the risk of illegal trade of CFC-12 is not high. The risk of illegal trade of HCFCs still exists and depends on financial implications for an importer in case of infringement in each particular case.

53. Currently, the major focus of the MNREP and the SCC is the control of HCFCs. The MNREP and the SCC are planning to organize training courses for customs officers using GEF funding under the HCFC Phase out Project.

3.7.2 Recovery, recycling, reclamation and destruction

54. Belarus has established the active recovery, recycling and reclamation system. However, the quantities of recovered and reused refrigerant fell short of established targets that lead to increased import of CFC refrigerant. Fortunately, this miscalculation did not result in non-compliance of Belarus with the Montreal Protocol.

55. The threat to impact of recovery and reclamation operations was assessed by comparing the recovered and reclaimed quantities of CFC refrigerant with the capacity of equipment provided to the country. The maximum quantity of the recovered refrigerant was 3,810 kg in 2002. With 50 recovery machines in operation, about 76 kg was handled by one machine annually. This quantity is far below the capacity of a machine. Similarly, the average annual output of reclaimed refrigerant was about 635 kg per one of six recycling and reclamation machines. This quantity was not critical for the capacity of this equipment either. One can safely conclude that there was no risk of overloading the refrigerant recovery, recycling and reclamation equipment meaning that the number of equipment and its geographical distribution was correct.

56. For the last two years, HCFC-22 was the only refrigerant handled by 3R centres. Given the smaller quantity of HCFC-22 handled in last three years, the available equipment seems to be sufficient to meet the existing requirements.

3.7.3 Halon

57. Halon continues to be used in Belarus in petrochemical industry, aviation and military. Notwithstanding that some end-users utilize recycling and reclamation equipment, the absence of centralized halon management bank creates the risk of avoidable and unavoidable emissions of halon to the atmosphere. There were no specific plans to discontinue the use of halon in the above-mentioned applications.

58. The World Bank and GEF missed the opportunity to address adequately the halon sector in Belarus. No consideration has been given to an investment proposal for the halon sub-sector.

3.7.4 Destruction

59. The MNREP encourages collection of contaminated ODS for future destruction. Destruction facilities are not available in Belarus and destruction outside has not considered because of complex transportation procedures and high cost. There is a risk of emissions of collected ODS to the atmosphere.

3.8 IMPACT ON THE PHASE OUT OF OZONE-DEPLETING SUBSTANCES

60. The project achieved its main objectives to assist Belarus with the phase out of consumption of CFCs and halons by 2000 in accordance with Decision VII/17 of the Parties to the Montreal Protocol. Assistance to high consumption enterprises in Belarus enabled them to make the transition to non-ODS materials before supplies diminish. The project also provided needed technical assistance and institutional strengthening to an Ozone Office established in the Ministry of Natural Resources and Environmental Protection (MNREP). The total 1996 CFC consumption of CFCs of 523 ODP tonnes and 24 ODP tonnes of halon were reduced to zero in 2000.

61. The recovered CFCs have been made available for servicing refrigeration and air conditioning equipment reducing the import of virgin CFC refrigerants and extending the life time of the equipment.

62. Technology conversion allowed all but one beneficiary enterprises to be competitive both in the domestic and export markets.

4 BULGARIA

4.1 BACKGROUND

1. Bulgaria was similar to other countries in Eastern Europe that experienced significant economic and social hardship when moving from a communist to a capitalist society[1]. Between 1992 and 1994 much of the land and industry were privatized, which was accompanied by high levels of unemployment for the remainder of the 1990s due to the failure of uncompetitive industries.

2. As in many of the countries that had become independent of the former Soviet Union that had ratified the Montreal Protocol, many steadily reduced imports of ODS from 1990 to 1995 in anticipation of the imminent closure of CFC and halon 2402 production in the Russian Federation. They aimed to eliminate their dependency on predominantly Russian imports by putting in place procedures that would minimise disruption to the national users of refrigeration and air conditioning equipment, when eventually the supply of ODS from Russia ceased.

3. In 1994 when the Project was being formulated, Bulgaria had acceded to the Vienna Convention and the Montreal Protocol in 1990. Later Bulgaria ratified the London, Copenhagen and Montreal Amendments in 1999; and the Beijing Amendment in 2002.

4. As a developed country that had agreed to the Montreal Protocol and its Amendments, Bulgaria was required to, *inter alia*, to phase out the Consumption of halon on 1 January 1994; and to phase out CFCs, methyl chloroform and carbon tetrachloride on 1 January 1996. Consumption of CFCs by Bulgaria was reduced from 2,612 ODP-tonnes in 1989 to 322 ODP-tonnes in 1995[2], during a period of severe economic turmoil. Despite this significant effort, Bulgaria found itself in non-compliance with the Protocol because Consumption of 5.6 ODP-tonnes[2] of Annex A (Group I and II) was reported in 1996; and 1.6 ODP-tonnes of halon in 1996 and 1997.

5. Bulgaria met twice with the Protocol's Implementation Committee to discuss its compliance status with the requirements of the Montreal Protocol. In 1995, Bulgaria notified the Committee that there was a likelihood of non-compliance in 1996. At the second meeting in 1999, the Committee noted Bulgaria's Consumption of 1.6 ODP-tonnes of CFCs in 1997, and expressed its appreciation for the work undertaken by Bulgaria that had been undertaken with the financial assistance of the GEF, and that had resulted in the development of a country programme and a phase out plan that had brought Bulgaria into compliance[3].

4.2 INPUTS

6. Three Projects provided financial assistance to Bulgaria to phase out ODS. The first was a

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[1] The first free elections since 1931 were held in June 1990. In July 1991 a new Constitution was adopted.

[2] OzSec Data Centre, data update 13 May 2009. Annex A (Group 1 CFCs)= 4 ODP-t; Annex B (Group II halons)= 1.6 ODP-t

[3] Dec VII/16 (1995) and Dec XI/24 (1999): Compliance with the Montreal Protocol by Bulgaria

GEF/UNEP-World Bank Project that targeted all ODS for phase out except methyl bromide and HCFCs. The second was a Project that aimed to reduce the use of methyl bromide. The third was a larger Regional Project to phase all uses of methyl bromide, except those used for quarantine and pre-shipment.

4.2.1 World Bank ODS Phase Out Project

7. The GEF / World Bank Project was approved on 9 November 1995 and completed on 30 April 2000, after two extensions beyond the original closing date of 31 October 1998. The GEF Grant was $9.6 million which was matched by $3.8 million from enterprises. The Project aimed to phase out 392 ODP-tonnes of ODS, with the remaining 45 ODP-tonnes to be eliminated by smaller companies that were not part of the Project. ooo

8. The objectives of the Project were to assist Bulgaria to transition to non-ODS technology by providing financial support to:

    1) Assist six[4] enterprises identified in the Country Programme to eliminate ODS;
    2) Initiate ODS recovery, reclamation and recycling operations; and
    3) Strengthen the government institutional capacity.
    4) There was no sub-project to phase out the Consumption of 16 ODP-tonnes of halon, even though this Consumption was reported by Bulgaria in 1992.

4.2.2 UNDP/UNEP Projects on the phase out of methyl bromide

9. A GEF/UNEP Project "Initiating early phase out of methyl bromide in CEITs through awareness raising, policy development and demonstration/training activities" that was designed to assist seven CEITs to reduce their use of methyl bromide[5]. The Project commenced in March 2000 and concluded in September 2002. The total budget was $806,195 consisting of $700,000 from GEF, $37,000 in kind from the government, and $106,195 from Canada.

10. The UNDP/UNEP Regional Project commenced in May 2004 and was completed in Bulgaria on 30 June 2008, after one extension beyond the original closing date of 31 December 2007. Bulgaria was budgeted GEF funds of $727,522 which consisted of $177,526 for non-investment and $549,996 for investment activities. The government of Bulgaria co-financed some of the activities related to Project coordination. The objectives of the project were to phase out the use of methyl bromide for all uses except quarantine and pre-shipment by 1 January 2005, in accordance with the Copenhagen Amendment of the Montreal Protocol relevant to developed countries.

4.3 IMPACT DRIVER I: GOVERNMENT COMMITMENT

4.3.1 World Bank ODS Phase Out Project

Institutional and legislative strengthening

11. The Country Programme, which included key policy actions and identified priority investments, received wide support from Government departments such as MoEW and Customs, as well as enterprises and an NGO. The ODS phase out was a core government objective in Bulgaria's environment strategy.

12. The Government formed an Ozone Task Force within the Ministry of Environment and Water (MoEW) to implement, manage and monitor the GEF Project. The OTF became more effective after it was re-structured in June 1997, resulting in 77% of the funds being

[4] There were originally 7 companies considered for funding but 2 were later determined as ineligible, and the funds were used to assist another company to phase out ODS.

[5] GF/4040-00-10 for CEITs Bulgaria, Estonia, Hungary, Latvia, Lithuania, Poland and Slovakia

disbursed between 1 July 1998 and 30 June 1999. The Global Atmospheric Department in the MoEW currently has three staff involved in the control of ODS and fluorinated gases, two of which were involved in the Regional Project on the phase out of methyl bromide.

13. From 1992 and 1994, the National Assembly defined a national programme for ending the use of ODS in Bulgaria, which was later transposed in legislation. This legislation, which is summarised in Table 6:

    1) Established a licensing system on the import of ODS and ODS-containing equipment, including those used in pharmaceutical products (1994);
    2) Banned imports of CFCs (1996);
    3) Implemented penalties for deliberate venting of CFCs (1996);
    4) Introduced fees for importing HCFCs and methyl bromide (1996);
    5) Set import quotas for HCFCs, and required imported quantities to be reported (1996);
    6) Set deadlines for ending the trade and use of HCFCs (1996);
    7) Required recovery and recycling of CFC-12 for servicing (1996).
    8) Improved the ODS import/export licensing system (1999).

14. Bulgaria harmonised its national legislation several years in advance of adopting EC legislation on the phase out of ozone-depleting substances when it acceded to the EU on 1 January 2007.

Table 6: Legislation on ozone-depleting substances in Bulgaria

Year	Number	Description
1994	Decree No. 307	Regime on the export and import of ODS
1995	Decree No. 266	Amendment of the regime on the export and import of ODS
1996	Ordinance No. 3	Terms and conditions for permitting the Import and Export of ODS
		Clean Air Act (ODS addition)
1999	Decree No. 254	Control and Management of Ozone Depleting Substances
2002	Decree No. 224	Amendment to the Control and Management of ODS
2007	Decree No. 28	Amendment to the Control and Management of ODS
2008		Amendment to the Control and Management of Substances that Deplete the Ozone Layer
2009	Decree No. 336	Adoption of the Ordinance for establishing implementing measures of Regulation (EC) No. 842/2006 on certain F-gases
2009	*State Gaz No 6*	Clean Air Act (F-gases addition)

15. The GEF funding for the institutional strengthening component of the Project was reported by the NOU to have been crucially important for resourcing activities that contributed toward the development of the legislation and for putting in place procedures to permit, track and record ODS. The funding assisted Bulgaria to train experts from MoEW on how to manage donor projects. The funding for these activities was especially important at the time when Bulgaria was in economic crisis, as many banks went bankrupt and inflation was rampant.

16. This legislation was well time and broad based. It targeted many different aspects of controlling ODS, but in particular licensing, bans on imports, and importer-pay fees. The legislation on penalties for deliberate venting of CFCs was the forerunner to later legislation that mandated recovery and recycling of ODS. Some of this legislation was

implemented *before* the start of the GEF Project, which gave sub-project implementation a 'flying start'. Legislation continued to be put in place as recently as 2009, which indicated the government's commitment to environmental protection including the climate system and the ozone layer.

Customs and border security

17. The Project paid for 20 refrigerant identifiers for Customs officers and 18 for the Regional Inspectorate. The distribution to both organisations was evidence of the cooperative approach pursued by Customs and the MoEW on a range of activities, including ODS interceptions and training in the detection of ODS.

18. The First and Second phases of the customs training were undertaken just after the Project ended in 2000, which resulted in 120 customs officers being trained. The first phase of the training covered theory and practice, and the second phase focused on the practical aspects such as the use of the refrigerant identifiers. Later in February 2007, a further 15 Customs officers 18 environmental inspectors were trained in a one-day workshop with finance provided by the Customs Agency and the Technical Assistance and Information Exchange Programme (TAIEX).

19. The customs officers checked the import documents and, if these were not in order, they used the Refrigerant Identifiers to check the type of refrigerant. The customs department reported every March to the MoEW on the quantities of ODS imported and exported by type. To date there have been no interceptions of ODS that have resulted in legal action. Bulgaria has a policy of returning any illegal imports of equipment or refrigerant to the country of origin.

20. Bulgaria has put in place satisfactory measures to combat illegal trade in ODS. The Customs agency undertook both administrative and physical inspections of imported ODS, provided regular reports to MoEW on the results of their inspections, and the training of Customs officers has continued since the Project was completed in 2000.

4.3.2 Phase out of methyl bromide

GEF/UNEP Project

21. The GEF/UNEP Project[6] "Initiating early phase out of methyl bromide in CEITs through awareness raising, policy development and demonstration/training activities" aimed to assist Bulgaria to comply with the phase out deadline for methyl bromide of 1 January 2005. In 1999 just prior to the start of the Project, Bulgaria reported a Consumption of 36 ODP-tonnes.

22. The project consisted mainly of awareness raising activities on the uses of methyl bromide and its alternatives, policy development for methyl bromide phase out, identification of alternatives, diffusion of demonstration results, adoption of alternatives, and implementation of national programmes. Workshops were held in Hungary (23-25 April 2001, soil uses) and Bulgaria (28-30 May 2002, postharvest uses).

23. Bulgaria reported that this Project was assisted in the completion of a range of activities, including the publication by the NOU in both English and Bulgarian of a booklet entitled "*Without MB –but how?*", which was based on material translated from UNEP publications; publication of methyl bromide Consumption figures and presentations from the national awareness meeting held in Plovdiv (2001); and a video on the topic of methyl bromide and radio commentary were broadcast. The Extension Service provided seminars on

[6] GF/4040-00-10. Prof Reuben Ausher Review reported in October 2003.

alternatives to methyl bromide in grapes and vegetable production. Bulgaria surveyed the rural population to determine their awareness of the need to phase out methyl bromide. In regard to alternatives, Bulgaria's involvement in the project encouraged the expansion of solarisation for the control of soil pests, which it had initiated in 1999.

24. In 2002, Bulgaria implemented legislation[7] that banned methyl bromide from the market after 31 December 2003 and its use after 31 December 2004, except for quarantine and pre-shipment and critical uses. Methyl bromide applicators were required to be licensed and to minimize any emissions of methyl bromide. A 50 meter buffer zone was required between fumigated fields and any housing.

UNDP/UNEP Regional Project

25. In the Regional Project to phase out methyl bromide, the implementation of the Project was coordinated by a senior representative from the MoEW. The Maritsa Vegetable Crops Research Institute, Agricultural University of Plovdiv, Institute for plant protection of Kostinbrod, the National Plant Protection Service and its Regional Plant Protection Services, together with several companies involved in soil and postharvest activities, were the main organisations that were involved in the programme.

26. The major challenges that the MoEW faced at the beginning of the Project was to achieve sufficient administrative capacity to be able to direct the Project competently, to cope with unknown and sometimes changing procedures and methods of work involving the implementing agencies, and to overcome the scepticism towards methyl bromide alternatives expressed by both the fumigators and the farmers that depended on their services. At the end of the Project, the major challenge for the MoEW was to find a fair way to distribute the equipment.

27. The programme coordinator organised regular meetings of the NSC with the stakeholders to obtain feedback on progress in the various activities. The MoEW coordinated the activities between the Implementing Agencies, the companies and the organisations and institutes that were involved in the implementation of the alternatives. The feedback on the project continued for two years after its completion, in compliance with the requirement for the beneficiaries of the equipment to send a report every 6 months to the Regional Service for Plant Protection in Plovdiv.

28. When some activities were delayed, MoEW identified the cause of the delay and suggested solutions. When UNDP was involved on some occasions the intervention was successful, but on other occasions the MoEW regretted that it was not always able to solve a fundamental communication problem that seemed to be between the Bratislava and Sofia offices of UNDP.

29. Training of farmers and postharvest specialists on the alternatives to methyl bromide was a major part of the Project. It began with the "Train-the-Trainers" programme, which focused on the chemical and non-chemical alternatives that could be used to control the most serious pests and diseases that affect vegetable production. A manual[8] on how to use alternatives to methyl was prepared and distributed to farmers. There were lectures and demonstrations, including a visit to glasshouses to see first-hand how to safely apply the pesticides and the use of solarisation sheets. There was farmer training on the use of the Dositron soil injection equipment that was used in the glasshouses and tunnel houses to release dazomet into the irrigation system. Staff from Yandi and Fitozashtita companies,

[7] Regulation 224. 2002.

[8] "The introduction of the most important pests on greenhouse vegetables and their control using methyl bromide alternatives"

who received rotary spaders from Imants in the Netherlands (one for granules, one for liquid), were trained by Imants specialists on the use of the soil fumigation equipment.

30. Most of the participants in the workshops and seminars on alternatives to methyl bromide reported that they were satisfied by the information provided in the field schools, workshops, conferences, publications, practical training and consultations. Moreover, they were confident in the application of the alternatives after the training. Solarisation combined with *Trichoderma* was reported to be used on the greatest area for soil disinfestation. Basamid and Nemasol were the most frequently applied chemical treatments, but to a smaller area than solarisation.

31. In the postharvest sector, the Institute for Plant Protection in Kostinbrod and the University of Forestry of Sofia organized the training of 15 technologists, 20 end-users (owners of storages for grain and plant products) and 29 student technologists. The trainees were satisfied with the consultants chosen by UNDP/UNEP and the materials that provided information on alternatives.

32. The stakeholders were generally satisfied with the outcomes of the Project. However, they said they would have benefited from the advice of a committee that could have been established at the start of the Project to determine the most appropriate pest control equipment and technologies available. They envisaged that if a Committee had been established it could have undertaken a study tour to 2 or 3 countries to view equipment and procedures, and then to report back to the stakeholders. This might have avoided procurement of the rotary spader equipment, which was now considered too slow for the larger properties.

33. Despite the administrative difficulties experienced by MoEW, it successfully coordinated the work of the organisations to deliver information on a range of suitable alternatives to the stakeholders. The combination of lectures and hands-on activities expedited the widespread use of alternatives by farmers and the subsequent reduction in the use of methyl bromide.

4.4 IMPACT DRIVER II: RECOVERY AND RECYCLING PROGRAMME

4.4.1 World Bank ODS Phase Out Project

34. This programme aimed to recover, recycle and reclaim as much refrigerant as possible during the transition period between CFCs and CFC-free technology, at a time when the importation of CFCs was banned in Bulgaria. Therefore, the only available CFC refrigerant to service existing equipment was obtained from the CFCs in the market that were recovered, recycled and reclaimed ('3R'). This programme consisted of two parts:

- Training of technicians in refrigeration management; and
- Distribution of equipment for ODS recovery, recycling and reclamation activities.

Training of technicians in refrigerant management

35. The Institute for Refrigeration and Air Conditioning (IRAC) delivered week-long training courses to 1,200 trainees between 1998 to 2000 on all aspects of refrigerant handling, including the efficient and environmentally-safe recovery of ODS. A total of 1,500 technicians have been trained. There were no training courses delivered from 2000 to 2006. Apart from IRAC, companies could be affiliated to other organisations that provided them with information on heating, ventilation, refrigeration and air conditioning equipment, such as the Bulgarian Branch Chamber and the National Installation Union.

36. In the past 2 years, training courses have recommenced on ODS and F-gas refrigerants[9], which so far have trained about 500 technicians. The trainees themselves paid for the courses or their companies, which was evidence that the courses had value and that the programme was sustainable. The F-gas requirements are now the driver for training rather than ODS, which was the driver in the past. The syllabus[10] follows closely that prescribed by EC legislation[11], and is delivered in 2-4 days depending on the training centre. The trainee themselves or the company paid for the training. The certificate is valid for 5 years and renewable by taking an update of the training course.

37. We therefore assessed the training component as both sustainable and important for ensuring the technicians were qualified to repair and maintain equipment containing ODS, which was supported by national legislation. Bulgaria put in place legislation that permitted only certified technicians to work on equipment that contained ODS or F-gases. This legislation discouraged unqualified technicians that want to work on F-gases or ODS, as they penalised when apprehended. The work on ODS has expanded to include F-gases, which will also benefit the work on ODS since air conditioning and refrigeration equipment operates on both F-gas and ODS-refrigerants. In this regard, Bulgaria planned to have legislation in force by 4 July 2009 that required specialised training for technicians that worked with F-gases.

Recovery, recycling and reclamation equipment

38. The project financed 2 reclamation machines (Sofia and Varna), 30 recovery and recycling machines and 1,000 recovery machines (Figure 2), and 32 refrigerant identifiers[12]. The number of recovery machines is more than in any of the CEIT countries surveyed because IRAC provided a team of technicians to assemble 20-30 units per week from component parts, which was less expensive than purchasing the completed units from a supplier. The Institute estimated that about 70-75% of the recovery machines, and two of the recovery and recycling machines, were still operational in Bulgaria. This underscored the continued value of this equipment to the service personnel, and that the machines were still having a sustainable impact in reducing ODS almost 10y after the Project was completed.

Figure 2: Equipment for recovery of ozone-depleting substances. Institute for Refrigeration and Air Conditioning, Sofia, Bulgaria.

39. Companies that imported ODS were required to apply to MoEW for a quota, and to report quantities imported to the MoEW the following year. The regional inspectorates of MoEW

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[9] Regulation (EC) No 303/2008 of 2 April 2008 establishing, pursuant to Regulation (EC) No 842/2006 of the European Parliament and of the Council, minimum requirements and the conditions for mutual recognition for the certification of companies and personnel as regards stationary refrigeration, air conditioning and heat pump equipment containing certain fluorinated greenhouse gases

[10] Theory: Historical development of refrigeration, Thermodynamics, Impact of refrigerants on the environment, Leak checks, Safe handling practices, and compressors. Practical: Installation checks, leak testing, portable measuring instruments, pipe connections that avoid emissions, refrigerant charging, compressor operations, electronic controls.

[11] Annex to Commission Regulation (EC) No 303/2008 on the qualification requirements for working with F-gases.

[12] 70 identifiers in total which were distributed as follows: 32 to the operators of the recycling and the reclaim installations; 20 to the customs officers (since the import/export in Bulgaria is at 20 customs check points only); 18 to the Regional Inspectorates of Environment and Water to the MOEW

were required to report every March on the quantity of ODS imported, exported, recycled and used. The Customs also report on the quantities of ODS imported by type. Data supplied to the MoEW from multiple sources permitted the NOU to cross check that the reports on ODS from the different entities were reasonably accurate.

40. The quantities of CFCs, HCFCs and HFCs recovered and recycled from 2001 to 2008 are shown in Table 7. Recovery of CFCs remained relatively low during this period, which indicated that the equipment that operated on CFCs had already become rare, unlike HCFCs which were recovered in greater amounts because of the predominance of HCFC equipment. The quantity of HCFCs continued to increase over the period, along with HFCs.

Table 7: Quantity (kg) of CFCs, HCFCs and HFCs recovered each year from 2001

Substance	2001	2002	2003	2004	2005	2006	2007	2008
CFCs	230	-	70	145	750	0	0	0
HCFCs	40	30	510	750	900	1,050	1,310	1,510
HFCs	0	0	0	0	100	200	250	315

41. There were also two machines paid by the Project that were used to certify compressors, on average two new compressor designs per year for the last 5 years. The reclamation units (Figure 3) were capable of reclaiming about 300 kg of HCFCs each, and were expected to be fully utilised from 2010 to 2015 when only recycled HCFCs can be used to re-fill refrigeration and air conditioning equipment in the EU. One of the reclamation machines was still operational. The NOU reported that recently the recovery and recycling of HCFCs in particular, and refrigerants in general, has been encouraged by the increase in the cost of new refrigerants compared to recycled ones[13].

Figure 3: ODS reclamation equipment. Institute for Refrigeration and Air Conditioning, Sofia, Bulgaria.

42. There NOU reported that there were no ODS destruction facilities in Bulgaria, and that as a result recovered ODS that could not be recycled would have to be sent for destruction to other EU countries such as Germany). The MoEW has identified a company in Bulgaria that would be suitable for the work, but the company has yet to receive the appropriate licence from the Government for expanding its activity to include ODS. So far none has been sent as there is no company licensed under the Waste legislation. However, recent increases in the cost of transport make ODS destruction too costly. As a result, the potential for emitting recovered ODS has increased. Companies with large quantities of installed CFCs in commercial RAC equipment are aware of the penalty for 'accidental release' and are waiting for an environmentally friendly solution to be developed.

43. There were no reports of recovered substances earlier than 2001 during the period of the Project, despite the legislative requirement for CFCs to be recovered and recycled. This prevented an assessment of the benefit of the servicing component. However, the impact of the programme was assessed to be sustainable as a large proportion of the equipment

[13] New refrigerant is about 12 BGN/kg whereas recycled is 2-3 BGN/kg

used in the Project to recover and recycle ODS was still in use. Reports supplied the MoEW in each year for the past 8 years showed the valuable contribution of recovered and recycled ODS for servicing existing equipment.

Awareness raising

44. An NGO called "*Borrowed Nature*" carried out a 6-month public awareness programme on the importance of phasing-out ODS to protect the ozone layer. This programme helped to strengthen the project's sustainability by fostering a wider public awareness on the importance of ODS phaseout and the measures taken in Bulgaria for the phase-out. In large gatherings and in public events, the NGO provided information that highlighted the need to protect the earth's ozone layer. Short movies, including interviews with experts and Government officials, were shown on television. Press conferences and media workshops highlighted the need to protect the ozone layer. There was special emphasis on informing the young and a drawing competition was held for children. Seminars were held in 25 cities with representatives of industry, the media, Government institutions to explain national programmes, policies and future measures on the phase-out and management of ODS.

45. After the completion of the Project, MoEW has been involved in Awareness Raising activities when funds were sufficient. The last big campaign in 2004 celebrated the International Ozone Day. Currently, the MoEW's activities related to making the legislative requirements more popular among stakeholders through workshops, publications in the national newspapers, and radio interviews. Key topics depended on the target audience: For schools, the MoEW stressed the importance of preserving the ozone layer and protecting themselves against harmful UV-B rays. For operators and servicing companies, the MoEW organised each year seminars for companies and operators to describe their obligations under the current ODS and F-gas legislation, and legislation under consideration for the future.

46. As in many other countries, Bulgaria undertook activities on Awareness Raising to shore up support from the public, government and business stakeholders for legislation and activities that would restrict and eventually phase out ODS. A baseline and performance indicators to measure the benefits of ODS reduction as a result of the awareness programme were never developed. These could have been, for example, before and after data on the number of ODS-free refrigerators bought by the general public, an increase in ODS refrigerators being sent for recycling, demand for information on the website (as number of hits) on ODS-free alternatives. It was therefore impossible to evaluate the impact of the awareness programme.

47. In terms of government commitment, Bulgaria had put in place a range for activities to manage the phase out of ODS. Among these, it had established an effective and sustainable administrative structure for monitoring the import and use of ODS by companies. Since 2001 the MoEW had received reports from its inspectorate and from Customs on these imports, as well as information from companies involved in the 3R programme. The government had trained technicians since the project ended, and was about to embark on further training on refrigerants, which will benefit the ODS programme, in response to the qualification requirements in the F-gas regulation. The government was well aware that illegal trade could undermine the work to date, but it has in place legislation to support customs officers in their work and to penalise those that are caught illegally importing ODS.

4.5 IMPACT DRIVER III: ENTERPRISE SUSTAINABILITY

4.5.1 World Bank ODS Phase Out Project

48. There were six companies that received GEF financial assistance to phase out ODS in Bulgaria in the *UNDP/UNEP ODS Phase Out Project*: Coolstar (later Lucky Polyus, refrigerated display cabinets); MRAZ (domestic refrigerator production); Frigo (domestic refrigerator production); Brist (refrigerated display cabinets); Klima Inkom (refrigerated display cabinets); and VMZ (ball bearing manufacturer). The World Bank analysed the financial viability of these enterprises in Bulgaria to try to ensure that funding was only provided to those that were technically viable, competitive on the market and likely to be sustainable in the longer term.

49. There were two companies that received GEF financial assistance in the *UNDP/UNEP Regional Project on the phase out of methyl bromide Project* to phase out methyl bromide used for disinfesting soil: Yandi and Fitozashtita. In the pre-harvest sector, Swingfogs[14] were distributed to some greenhouses, the Agricultural University, the Crops Vegetable Institute "Maritsa" in Plovdiv and the Institute for Plant Protection in Kostinbrod. The Crops Vegetable Institute "Maritsa" also received a drip irrigation system. In the postharvest sector, there were 11 companies that received GEF financial assistance for equipment in the postharvest sector: Agria Plovdiv, Brothers Pilevi, Petromel, Socotab, Unipest Control, Nibo, Atanas Kostov & son, Teza 97, BulAgro Control, Yandi and Fitozashtita.

Coolstar commercial display cabinets

50. Cool Star, manufacturer of refrigerated commercial display cabinets, purchased Lucky Polyus which was financed in the GEF Project. The GEF paid $536,642 for the replacement of 27 ODP-tonnes of CFC-11 and CFC-12 with HCFC-141b and HFC-134a respectively. The company later replaced the use of HCFC-141b with polyol/isocyanate in the production of the insulation (Figure 4). CoolStar was not able to provide information on the number of new units produced from 1995 to 1998, as the factory used the CFC-11 and CFC-12 to produce new units and to refurbish used display cabinets. The production from 1999 was only new units.

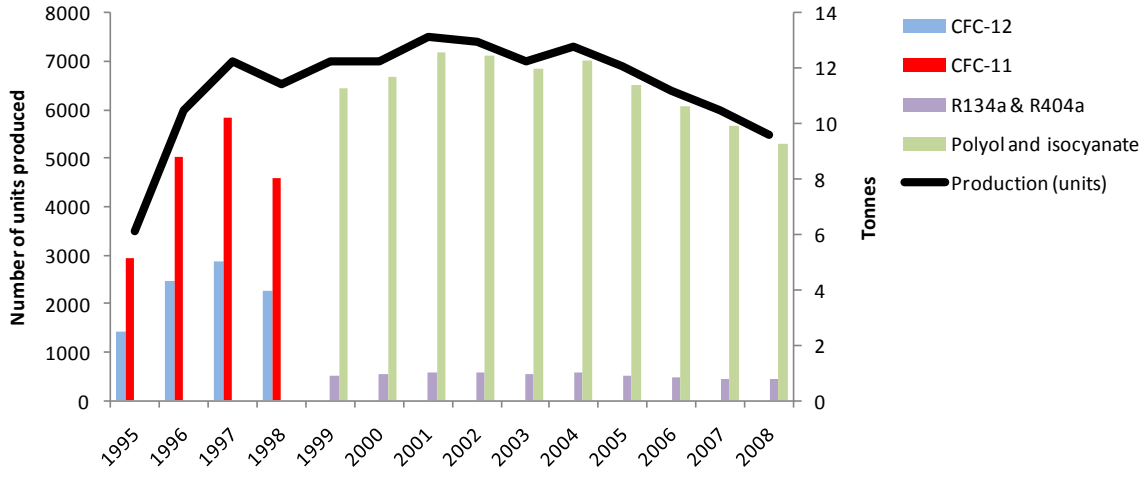

Figure 4: Number of refrigerated commercial display units produced by CoolStar/Lucky Polyus using CFC-12, R134a or R404a in the circuit, and CFC-11 or polyol/isothiocyanate in the insulation

51. Cool Star said the Project finance improved product quality as the performance was

[14] SN PE (Greens, Philipov I.S. LTD, "GNC" LTD)

improved as energy Consumption was 20% lower than before the Project. In addition, the number of models increased. The GEF funding improved the marketing opportunities for the company. Cool Star is operating a 4h shift at present because of the economic crisis. The company reported that it has participated in a number of EC-funded projects, and that the GEF project was the best organised and had the best procedures. The administrative reporting was the least of all the programmes, and the installation of the equipment was much faster than had been anticipated.

MRAZ SA domestic refrigerators

52. MRAZ S.A. was a domestic refrigerator producing company that was among the first refrigeration appliance manufacturers in Eastern Europe to introduce CFC-free technology in the production of domestic appliances. In 1999, the GEF paid $3,337,655 for the replacement of 14 ODP-tonnes of CFC-12 with HFC-134a in domestic refrigerators; the replacement of 44 ODP-tonnes of CFC-11 by cyclopentane in insulation foam; and the replacement of 70 ODP-tonnes of CFC-12 and R502 by HFC-134a and R404a in the compressor and condensing units.

53. MRAZ reported that prior to 2002, they produced 80,000 compressors and condensing units and 100,000 refrigerators per year. The company was satisfied with the procurement process. However, production ceased in 2005 or 2006 and today the production facility is being converted into an office and shopping complex. MRAZ reported that the equipment provided by the GEF resulted in the refrigerators no longer being competitive on the European market, as the Project did not pay for any incremental operating costs, which was reported as one of the reasons for the company's demise. One of the foam machines was sold, the other remains installed in the factory unused together with automatic filling and leak testing equipment.

54. Although financial viability analyses of the companies were undertaken by the Bank during project formulation, and indeed the Project was suspended until privatisation had been completed in the companies, it would be difficult to include in the initial analyses the possibility of the factory site being converted to a more profitable shopping and business complex.

Frigo SA domestic refrigerators

55. Frigo SA is a domestic refrigerator manufacture. The GEF paid $1,075,786 for the replacement of 5 ODP-tonnes of CFC-12 with HFC-134a, and 12t of CFC-11 with cyclopentane for insulation foam. The finance provided to the company was reported to be important for local employment and to enhance competitiveness. Prior to 2003, 80% of the products were sold in Bulgaria (the remainder in the Czech Rep., Russia and Cuba). Frigo SA has not been in operation since January 2009 due to the economic crisis, and therefore the company was not able to provide information on refrigerator production.

Brist commercial display cabinets

56. Brist manufactures display cabinets for shops and restaurants. The GEF paid $2,046,205 for the replacement of 3 ODP-tonnes of CFC-12 with HFC-134a as refrigerant in commercial refrigerators, and the replacement of 7 ODP-tonnes of CFC-11 with cyclopentane for insulation foam. The website acknowledged the assistance of the GEF finance which, *inter alia*, paid for Cannon foaming and Galileo gas injection equipment. The replacement of ODS with non-ODS in the manufacture of refrigerated display cabinets is shown in Figure 5 on the following page.

57. Although there was a decline in production from 1993 to 2001, production increased after this time and averaged about 650 refrigerators and freezers since 2001. Suppliers such as ACC-Spain (compressors) and EVCO-Italy (thermo-regulators) increased their business with

Brist as a result of the GEF funding. Export sales to Russia and Macedonia increased by 15% as a result of the Project. The financial stability of the company was improved, and employment has steadily increased. However, sales on the local market were reduced, as according to Brist the Government allowed the imports of used refrigerators[15], which undercut their market for new refrigerators.

Klima Inkom commercial display cabinets

58. Klima Inkom is a manufacturer of refrigerated commercial display equipment. The GEF paid $1,011,559 for the replacement of 8 ODP-tonnes of CFC-12 with HFC-134a in the compressor, and 11 ODP-tonnes of CFC-11 in the insulation with cyclopentane. Although the Project had been completed and the company was currently operational, the company declined to provide information as a claim for financial reimbursement of costs was ongoing with the MoEW for activities that were undertaken during the Project that it claimed had not been paid by MoEW.

VMZ ball bearings

59. VMZ Ball Bearings was acquired by SKF Bearings – Bulgaria in 2002[16]. The GEF paid $649,354 for the replacement of 50 ODP-tonnes of CFC-113 and methyl chloroform with aqueous or chlorinated solvents in the cleaning operations of the ball bearings. The new owner of the company was not aware of the GEF Project and was unable to provide any information.

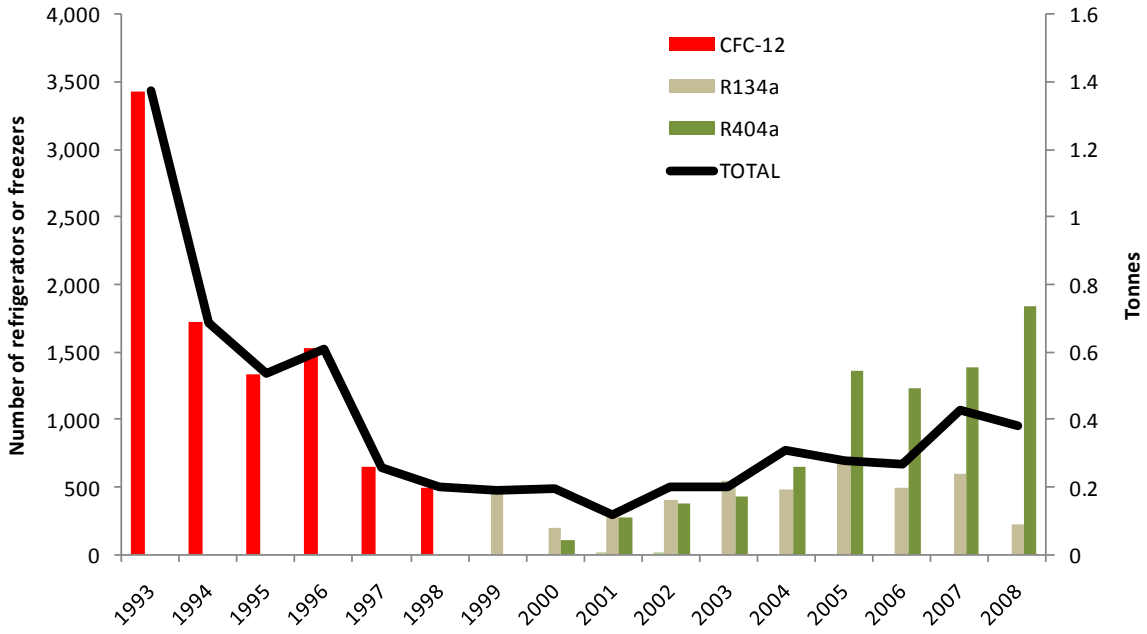

Figure 5: Number of refrigerated commercial display units produced by Brist from 1993 to 2008 using CFC-12, R134a or R404a in the compressor

4.5.2 UNDP/UNEP Regional Project on the phase out of methyl bromide

Yandi and Fitozashtita agricultural supply and service companies

[15] MoEW said the imports were banned at the time, so they may have been illegal imports.

[16] Press release. 15 Sep 2004. Vazovski Mashinostroitel ni Zavodi (VMZ) was now named SKF Bearings Bulgaria EOOD. It was acquired in early 2002 from the Bulgarian Privatization Agency

60. Yandi and Fitozashtita companies both received two rotary spaders (Figure 6) for the application to the soil of metam-sodium or dazomet in glasshouses or plastic tunnels in different regions of Bulgaria. They reported that the work for the machines was generally increasing. They also provided general advice on pest and disease control to the farmers, and this had the potential to increase further.

Figure 6: Rotary spaders for injecting nematocide in soil. Yandi company, Bulgaria.

61. In general, the farmers that owned larger glasshouses (more than 1 Ha) used a combination of solarisation and hydroponic production. They used solarisation with chemical disinfestation to reduce the time for soil disinfestation to about 2 weeks (depending on the temperature), as this was commercially acceptable. Without solarisation, the period extended to one month which was not satisfactory.

62. In the postharvest area, Agria Plovdiv, Brothers Pilevi, Petromel and Socotab received a range of postharvest equipment for heat treatment of mills, for pesticide fogging of mills and storage areas, for IPM insect trapping and monitoring operations, and for phosphine fumigation and monitoring.

63. The equipment included heaters for heat treatments, vacuum cleaners and general cleaning equipment, sprayers, foggers (Figure 7), rodent traps and bait stations, insect monitoring traps and lures, phosphine generating equipment (Speedboxes™, Figure 8), phosphine insect-resistance testing kits, safety equipment such as masks, gas detectors and fumigant measuring equipment. The equipment was currently stored by 5 enterprises. Most of equipment had yet to be used commercially because the companies had not been transferred to them by UNDP[17].

Figure 7: Fogging machine that releases pesticide in flour mills. Yandi company, Bulgaria.

Figure 8: Speedbox for releasing. phosphine pesticide in flour mills. PNOS company, Buglaria.

64. Phosphine generated from the speedboxes has yet to be authorised by the Pesticide Department in Bulgaria. Bulgaria is intending to use the Mutual Recognition Procedure operating between Member States in the EU. However, the European Food Safety Authority Review recently identified data deficiencies, which will extend the period for approval.

Enterprise Summary

65. Two of the 6 companies in the GEF / World

[17] The following equipment was used: 4 Thermonox heaters by Agria AD; 6 vacuum cleaners by Brothers Pilevi, Petromel and Socotab; 12 insecticide fogging machines. The insect traps, pheromone lures, safety materials and cleaning equipment were distributed to the companies

Bank Project, whose ODS elimination accounted for about 10% of the total ODS targeted in the investment sub-projects, showed that the financial assistance increased the number of models they produced, increased marketing opportunities and/or increased sales. There were no reports from three companies. One company reported that it went bankrupt and the site that it occupied was being converted into a shopping complex. The fate of the equipment that was financed with Project funds in the companies that did not report or went bankrupt could not be ascertained.

66. The companies in the UNDP/UNEP project also had mixed success. In general, the soil fumigation companies were looking at the prospects of more work as the area for soil disinfestation expanded. However, the impact of the finance on the postharvest fumigation companies could not be assessed as these companies have not yet used most of the equipment that was delivered because it had not been transferred to them by UNDP.

4.6 IMPLEMENTING AGENCIES

4.6.1 World Bank ODS Phase Out Project

67. Elimination of about 16 ODP-tonnes of halon was not included. The Consumption of halon appeared to be a greater problem than Consumption of CFCs (4 ODP-tonnes) since the CFC Consumption was for only one year (1996) whereas the halon Consumption extended for 4 years after the phase out. The omission of halon by the World Bank in the formulation of the Project appears to be an oversight.

68. The termination of the Project was delayed for several reasons:

5) The World Bank and the government agreed to suspend funding of companies until privatisation was complete, which was occurring at a time of a 30% decline in GDP between 1989 and 1996;
6) A new local financial agent had to be identified when the original bank selected for the Project went out of business; and
7) ODS-free equipment could not be supplied on time by suppliers because of the large demand for such equipment from relatively few global suppliers.

69. Despite the delay in termination of the Project, the representatives of the companies were generally satisfied with the sub-project formulation, the equipment selection and procurement procedures, the project organisation and management, and the interaction with the World Bank consultants with company representatives.

4.6.2 UNDP/UNEP Regional Project to phase out methyl bromide

70. The stakeholders and the MoEW reported that they were satisfied with the outcomes of the Project, and in particular with their interactions with UNEP. The MoEW considered that the Project was absolutely necessary for Bulgaria at the time, that the objectives were well chosen, it had the right target pests, and the majority of the stakeholders were fully dedicated to achieving sustainable results.

71. The MoEW and stakeholders considered that the project commenced late, considering that the target date for the phase out was 1 January 2005 and that the Project did not start until May 2004. It was impractical to allow only one season in which to finalise the work for the phase out. The delay was partly due to slow equipment procurement and delivery, and partly due to the additional time needed to convince the farmers to phase out methyl bromide. Some of the delays were also caused by a lack of understanding by UNDP on the new customs requirements after Bulgaria joined the EC, which resulted in customs duty payments by some companies.

72. MoEW wanted UNDP staff to coordinate the import and transfer of the equipment in a more timely manner, to reduce the duration of the Project to improve its implementation.

More than a year after the end of the Project, the postharvest equipment had not been used as it has not been transferred to company ownership, despite the administrative details having been completed by the Ministry. The MoEW wanted more clarity on equipment ownership provided at the beginning of the project, which would have reduced tensions over equipment ownership between companies in the postharvest sector.

73. In addition, timely processing of the procurement procedures by UNDP would have enabled residual GEF investment funds allocated to Bulgaria to be used for the purchase of equipment that identifies soil pests. The MoEW regretted that it was not possible to use all the funds that were allocated to Bulgaria, because of delays in procurement by UNDP.

4.7 IMPACT THREATS / RISKS

4.7.1 Illegal trade

74. In 2003, the government estimated that 950t of CFCs remained installed in domestic and commercial refrigeration equipment, air conditioning equipment, transport refrigeration equipment and insulation foam[18]. The servicing demand for this equipment at that time would have increased the risk of illegal trade as the reported amount of recovered and recycled ODS (in 2001 250 kg) would not have significantly reduced the service demand.

75. Although the possibility of illegal trade in CFCs could not be completely eliminated, the NOU considered that the risk was very small today as the majority of the installed CFCs have been substituted by HCFCs and HFCs. Only very small amounts of CFCs might still be used to service old domestic refrigerators in the urban areas of Bulgaria.

4.7.2 Methyl bromide

76. The sustainability of the phase out of methyl bromide depends to a very large extent on whether its replacement metam sodium continues to be available in the future. Metam sodium is undergoing review along with other fumigants according to the review procedures described in Regulation (EC) No 91/414. The MoEW noted that the drip irrigation system used in the soil sector could also be used to apply non-chemical alternatives, which are considered sustainable.

4.7.3 Government commitment

77. From the end of the Project, the government has continued to show a significant commitment to financing staff to work on ODS phase out activities. Currently, Bulgaria finances from the central budget 1.5 FTE for ODS and F-gas issues. The financial support for ODS personnel by the government has varied from 1 – 2 FTEs, depending on the needs of individual Projects[19]. However, there is a risk that the small team could be left without sufficient staff for a period of 6-12 months in the event of a resignation, as government salaries were lower than in the private sector and recruitment procedures were reported by the NOU to be time-consuming.

4.7.4 Destruction

78. The NOU reported that the cost of transporting ODS for destruction such as Germany had increased recently to the level where it was too expensive for companies. A company had applied to the MoEW for an amendment to its licence under the Waste legislation, in order to include ODS (including halons)[20]. Once licensed, they would be able to collect and

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[18] Bulgarian HCFC Phase Out Strategy. 2004. Table 7 page 13.

[19] 1 FTE to 2004; 2004 – 2006 = 2FTE; 2006 – 2009 = 1FTE; From 2009 1.5 FTE.

[20] In September 2009 the Ministry of Environment reported that BalBok Engineering.Co (http://www.balbok.com) had been recently licensed by the government to recover halons, CFCs, HCFCs and HFCs.

transport ODS to a destruction facility in another EU Member State. Delays in approval by the government increased the risk of stored ODS leaking to the atmosphere. It was not possible to assess whether the penalty for deliberate venting had totally or partially discouraged this activity. The NOU said that destruction of ODS was neglected in the formulation of the sub-project and they wanted it to have been included as a component of the recovery and recycling sub-project.

4.8 IMPACT ON THE PHASE OUT OF OZONE-DEPLETING SUBSTANCES

4.8.1 World Bank ODS Phase Out Project

79. Bulgaria's objective to phase out of 392 ODP-tonnes was fully met, most probably as a result of the GEF financial assistance. Bulgaria phased out approximately 250 ODP-tonnes in six investment projects, which eliminated the demand to import this quantity of CFCs. The success in the investment projects improved the environmental performance of these companies, while at the same time allowing them to retain their scope of activities and for some to even increase their production capacity and to be competitive on foreign markets.

80. The quantities recovered and recycled were not reported prior to 2001 during the Project, and therefore it is not possible to determine the contribution of this sub-project to Bulgaria's objective. The phase out of the remaining 142 ODP-tonnes might have been the result of self-financed conversion to non-ODS activities by companies that were not financed through the GEF project.

81. The GEF finance also assisted Bulgaria to comply with the ODS phase out requirements of the Montreal Protocol, following discussions with the Implementation Committee in 1995. Bulgaria phased out the Consumption of 16 ODP-tonnes of halon from 1994 to 1997. Based on Consumption data reported by Bulgaria to the Montreal Protocol, Bulgaria was compliant with the phase out schedules for all ODS from 1 January 1998.

82. The success of the GEF Project was reported by Bulgaria to have assisted with the requirement to comply with the ODS legislative requirements of the EU, prior to accession on 1 January 2007.

4.8.2 UNDP/UNEP Regional Project on the phase out of methyl bromide

83. The objectives of the *UNDP/UNEP* Regional Project were fully met. Bulgaria reported zero Consumption from 1 January 2004, which was a significant reduction from the reported Consumption of 51.8t in 1991.

84. Bulgaria reported that the information provided on methyl bromide alternatives by international consultants, and the equipment provide by the Project, were both of great importance for the sustainable phase out of methyl bromide. The companies involved in the soil and postharvest sectors would neither have been able to purchase the equipment with their own funds, nor would they have the capacity to gain the knowledge for the alternatives on their own.

5 THE CZECH REPUBLIC

5.1 BACKGROUND

1. The Czech Republic was established on 1 January 1993. However, its independence from the former Soviet Union was several years earlier when (as Czechoslovakia) the Communist Party collapsed with the resignation of its leaders in 1989. This was also the beginning of the era of profound and sustained economic reform. Since 1991, good economic management has led to the elimination of 95% of all price controls, large inflows of foreign investment, increasing domestic consumption and industrial production, and a stable exchange rate[1]. In the mid to late 1990's, the Czech Republic began to export more to Europe than it had in the past to the former communist economic bloc markets. This shift toward Europe was one of the many steps that paved the way for the Czech Republic's accession to the European Union in 2004.

2. In the mid-1980's, the Czech Republic was one of the most polluted countries in continental Europe due to its concentration of heavy industry and mining. The production of ODS contributed to this environmental pollution because, as the former Czechoslovakia, it was the largest producer of ODS in Central and Eastern Europe. In 1989, just over 2,000 tonnes of mainly CFCs (CFC-11, -12 and -113) and 5,000 tonnes per year of carbon tetrachloride were produced. Consumption in 1993 was about 1,400 tonnes, which were mainly used in the refrigeration (48% of total), solvent (42% of total) and rigid foam (10% of total) sectors.

3. The Czech Republic succeeded to the Vienna Convention and the Montreal Protocol in 1993; and acceded to the London and Copenhagen Amendments in 1996. As a developed country and a signatory to the London and Copenhagen Amendments, the Czech Republic was mandated to, *inter alia*, phase out of the consumption of halon by 1 January 1994; and to phase out CFCs, methyl chloroform and carbon tetrachloride by 1 January 1996.

4. Despite the significant effort by the Czech Republic to eliminate consumption of ODS by the due dates, this proved to be impossible in three cases. The Czech Republic reported consumption of nearly 50 ODP-tonnes in 1996, instead of zero; 113 ODP-tonnes of halon in 1994, instead of zero; and 11.2 ODP-tonnes of methyl bromide, instead of a value below the freeze limit of 6.5 ODP-tonnes. In each case, the Czech Republic did not have an exemption from the Parties for this consumption.

5. The Czech Republic discussed these issues with the Protocol's Implementation Committee[2] in 1996, 1997 and 1998 who took no action in each case other than to continue to review the compliance status of the Czech Republic. The Czech Republic reported that "*…it had the utmost interest in reliably meetings its obligations under the Montreal Protocol*".

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1 US State Department. Background note: Czech Republic.

2 Decision VIII/24. 1996. Non-compliance of the Czech Republic with the halon phase out by 1994; Decision IX/32: 1997. Non-compliance of the Czech Republic with the freeze in the consumption of methyl bromide by 1995. Decision X/22. 1998. Compliance with the Montreal Protocol by the Czech Republic.

5.2 INPUTS

6. In 1991, the Czech Republic established the State Environment Fund which introduced a fee for the use of ODS, as well as for its production and trade. From 1994 until 2003, the fund raised more than $10 million which were used to support non-ODS technologies.

7. The Czech Republic was one of the first eligible for GEF grant funds to launch a comprehensive ODS phaseout programme, and it became the first project on ozone-layer protection approved by the GEF. It was approved on 23 August 1994 and completed on 31 March 1998, including two extensions that delayed closure by 21 months. The main causes of the delay were technical problems, the need for sub-project redesign and implementation difficulties. The total budget was $4,148,000 which consisted of GEF $2,300,000 (56% of total) and national co-finance $1,848,000 (44%). The World Bank was the Implementing Agency for the Project.

8. The objectives of the Project were to assist the Czech Republic to eliminate approximately 1,400 tonnes[3] of mainly CFCs per year by providing financial support:

    1) To phase out the production of CFCs and to produce a report on other chemicals that could be produced with feedstock chemicals that would no longer be used for CFC production;
    2) To establish a network of refrigerant recovery, recycling ("3R") and reclamation operations that would provide sufficient CFCs to service existing equipment; and to undertake training in the best practices of refrigerant management to minimise emissions of CFCs;
    3) To introduce non-ODS technologies in the commercial and refrigerated transport sectors, and in so doing establish retrofit procedures that could be used by other countries;
    4) To reduce the quantity of CFCs used in foam production, with a view to developing retrofit procedures for CFC-free foam production; and
    5) To strengthen the government institutional capacity to coordinate and manage the phase out of ODS.

9. The Project was managed by a National Ozone Unit (NOU)[4] within the Ministry of Environment's (MoE) Department of Air Protection. The NOU was advised by a Technical Advisory Group (TAG) that helped the NOU to prepare sub-project proposals, arranged demonstrations of alternatives, monitored the status of the ODS reduction, and helped to identify 20 experts/consultants that were needed for the Project. The NOU also cooperated with the Ministry of Industry & Trade, and received advice from universities and research institutes.

10. As this was the first Project approved by the GEF on ozone layer protection, a Project Implementation Manual was prepared by the World Bank that described the Bank's guidelines for procurement, disbursement, use of consultants and financial reporting. It included sample bidding documents and project specific documents. In addition, a Document of Understanding was prepared for the refrigerant recovery and reclamation (3R) project. The Bank also undertook a financial viability analysis of the companies prior to any financial investment, which was important at the time in the Czech Republic when many companies had only recently moved from State to privately operated enterprises.

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[3] Precise consumption data for 1993 were unknown.

[4] Called NOU here to show equivalence with similar units in other CEITs, but it was called the Project Management Unit

5.3 IMPACT DRIVER I: GOVERNMENT COMMITMENT

5.3.1 Institutional and legislative strengthening

11. The Czech Environmental Inspectorate was established in 1991 to control the management of ODS, its production, import and export, and to report on its use. The Inspectorate worked closely with the Czech Trade Inspectorate that was responsible for ODS labelling and placement on the market, and the Directorate General of Customs. The effective coordination that was established between the Environmental Inspectorate, the Customs Directorate and the Ministry of Environment (MoE) is discussed further in Section 5.3: Customs and Border Security on page 55.

12. A comprehensive Country Programme for the phase out of ODS in Czechoslovakia was completed in November 1992. This programme assisted with the adoption of early legislation on ODS in July 1993, called "*ODS Phase Out*", shortly before the start of the Project[5]. This important legislation on ODS imposed a tax of about $3.50 per kg of ODS produced or imported, which was collected by the State Environmental Fund; banned the import of CFCs or products containing CFCs from 1 January 2004. It also banned emissions of ODS, thereby providing a legal basis for the enforcement of refrigerant recovery during servicing. A separate decree by the MoE required all existing producers and consumers of ODS to be licensed, except aerosol companies who had already phased out the use of ODS as propellants[6].

13. In 1995, legislation was introduced that required permits and set quotas[7] for the import, export and production of ODS, and ODS-containing products. This legislation provided the basis for the involvement of the Czech Environmental Inspection and Customs authorities. Service companies and owners of equipment that used more than 10 kg of refrigerants were required to complete a Form annually (for use in the previous year) that provided information on the name of the substance, its source (import or EC), the quantity at the beginning of the year, the quantity added, the intended use, the amount recycled/regenerated/destroyed, and the amount remaining at the end of the year[8]. The same legislation also banned the production and use of HCFCs from 1 January 1997, and permitted ODS to be assessed and used where necessary for Essential Uses[9] in the health, fire protection, aircraft, laboratory and nuclear sectors. The 1995 legislation banned from 1 January 1996 the production, import and placing on the market and use of CFCs, as well as products that contained CFCs[10]. This law effectively ended the use of virgin CFCs for servicing refrigeration and air conditioning equipment, and promoted the installation of new equipment that did not depend on CFCs.

14. With this raft of legislation that was adopted over a period of 3 years from 1993 to 1996, the Czech Republic paved the way to setting ever-diminishing quotas for the production, import and export of CFCs, terminating the use of new CFCs as refrigerants, promoting the establishment of technology that no longer depended on CFCs, and empowering their environmental inspectorate and customs authorities to enforce the legislation on ODS.

15. From the end of the Project in 1998 until today, the MoE has continued to be the focal point for ODS and has assigned of 0.5 FTE to this work. To leverage the effectiveness of the relatively small NOU, the MoE has put in place legislation that empowers other services

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5 Act 211/1993 Coll. of 8 July 1993. Ban of the production, import and use of ODS and ODS-containing products

6 Decree 14/1995 Coll, of 3 January 1995. Limits on the use of CFCs for MDIs [asthma medication].

7 Act No. 86/1995 Coll. In Decree 276/1995 Coll. 26 October 1995

8 Act 483/1995 Coll.: Reporting requirements

9 Decree 277/1995 Sb. of 26 October 1995

10 Act 86/1995 Coll., of 20 April 1995. Prohibition of the production and import of CFCs

(such as Customs officers and inspectors) to undertake work on ODS according to the legislative requirements, and to report the results of their activities.

16. The NOU shared concerns and coordinates policy development with other units that work on climate and F-gases in order to harmonize requirements at the national level and to facilitate implementation by industry. In 2002, the MoE introduced legislation in 2003 that harmonised as much as possible the Czech Republic legislation on ODS with Regulation (EC) No 2037/2000 prior to the Czech Republic acceding to the EU in 2004. Most recently, legislation on ODS and fluorinated gases (F-gases) came into force on 1 February 2009 that fully implemented the requirements of EU legislation, and which replaced all previous versions on ODS legislation[11].

17. The Czech Republic had demonstrated its national and international commitment to the Montreal Protocol. The Czech Republic has been one of the major supporters of the Montreal Protocol from its inception. Its representatives have served on the highest positions in the Montreal Protocol and the Vienna Convention. The Czech Republic hosted the 16th Meeting of the Parties to the Montreal Protocol in Prague in November 2004. The Czech Republic became the first country in Central and Eastern Europe that accepted all Amendments to the Montreal Protocol.

18. At the national level, the Czech Republic has been very active implementing legislation and policies to manage, reduce and eliminate ODS. The NOU is part of the core team within the Ministry of Environment and funded from the central budget. The NOU continues to pay close attention to ozone layer protection, by being involved in the regular meetings of the EU Management Committee operating under Regulation (EC) No 2037/2000. As a result of EU membership, the European Commission requires the Czech Republic to submit annual reports including those on emissions control of ODS (minimum qualification requirements), the use of MB and alternatives, critical uses of halons, the use of CFCs in medical products that control asthma, the phase out of halon on ships and in aircraft, and the quantity of ODS recovered, reclaimed, recycled and destroyed. The government is committed to providing reports to the EC on a range of ozone layer activities mandated in that Regulation and that are being carried out in the Czech Republic.

5.3.2 Customs and border security

19. Legislation has been put in place to combat illegal trade in ODS in the Czech Republic, including penalties for smugglers that are caught. MoE reported that it exchanged information with the Customs Department on a regular basis. For example, the MoE sent drafts of any legislation for the opinion of the Custom's Department, provided information on the latest decisions adopted under the Montreal Protocol on curtailing illegal trade, and provided guidance documents on ODS. In return, Customs were obliged by legislation to provide import/export data by company and by substance to MoE every 6 months.

20. When the Project was being carried out in 1997, about 80 Environment Inspectors were trained by the NOU in 2 workshops on ODS legislation and methods to identify ODS. In addition, more than 35 Customs Officers were trained on the different types of ODS and equipment packaging and hazardous chemicals. Customs focused on the validity of the MoE permissions for import and export of ODS and ODS-containing products, labelling of imports, and any documentation or certificates. The Environmental Inspectors work in partnership with Customs to perform secondary checks on the companies, based on any irregularities in imports or exports that might have been detected by the Customs.

[11] Act 483/2008 Coll. of 31 December 2008

21. The Czech Republic reported 146 incidents of illegal trade in ODS from 1995 to 1997[12]. These included delays by companies in forwarding information on ODS quantities to the Customs Authorities (118 instances), import of ODS without a permit (10), import of ODS that exceeded the permit (14), and failure to pay fees for the transport of ODS (4). The fines imposed on violators by the Czech Environmental Inspectorate totalled $53,310. More recently, information provided by Customs from 2004 to 2008 showed there were no serious violations of the legislation on ODS. In general, Customs returned substances or products that were not prohibited in the exporting country.

22. Today, there are more than 22 Inspectors that collect information on ODS from companies and provide it to MoE. There are currently 700 companies in the database, a number that has remained relatively constant in the past 3 years. The Inspectors pursue potential cases of non-compliance with legislation on chemicals management and pollution control. There are penalties established for failing to report. There were more than 450 companies that reported until about 1998, but because ODS use has been replaced by alternatives the number reporting is far fewer in 2008.

23. The evaluation team noted that the Czech Republic has established a network of border checks and company inspections that is shared between three agencies. This network has been successful in the past in detecting illegal trade in ODS and penalising the violators. This system appeared to be effective, despite the lack of refrigeration identification equipment that in other countries had been supplied to Customs officers for use at the border.

5.4 IMPACT DRIVER II: RECOVERY AND RECYCLING PROGRAMME

24. The 3R project was designed to cushion the impact of the phase out of production, so that recycled CFCs would be available to service equipment and thereby avoid the prospects of early retirement of equipment that had further commercial life. The 3R programme aimed to recover, recycle and reclaim as much refrigerant as possible during the transition period between CFCs and CFC-free technology, at a time when imports of CFCs were banned. Therefore, the only available CFC refrigerant to service existing equipment was obtained from the CFCs in the market that were recovered, recycled and reclaimed ('3R'). This programme consisted of two parts:

    1) Training of technicians in refrigeration management; and

    2) Distribution of equipment for ODS recovery, recycling and reclamation activities.

25. Several organisations assisted the NOU to implement the Project. One of the most important was the Association of Cooling and Air Conditioning Technology (now called SCHKT) which was formed in 1991. SCHKT was established as a non-profit organisation. At the time of the Project, SCHKT had a membership of 1,700 authorised refrigeration technicians, and in addition 200-300 refrigeration repair workers. At that time it had only 42 companies as members, but by 2004 it had expanded to 82 individual members and 789 companies.

26. SCHKT's current mandate is to provide economic and technical advice to its members, improve members' skills and qualifications, participate in the preparation of legislation, influence the standards developed by the Technical Standards Board, and to participate in the all areas of "*recycling, reclamation and compensation*" of refrigerants. SHCKT annually catalogues companies that belong to SCHKT. To keep its members abreast of the latest developments, SCHKT publishes each monthly a technical magazine and a newsletter.

[12] Workshop on enforcement and compliance with multilateral agreements, Geneva, 12-14 July 1999.

5.4.1 Recovery, recycling and reclamation equipment

27. At the beginning of the Project, there were 500-600 Refrigeration Servicing Enterprises (RSEs) in the Czech Republic. SCHKT helped distribute 500 recovery and recycling machines to most of the RSEs.

28. Various companies took responsibility for different parts of the 3R sub-project. Ekotez was responsible for the production of the recovery machines (see Section 5.5: Enterprise Sustainability on page 61 for further details). Kovosluzba and Ekotez were responsible for refrigerant sales, equipment, and spare parts. Spolek and Ekotez were responsible for reclamation. Servicing was the responsibility of a network of service centres whose technicians were trained by SCHKT (see Section 5.4 on page 57 for further details).

29. The RSEs were required to deliver contaminated CFCs to the two reclamation centres that were established at the enterprises Ekotez and Spolek[13] (now called Spolchemie). In addition, Spolek which is a large chemical company, was responsible for the storage of any ODS that could not be reclaimed, pending destruction. Both RSEs/reclaim-centres were licensed to sell refrigerants in general, as well as any reclaimed CFCs for about $1.50 per kg. The GEF paid for the equipment installed in the reclamation facility, and contributed 40% towards the cost of the recovery machines.

30. The few companies that did not receive the recovery machines purchased their own because they provided a cost-effective way of continuing to use CFCs for servicing equipment, and because the machines were necessary for them to obtain certification.

5.4.2 Training of technicians in refrigerant management

31. In order to receive the equipment, personnel from the companies were required to participate in seminars on refrigerant management. There were two seminars held in 1997, which included practical demonstrations on the use of the equipment for recovery and recycling. SCHKT was responsible for undertaking the training, which was delivered by the EducoCh Training Agency (ETA) and the Specialised Vocational School of Refrigeration (SVSR) in the training of technicians.

32. There were 850 technicians trained by the Project. The GEF grant paid for the training course for each technician. Each technician received a “Greencard” as evidence of their professional qualification. The Green Card was also displayed by the technician to prospective clients to show that they had the qualifications to undertake the work. From 1997 to 2007 all trainees that passed the courses received a Greencard, which was valid for 3 years.

33. During the Project, the training focused on protecting the ozone layer. However, from 2002 the training was expanded to include a broader consideration of environmental protection, and especially on refrigerants that increase global warming. The Czech Republic amended the Air Protection legislation[14] in 2008 to include the minimum requirements for the mutual recognition and certification of companies and technicians for the environmentally-safe handling of F-gases[15]. Trainees were required to pay about $200 to attend a 40h course (15h theory; 25h practical). Not all trainees pass and about 20% fail either the theory or the practice and must re-sit the test.

34. In total, more than 2500 technicians have been trained. The SCHKT said that due to the legal requirement for professional qualifications, regular inspections of companies by the

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[13] United Chemical and Metallurgical Works Ltd

[14] Act 86/2002 Coll. Air Protection.

[15] Act 483/2008. 31 December 2008. Minimum qualification requirements for work on F-gases.

Environmental Inspectorate, the provision of courses by SCHKT that give training in this area, and the large number of technicians that had been trained, it was very unlikely that unqualified refrigerant technicians were working in the Czech Republic. Any unqualified workers found to be servicing refrigeration and air conditioning equipment can be fined under legislation in the Czech Republic.

35. Together with ETA and SVSR, the SCHKT Association still continues to provide training courses at the SCHKT Training Centre. Training ensured that that safe handling of refrigerants remained a top priority for Association, and met the government goal of best environmental practice. It also reduced the prospects of unqualified technicians entering the workforce, which could undermine the work that had been put in on best practice refrigerant handling. Training was recently postponed until May 2009 when a new syllabus is expected to be approved by three bodies[16] to meet the EU training requirements for the environmentally-safe handling of F-gases[17]. In the meantime and until 4 July 2011, the MoE has temporarily authorised technicians with a current Greencard that have not received F-gas training to continue to work on F-gases and ODS refrigerants.

36. The 17 other CEITs that were also involved in GEF Projects, and many of them with the World Bank, could have benefitted from a more widespread use of the organisational structure, document templates and concepts that were used and developed in the Czech Republic. The training methods, involvement of the Association and agencies to deliver the training, were examples of best practice.

5.4.3 Quantities of refrigerant recovered for servicing

37. The 3R sub-project aimed to recover increasingly larger amounts of CFCs per year over the course of the Project, leading to 150-200t recovered in the third year of operation. The total sub-project cost was $1,040,000 including recovery and reclamation equipment, training, delivery vehicles, cylinders, study tour and contingency finance. During the Project, there was legislation[18] that required reporting by the companies on the amount of refrigerant recovered, recycled and reclaimed.

38. The Czech Republic reported that about 200 tonnes per year of CFC-12 were recycled directly into equipment by technicians, and 6 tonnes of CFC-12 were reclaimed, over the period of the Project. The NOU was concerned that a large amount of 'dirty' rather than 'clean' reclaimed ODS was being recycled into equipment, which would shorten its operating life. However, there were no reports of equipment owners reporting early retirement of equipment, and therefore the NOU's initial concern was not warranted. Technicians had chosen to recycle (rather than reclaim) the vast majority of the CFCs because the market price of $18-22 per kg of CFCs greatly exceeded the $6 per kg price offered by the reclaim centre. The market price had increased substantially because the government had imposed a tax on the use of virgin CFCs, and had banned imports.

39. About 80 tonnes of CFC-11 were recovered, but only about 20 tonnes were reusable. In regard to the 60t that were not reusable, 40t was exported to Germany for use as feedstock by chemical companies, and about 20 tonnes were used for combustion tests of destruction in 3 incinerators in the Czech Republic. The destruction was certified.

40. The recovery and recycling component of the GEF programme was successful, especially as

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[16] Ministry of Education, National Institute of Vocational Education, and the Ministry of Industry and Trade

[17] Regulation (EC) 303/2008 (2 April 2008) establishes minimum requirements and the conditions for the mutual recognition of the certification of companies and personnel on stationary refrigeration, air conditioning and heat pump equipment containing certain fluorinated greenhouse gases

[18] Act 86/1995 Coll., Article 7: Reporting requirements for ODS recovered, recycled and reclaimed

almost three times more CFCs were recovered and recycled by the network of companies than were originally intended[19]. Used HCFCs were also recovered and recycled, but the quantities were not disclosed.

41. After the Project, the Czech Republic began to collect unwanted refrigerators, as these were recognised as an important source of ODS that would otherwise be released. The Sita company that collected these refrigerators beginning in 1999 first evacuated ODS from the cooling circuit, then crushed the cabinet in an enclosed environment which enabled the ODS refrigerant to be evacuated from the foam insulation. Products that remained were secondary raw materials such as metal, plastic and glass which could be recycled. The ODS refrigerant was destroyed by controlled thermal destruction at a destruction facility (see page 60 for further detail).

42. In 2002, legislation came into force in the Czech Republic that banned the disposal of unwanted refrigerators in a landfill[20], and required municipalities and companies to put in place procedures to manage the environmentally-safe recovery of ODS under the Waste Management Act[21]. In February 2005, the RAL Quality Assurance Association reported that the Czech Republic was one of the few Member States that recovered ODS from both the cooling circuit and the foam of unwanted refrigerators, whereas a large number of Member States recovered ODS from only the cooling circuit and not from the insulating foam where the majority of ODS was contained.

43. In 2005, legislation on the reporting of ODS recovered, recycled, reclaimed and destroyed was adopted[22] which improved earlier legislation on the same topic. As in the previous legislation, the amended legislation mandated all companies to report these quantities annually to the MoE[23].

5.4.4 Replacement of halon used for fire protection

44. In the 3R sub-project, the reclamation centres were not supplied with equipment to recover halon. After the completion of the Project, decommissioned halon was collected, recovered and recycled, and stored by ESTO Cheb. These activities were supported by Czech legislation[24].

45. The Czech Republic uses halon only for critical uses listed in Regulation (EC) No 2037/2000, which limits their use to mainly aviation and military uses. Esto Cheb was also a partner in the Phare Program 2000 "*Transfer of Advanced Fire and Explosion Protection Technologies"*, which financially supported the implementation of halon alternatives in the Czech Republic.

5.4.5 Destruction

46. ODS for destruction was shipped to Germany in accordance with EC legislation[25] on the shipment of waste, as there were no ODS destruction facilities established in the Czech Republic until 2003. Since 2003 the Czech Republic has used the Sita waste incineration plant to destroy CFCs and HCFCs in Ostrava. The cost for destruction is about $12 per kg, including the transport costs, which must be paid for by the owner of the waste. In the last 3 years, about 25 000 kg of ODS have been destroyed.

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[19] ICR18384. 1998. Table 5 on page 17: Key indicators for project implementation – ODS phased out in tonnes
[20] Act 86/2002 Coll.: Air protection and Decree 358/2002 Coll.
[21] Act 185/2001 Coll.: Waste Act
[22] Decree 117/2005 Coll.: Reporting requirements
[23] LAND 50-2004: Art VII: Reporting to MoE by 1 March each year.
[24] Act No 86/2002
[25] Regulation (EC) No 1013/2006 on the shipment of waste.

47. The quantity of CFCs destroyed was reported to be relatively small because they were used in Germany by the chemical industry as feedstock. Shipment to other countries was permitted by national waste legislation in the Czech Republic.

5.4.6 Awareness raising

48. The NOU undertook an extensive 9-month Awareness Raising campaign, beginning in April 1995, to disseminate information on ODS and ODS substitutes. The NOU provided written materials and delivered seminars that targeted mainly manufacturers, consumers, relevant trade organisations and the media. The goal of the programme was to gain acceptance for legislative and technical measures that were under development. The awareness campaign was essential for making ODS users, importers and exporters aware of their legal obligations, the enforcement implications and alternatives available to replace ODS. It was also important for encouraging a positive attitude amongst the general public toward ozone layer protection.

49. There was neither a baseline established, nor performance indicators developed, that could be used to monitor the impact of the awareness raising campaign on the ozone layer recovery. Therefore, it was not possible to assess the impact of this awareness raising campaign.

5.5 IMPACT DRIVER III: ENTERPRISE SUSTAINABILITY

50. The GEF funded Spolek to phase out the production of CFCs in one large chemical facility; the phase out of ODS in mobile air conditioning units produced by Thermo King; the phase out of ODS in sandwich panels produced by Bratri Horakove; and the funding of the production of ODS recovery machines by Ekotez.

5.5.1 Spolek chemical company

51. Spolek (now called Spolchemie) at Usti-nad-Labem is a large chemical company that produces, processes and trades about 500 chemical and biochemical products. It was privatised in 1994. The GEF paid $212,000 (actual expenditure) to phase out about 2000 ODP-tonnes of CFCs. In addition, Spolek paid $50,000 (actual expenditure) to phase out about 190 ODP-tonnes as a result of a feasibility report on the most cost-effective modifications to their facility that would consume the CTC and hydrofluoric acid that would not be fully used as a result of the phase out of mainly CFCs. The study aimed to provide a list of other products that could be made from CTC and hydrofluoric acid, such as HFCs and HCFCs.

52. Although the CFC production accounted for only about 1% of Spolek's revenue, its elimination was reported by the company to have created an imbalance in their chemical production 'balance'. As a result of the study, Spolek phased out CFC production but decided against the production of HFC-134a and HCFCs. The funds allocated for this sub-project were not fully utilised. The remainder of the funds contributed toward the costs of operating the 3R project.

5.5.2 Thermo-King-Frigera

53. In 1992, Thermo-King-Frigera (TKF) (now Thermo King Czech Republic[26], TKCR) was the largest refrigerated transport company in the Czech Republic. The merger between the Thermo King (US) and Frigera (CZ) brought substantial financial stability to Frigera that had suffered 2y of operating losses in the early 1990s. The goals of the sub-project were:

[26] Thermo King Corporation manufactures transport temperature control systems for trailers, truck bodies, buses, shipboard containers and railway cars. The company operates 10 worldwide manufacturing facilities including one in the Czech Republic, 17 parts distribution centres and 865 independently-operated dealers in 75 countries.

1) To establish prototype non-CFC transport refrigeration units in the Thermo-King facility;
2) To convert the CKD compressor manufacturer into a 134a-based manufacturing facility;
3) To establish retrofit procedures for industrial refrigeration equipment that could be used by producers of refrigeration systems and service (maintenance/repair) providers.

54. The GEF paid $143,000 (actual expenditure) for the Thermo-King operational changes and $206,000 (actual expenditure) for the CKD operational changes that phased out 110 ODP-tonne of CFCs.

55. The Research Institute of Refrigerating Engineering (RIRE, housed within TKF), was essential for the development of the retrofit procedures since it contained testing facilities and laboratories for commercial performance and service-life trials. Both TKCR and CKD were successfully converted to CFC-free refrigerant technology.

56. The transport refrigeration units were retrofitted with R-401b[27], as energy efficiency was reported to be improved by 8% although ODS was being used (89% HCFCs in the blend). Retrofit Manuals were produced in English, Russian and Czech, which helped to promote a range of CFC-free retrofit options in CEIT and European countries.

57. CKD went into receivership in 2000 and was purchased by CKD Nove Energo. RIRE relocated from Prague to new facilities in Hostivice in 2007, and has a staff of 90. Ingersoll-Rand purchased TKCR when it acquired Westinghouse in 1997. As a result of the sub-project, TKCR became the leading designers for a new bus air-conditioning system.

5.5.3 Bratri Horakove

58. Bratri Horakove Ltd (BHL) was the largest manufacturer of sandwich panels in the Czech Republic, with a market share of about 40% in the early 1990s. The factory employed 170 people and produced 170 tonnes of foam per year. The GEF provided $0.554 million (actual expenditure) to replace 80 ODP-tonnes of CFC-11 with 50%-CFC/water mix, to retrofit with high pressure non-CFC foaming technology, and to construct a small laboratory to determine the foam's thermal value, firmness and other properties. After a series of trials, BHL selected HCFC-141b as a transitional replacement for CFC-blown foam, and later transitioned to an HFC-134a/CO_2 blend which required 8% thicker panels to compensate for the lower insulative value.

59. BHL hosted workshops with other Czech manufacturers of foams to share the results of the trials with different foam-blowing formulations. The laboratory was made available to other Czech manufacturers for testing the properties of products produced with various foam blowing agents and procedures. The same blend was used by BHL for foam blowing. As a result of the sub-project, BHL increased its market share from 10% to 30% to become the largest foam panel manufacturer in the Czech Republic.

5.5.4 Ecotez

60. Kovosluzba was a former state-owned company that supplied refrigeration equipment and refrigerants, and was privatised into owner-operated servicing centres. Ekotez was established in 1991 with some of the partners that were involved in Kovosluzba. The GEF paid $751,000 toward the cost of the production of the recycling and recovery machines. The Project was very successful. Ekotez became an agent for reclamation equipment,

[27] R-401b is HCFC-22/HFC-152a/HCFC-124 as 61/11/28 percent.

designed and sold one of the first recovery machines, and became a partner in 53 international programmes[28] over a 10 year period.

5.5.5 Summary of enterprise sustainability

61. The NOU reported that motivation to reduce and phase out ODS was lowest in enterprises where the Project activities affected only a small part of their overall business. This occurred in particular in the Spolek and CKD enterprises.

62. Companies such as TKCR, BHL and Ekotez benefited from their involvement in the Project, as they became more competitive and increased their market share. Ekotez in particular sold recovery machines to other countries for use in their ODS recovery and recycling programmes.

63. The strength of the Project lay not so much in the individual ODS-free solutions that were developed for each enterprise, but rather in building the capacity of enterprises to develop their own solutions in the future. In this sense, the Project acknowledged the constantly changing legislative and commercial landscape, and empowered enterprises to continue to develop solutions themselves in the future. This was evident in the Thermo King project which had access to a sophisticated R&D facility, and the BHL project where a basic research capability was installed for the benefit of BHL and other local foam producers. Both companies were willing to share their experiences nationally (even with competitors), and to even produce information such as retrofit manuals that could be used by other countries. The Project has had a catalytic impact beyond the Czech Republic border, particularly in the foam sector

5.6 IMPLEMENTING AGENCIES

64. The NOU reported that, despite the two week course delivered by the Bank, it would have benefitted from more operational support from the Bank during implementation, especially in the start-up phase, and particularly in the training on procurement procedures and project accounting.

65. The NOU regretted that the Project did not have more of a focus on Customs, since the importance of their involvement was only acknowledged as the programme was implemented.

5.7 IMPACT THREATS / RISKS

5.7.1 Government commitment

66. As previously described in Section 5.1 on page 53, the Czech Republic has demonstrated its national and international commitment to the Montreal Protocol. The NOU continues to be active in implementing legislation and policies to manage, reduce and eliminate ODS. The risk of the government commitment to ozone layer protection being reduced was assessed as minimal.

5.7.2 Illegal trade

67. The risk from illegal trade was assessed as being minimal, as the Czech Republic had Customs officers trained in all aspects relating to the import of ODS, there were inspections of companies in the Czech Republic that dealt with ODS by the Environment Inspectorate, the companies were required to report to the government on their import/export or use of ODS, and legislation was in place that supported penalties for import/export violators. Moreover, the demand for ODS has reduced in the EC because of the widespread adoption

[28] Including with NORD and REFMA in Ukraine, under a UNIDO project

of non-ODS technology, which has reduced the incentive for illegal trade in ODS.

5.7.3 Recovery, recycling, reclamation and destruction

68. The Czech Republic had in place legislation that mandated the recovery, recycling and reclamation of refrigerants (ODS and F-gases), the reporting of these amounts, and destruction facilities in place to destroy those that could not be reused. Inspection of companies involved in refrigerants was undertaken by the Environment Inspectorate. Under EC legislation and since 2004, the Czech Republic has been required to report ODS recovered, recycled and reclaimed. The risk that these activities are not continued in the future was assessed to be very small.

5.7.4 Training

69. Legislation had been put in place at the time of the Project that required technicians to be qualified when repairing and maintaining equipment that depended on ODS. Responsibility for training was assigned to the Association (SCHKT), who collaborated with other providers to deliver the courses when required. New legislation related to F-gases that was implemented in 2009 has reinforced the requirement for technicians to be qualified, which builds on the legislation that was adopted in the past for ODS. The risk of training not being delivered on a regular basis in the future was assessed as minimal.

5.8 IMPACT ON THE PHASE OUT OF OZONE-DEPLETING SUBSTANCES

70. The objectives of the phase out of ODS in the GEF/World Bank project were not fully met during the term of the Project, as the Czech Republic continued to report consumption of CFCs from 1999 to 2002 that was above any limit exempted by the Parties. The reasons for this continued but low quantity (2.9 to 11.2 ODP-tonne) consumption was not evident from the reports of the Montreal Protocol. The Project did succeed, however, in also eliminating halon and methyl bromide, as zero consumption was reported in 1996 for both.

71. The finance provided to the Czech Republic probably helped to sustain policies and measures, and to instil confidence in further legislation that would lock in the gains achieved in the programme. For example, the Czech Republic reported that the ODS import-export licensing system that was established in 1996 allowed it to ratify the Montreal Amendment in 1999, since this Amendment required that a Party put in place a licensing system.

72. It was a significant environmental achievement that the Czech Republic eliminated the use of ODS as it was the largest producer and consumer of ODS in Central and Eastern Europe. The alternatives that have been put in place were largely based on HFC technology and were considered to be reasonably sustainable, which has proven to be the case given that lower GWP alternatives are continuing to be developed.

6 ESTONIA

6.1 BACKGROUND

1. Estonia began to adopt free-market policies even before it declared independence from the Soviet Union in mid-1991 and has continued to pursue reform aggressively ever since. For example, the government set privatization as an early priority and has now completed the process of putting most major industries in private hands. An integral part of Estonia's transition to a market economy during the early 1990s involved reorienting foreign trade toward Europe[1]: In 1990, about 87% of Estonia's trade was with the Soviet Union, but this fell to less than 10% with Russia in 2007. The fall of the Soviet Union caused a 36% contraction in Estonia's economy from 1990 to 1994, but it picked up again with more than 4% growth in 1995 and 1996. Russia's financial crisis in 1999 led to the only year of decline in Estonia's GDP since 1994, but the 0.7% decline was relatively small.

2. In 1996, Estonia had acceded only to the Vienna Convention and the Montreal Protocol. It was not until 1999 and just before the start of the GEF Project that Estonia ratified the London and Copenhagen Amendments. Today, Estonia has also acceded to the Montreal Amendment and ratified the Beijing Amendment.

3. As a signatory to the Montreal Protocol and some of its Amendments in 1999, Estonia was required to comply with the control schedule applicable at that time to ozone-depleting substances (ODS) which, *inter alia*, required developed countries to phase out the consumption of halon on 1 January 1994; and to phase out CFCs, methyl chloroform and carbon tetrachloride on 1 January 1996. Based on ODS consumption reported to the Montreal Protocol, Estonia was in non-compliance with Annex A Group I (CFCs) each year from 1997 until the end of 2000.

4. In 1998, after a meeting with the Protocol's Implementation Committee[2] to discuss appropriate action as a result of the consumption of CFCs, Estonia committed to a phase-out plan with interim benchmarks that aimed to:

    1) Reduce consumption by 1 January 1999 to no more than 23 ODP-tonnes of Annex A and B substances;
    2) Completely phase out consumption of Annex B substances by 1 January 2000;
    3) Reduce consumption by 1 January 2000 to no more than 14 ODP-tonnes of Annex A substances;
    4) Reduce consumption of CFC-12 to all but 1 tonne in 2001;
    5) Completely phase out Annex A substances by 1 January 2002; and
    6) Establish for 1999 a harmonized system for monitoring and controlling imports of ODS.

5. Estonia was encouraged by the Parties to the Montreal Protocol to work with the relevant

[1] US State Department. Background Note: Estonia.
[2] Decision X/23. 1998. Compliance with the Montreal Protocol by Estonia.

Implementing Agencies to reduce the consumption by installing non-ODS alternatives, and to quickly develop a system for managing recovered refrigerants and halon for any continuing critical uses. The Parties noted at the time that, in order to avoid disruption to the users of equipment that depended on ODS for its functioning, actions by Estonia should be taken urgently because of the anticipated closure of CFC and halon 2402 production capacity in the Russian Federation by 2000, which was Estonia's major supplier of CFCs and halon.

6.2 INPUTS

6. The *UNDP/UNEP* Project (the "Project") was approved on 9 February 2000 and completed in December 2007, after 3 extensions when additional time was necessary to finalise sub-project implementation. The GEF Grant of $750,895 was matched by $45,000 of co-finance (in-kind) from the Government of Estonia. The refrigeration sector accounted for 75% of the ODS consumption in 1998. The Project at the time was seen as particularly important by Estonia at the time for addressing the growing transit trade in ODS between Russia and Europe.

7. The objectives of the Project were to assist Estonia to eliminate 54.8 ODP-tonnes of mainly CFCs by providing financial support:

    1) To establish a network of refrigerant recovery, reclamation and recycling operations;
    2) To train the trainers in refrigerant recovery;
    3) To strengthen the government institutional capacity to manage the phase out of ODS; and
    4) To provide a (Baltic) regional centre for the recovery and reclamation of halon.

8. Unlike all the other 17 CEITs at the time, Estonia was unique in that received no funding for the phase out of ODS in enterprises.

9. The Project was prepared by the Ministry of Environment (MoE). After the preparatory phase, the Estonian Environment Research Centre (EERC, Figure 9) was contracted by the MoE to implement the Governmental Plan for the Phase out of ODS approved by the Government[3]. EERC, a company owned by the MoE, reports to a Supervisory Board consisting of two members from the MoE and two from the Ministry of Finance (MoF).

Figure 9: Estonian Environment Research Centre in Tallinn

10. The [4]National Ozone Unit (NOU) was established within the EERC in December 2000 to fulfil the National Programme for the phase out of ODS established by government decree 531-k. The NOU was given the responsibility to implement the Project, and the national plan to phase out ODS including contributing to the development of legislation on ODS. To implement these plans, the NOU, EERC and MoE developed and maintained relations with the Ministry

[3] EERC was officially established by Decree 531-k of 4 May 1999.

[4] In Estonia called the 'Ozone NOU', but given the acronym NOU (National Ozone Unit) as in the other country reports

of Social Affairs[5], MoF (which contains the Tax and Customs Board), the Plant Protection Inspectorate in the Ministry of Agriculture (for work on QPS uses of methyl bromide), the Estonian Rescue Service, the Ministry of Defence, the Ministry of Education and Science, Civil Aviation Administration, Estonian Maritime Administration, and the Railway Administration. NGO activity on ODS work also included the Refrigeration Association, the Heat Pump Association and the Security Association.

11. The NOU consisted of 3 FTE - an ODS Specialist, an Office Manager, and a specialist in the Reclamation Centre. The budget for EERC's operation was provided by MoE through contractual arrangements for specific tasks. A Senior Officer in the MoE provided the link between the NOU and the Ministry. The NOU also obtained funds for equipment from other sources, such as the Estonian Environmental Investment Fund, and through bilateral agreements on specific projects e.g., with DEFRA (UK) on the importance of the ozone layer and the need for skin protection against high UV levels.

12. This rather complex structure was being reformed toward more of an US-EPA model in order to improve efficiency and focus more on implementation, while at the same time maintaining a smaller MoE responsible for policy development and legislation on ODS. In the meantime, Estonia has established inter-ministerial commissions for each international environmental treaty.

6.3 IMPACT DRIVER I: GOVERNMENT COMMITMENT

6.3.1 Institutional and legislative strengthening

13. Legislation was introduced that banned the import of products that contained CFCs and halons in 1999[6]; introduced procedures for licensing ODS in 1999; the import of CFCs and halons was banned in 2002; the Ambient Air Protection Act[7] was developed and implemented, which included requirements on ODS, labelling of ODS already categorised as waste, and penalties for infringements of the regulations related to ODS; establishment of a national reporting[8] system for recovered, recycled and reclaimed ODS; qualification requirements[9] for persons dealing with ODS and F-gases; and a procedure for keeping log books[10] on equipment containing ODS and F-gases. An ODS licensing system and quotas was also introduced for HCFCs. Some legislation was drafted in 1999 in anticipation of Estonia's accession to the EU in 2004. When it was implemented after accession, Estonian legislation on the same topic was no longer necessary and became invalid.

14. The driver for legislation in Estonia on ODS from 2002 onwards was Regulation (EC) No 2037/2000, which came into force in the EU on 30 June 2000, as Estonia acceded to the EU on 1 May 2004. Two years prior to accession to the EU and thereafter, members from the NOU and the MoE regularly attended meetings in Brussels related to improvements in the implementation of regulations on ODS. They also attended meetings of the Nordic-Baltic network to discuss a range of ODS-related issues, and engaged in Twinning Project with Germany on modifications that are needed to the ODS legislation to allow control of F-gases.

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5 MSA and its medicinal board have the lead role in relationships with industry & industry associations, on the management of chemicals & their use in products, and public health e.g., Metered-dose inhalers for asthma.

6 Governmental Regulation No 146 of 6 May 1999

7 RTL, 19.05.2004, 43, 298: Ambient Air Protection Act

8 RTL, 29.11.2004, 80, 537: Requirements for Ozone Depleting Substances and reporting for ODS and F-gases

9 RTL, 22.03.2005, 32, 446: Competence of Personnel Dealing with Installation, Operation and Decommissioning of Equipment Containing Ozone Depleting Substances and Fluorinated Gases

10 RTL, 29.11.2005, 114, 1755: Procedure and format for Keeping Logbooks on Equipment containing Ozone Depleting Substances and Fluorinated Greenhouse Gases

15. As a result of EU membership, the European Commission requires the Estonian government to submit annual reports on emissions control of ODS (minimum qualification requirements), the use of MB and alternatives, critical uses of halons, the use of CFCs in medical products that control asthma, the phase out of halon on ships and in aircraft, and the quantity of ODS recovered, reclaimed, recycled and destroyed. The process of report preparation by the NOU resulted in a requirement for Customs to modify their checking procedures.

6.3.2 Customs and border security

16. Ten Customs Officers and 14 Environmental Inspectors were trained on ODS management in November 2003 and 2004, using funds from the Institutional Strengthening sub-project. The Tax & Customs Board was provided with 5 Yokogawa refrigerant identification kits. A Handbook was also produced, and a poster to remind officers of the importance of illegal trade in ODS.

17. The work of Customs focused on a close examination of the import and export documentation, rather than taking samples of refrigerants to determine ODS violations. All of the documentation associated with ODS imports and exports was checked. The work was assisted by a Guide[11] on ODS-containing products which is used in the Nordic countries. Recently, the guidebook was updated as a result of a twinning project with Germany on F-gases. The guidebook also contained information on ODS in accordance with EC Regulation No 2037/2000.

18. The Customs officers used a software processing system called COMPLEX to record and interrogate declarations, which allowed goods to be diverted into red, yellow or blue channels for detailed examination. Intelligence work was carried out by Intelligence Department in the Tax & Customs Board, who provided information to the Customs Control Department. There were risk criteria entered into the electronic system for ODS. This resulted in about 3-5% of all imports including ODS being inspected. There were 2 mobile X-ray machines that could be moved between the border points relatively easily to inspect shipping containers, so that contraband goods could be detected even in densely-packed containers.

19. The Tax & Customs Board also contracted the services of the NOU for advice on ODS legislation and analysis of samples in the laboratories, and they met about 3- 4 times per year. The Tax & Customs Board and the NOU reviewed annually the ODS import & exports *versus* the permits issued, which resulted in 10 companies being fined a total of $5,000 for smuggling. In addition, the ship owners of 2 ships that each had 200 kg of halon for fire protection were fined in 2007 for exporting halon to Russia and Georgia.

20. We conclude that Estonia had put in place effective policies and measures to detect and intercept illegal trade in ODS, and to penalise violators. Legislation was in place to support actions taken by Customs to apprehend and penalise illegal trade in ODS. The customs used a range of equipment that varied from relatively inexpensive refrigeration detection kits to sophisticated X-ray machines. There was strong cooperation between the NOU, Customs and other departments to review information on illegal trade and to detect ODS violators. Further work was planned to improve the detection of smuggled ODS, including a study tour to Germany. In the future, the Customs is likely to use risk profiling techniques to identify countries and companies that are most likely to not comply with import legislation. Risk profiling is required in new ODS legislation in the EC that is

[11] Ingrid Kökeritz. 2007. On Products Containing Ozone Depleting Substances. A Guide to Customs Officers and Inspectors in the Nordic Countries. Nordic Council of Ministers, Copenhagen 2007.

expected to come into force in 2009.

6.3.3 Awareness raising

21. Highly targeted Awareness Campaigns were conducted in October 2002 and 2003 and 2004 that encouraged the recovery of unwanted refrigerators that mostly contained ODS. These initiatives included media (TV, radio, press) communications, 4,000 brochures called '*Save the Ozone Layer*', distribution of a booklet '*The Sun, the Ozone Layer and Us!*', and the creation of an ODS homepage. In 2005, the RAL Quality Assurance Association contributed to a seminar on the proper handling of end-of-life refrigerators.

22. This campaign resulted in almost 5,000 refrigerators being collected by the staff of the NOU during the Project. The NOU estimated that 3 times more used refrigerators were collected by other companies during the campaign period. At that time, the refrigerators were shipped to Finland for destruction, but today two companies[12] collect and send them to Lithuania.

23. Estonia is rare in the CEIT countries in that it had a highly targeted awareness campaign that focused mainly on the recovery of unwanted domestic refrigerators. Although there was no baseline established, the performance indicator was the number of refrigerators recovered. The results of the refrigerant recovery are discussed further on page 71 in "Recovery, recycling and reclamation equipment". For the other activities in the Awareness Campaign, there was neither a baseline established, nor performance indicators developed, that could be used to monitor its impact. Therefore, it was not possible to assess its impact in these areas not related to refrigerator recovery.

6.4 IMPACT DRIVER II: RECOVERY AND RECYCLING PROGRAMME

24. This programme aimed to recover, recycle and reclaim as much refrigerant as possible during the transition period between CFCs and CFC-free technology, at a time when imports of CFCs were banned. Therefore, the only available CFC refrigerant to service existing equipment was obtained from the CFCs in the market that were recovered, recycled and reclaimed ('3R'). This programme consisted of two parts:

    1) Training of technicians in refrigeration management; and

    2) Distribution of equipment for ODS recovery, recycling and reclamation activities.

6.4.1 Training of technicians in refrigerant management

25. Specialised training schools, the Refrigeration Association and a company have trained technicians in the safe-handling of refrigerants in Estonia. The Refrigeration Association was started in 1999 largely in response to the Project. They have 34 members from 30 companies. Their mandate is to represent the interests of the refrigeration industry, to provide training on refrigeration management, to work with the government on the implementation of existing legislation, and to provide a technical opinion on future policies and legislation. The training was expected to eliminate the need for about 8 ODP-tonnes of ODS annually using emission reduction procedures.

26. Fifteen refrigeration technicians qualified as trainers in a 5-day course conducted in October 2002. A Canadian expert delivered the course, which covered both theory and good practice in refrigerant recovery as well as alternatives available to replace CFCs. The MoE co-financed the production of the Training Manual ($30,000).

[12] EES-Ringlus and Eesti Elektroonikaromu

27. Training of a 59 trainers in 3 seminars was organised by the Maritime Academy[13] and the Refrigeration Association in March and April 2003, with a focus on practical proficiency. In March 2004, the Refrigeration Association provided four one-day courses for 59 technicians, largely in response to the EU requirements for qualifications. A further 26 were trained, some of them at the Maritime Academy, in accordance with the additional qualification system described by the Professions Act. Õpimaja company provided training in refrigeration to 49 people from 2000-2008. The NOU distributed electronic documents to participants on "*Good Practices in Refrigeration*", and 20 copies in hardcopy for the training centres. In total, the NOU estimated that more than 200 personnel have been trained as refrigeration technicians during the period 2000 - 2008 in Estonia.

28. The qualification requirements for staff dealing with ODS and F-gases were prescribed[14]. In general, the trainee or their company paid about 30% of training fee, and the government the remainder. The NOU regards the investment in training as a major factor that has contributed towards reducing the ability of unregistered technicians to work on refrigerants in Estonia.

29. We assessed the training component has having been carried out to a high standard. There were several organisations involved in delivering the training, the trainees or their company paid for the training themselves, there were Manuals developed, the training continued after the Project had been completed, and above all the requirement for qualifications was underpinned by legislation. All of these factors increased the likelihood that well-trained technicians will continue to be a part of the refrigerant servicing workforce in Estonia.

30. The last training session that involved Estonia took place after the completion of the Project, which was a 2-day training course that focused on F-gases but also had information on ODS[15]. There was also evidence that the scope and frequency of training would increase in the near future. Future training is likely to focus on the requirements for the environmentally-safe handling of F-gases, which is also applicable to ODS and is directed at the same personnel that have received the training on ODS. The overall proficiency on ODS and F-gas management will be further supported in the near future by Refrigeration Standards translated into Estonian for refrigerating systems and heat pumps on all aspects of their design, installation and management.

31. The training organisations planned to reduce the training from to three days to one day, as companies could not afford to release staff for several days for training. In addition, training would be undertaken during the winter period when there would be less demand for refrigeration and air-conditioning services. The courses are likely to focus less on recovery, since this is now routine for technicians, but more on the practical aspects of retrofitting alternatives and the likely impact on their businesses and operations of future legislation. Technicians that wanted to receive further training could register on the CRAFT website, which also contained the legislation describing the qualification requirements.

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[13] The Maritime Academy offers a 4y engineering course for ship technicians and there were 18-20 graduates in 2008. Land-based technicians require 2y of classroom teaching and 2 months practical training. In contrast, the Refrigeration Association focuses on training refrigeration technicians on 1-day courses that provide information on best practice.

[14] Regulation no 16 of 11 March 2005. "Competence requirements for staff dealing with installation, operation, decommissioning and leak control of equipment containing ODS and F-gases".

[15] "Enhancing the capacity to reduce emissions of fluorinated gases in Estonia". Twinning project with Germany. 10-11 June 2008.

6.4.2 Recovery, recycling and reclamation equipment

32. The Project supplied 50 recovery machines, 50 manual recovery pumps / bags and 5 recovery and recycling machines for CFCs. The NOU reported that finance was required to convert the 5 RR machines to recover and recycle HCFCs (the manufacturer has said this is feasible). There have been no problems purchasing spare parts for this equipment. This sub-project was expected to eliminate the annual consumption of 13.4 ODP-tonnes of ODS.

33. Some companies did not receive the equipment because they were unwilling to sign a contract with the NOU that placed responsibilities on the company for maintaining the equipment, and for reporting on the amounts of ODS recovered. The Association opined that the recovery equipment was not highly valued by companies since most could afford to buy their own, if a unit was not supplied by the Project.

34. In 2006, 14,794 unwanted refrigerators were collected for ODS recovery and component recycling by 4 companies. All of the unwanted refrigerators were sent to Finland for dismantling and recovery of ODS and key parts, except 1,052 of them that were sent to Germany for the same purpose.

35. The total weight of shipped household appliances, rather than the number of items of each that was shipped, is recorded and reported by companies in accordance with record keeping procedures[16] implemented by the MoE. The procedures do not require companies to report on the number of individual unwanted refrigerators shipped. Lithuania is therefore responsible for reporting ODS recovered from refrigerators on behalf of Estonia.

36. The quantities of CFC-12, HCFC-22, carbon tetrachloride and methyl bromide that were recovered and recycled from 2003 to 2006 are shown in Table 8. In some cases, more CFCs appeared to be recycled than recovered in the same year, which was explained by the NOU as being due to the use of stocks that had been stored from previous years and that were not shown in Table 8. In general, the results showed that less CFCs were recovered and recycled than HCFCs, probably because CFC equipment had been replaced with HCFC (and HFC) equipment.

Table 8: Ozone depleting substances recovered and recycled in Estonia from 2003 until 2006

Ozone-depleting substance	2003		2004		2005		2006	
	Re-covered	Re-cycled	Re-covered	Re-cycled	Re-covered	Re-cycled	Re-covered	Re-cycled
CFC-12	474	474	9*	127	114	0	13	0
HCFC-22	2320	2320	2431	9	2838	2838	5240	4356
Carbon tetra-chloride	300	0	0	0	15	0	0	0
Methyl bromide	0	0	0	0	30	0	0	0

* Last year of project when owners reported less recovered but more recycled from stocks

37. The NOU considered that the Project was implemented too late to capture the majority of the CFCs, as the peak of their use was several years before the start of the Project. There was a substantial decline in CFCs from 1995 to 1996 due to the bankruptcy of Ookean Ltd that owned a fleet of 20 large fishing vessels that contained refrigeration equipment that operated on CFCs, including 5 very large factory ships. There was no report of the CFCs from these ships being recovered, probably because there was no requirement to recover these CFCs at that time. The subsequent rise in HCFCs in 2003 was due to small shops still using HCFC-22 (supermarkets had switched to R404a) and the retailers importing more

[16] Government Regulation No 28 of 30 January 2006 specifies procedures for establishing and keeping a register of products of concern. Washing machines, refrigerators and heating equipment are not individually indentified.

HCFCs than usual because of uncertainties in supply when Estonia joined the EC in 2004. There were no refrigerants reclaimed or destroyed in Estonia during this period.

38. The Reclamation Centre also received a Gramkow reclamation unit for HCFCs that was purchased instead of spare parts with the GEF funds. The machine was unused and training is required on its use. The Centre planned to use the machine for the recovery and reclamation of HCFCs for use in Estonia, as from 1 January 2010 the use of virgin HCFCs will become illegal in the EU for topping up equipment that operates on HCFCs.

6.4.3 Halon

39. In May 2002 a halon seminar was conducted on halon decommissioning and alternatives to halon, and technicians were trained in the use of the halon recycling equipment (Figure 10). A Reclamation Centre was established to receive and store Estonian ODS. The Centre was also a regional base for receiving, reclaiming and storing halon 2001, 2402 and 1301 that had been decommissioned from fire protection equipment held in Estonia, Latvia and Lithuania.

Figure 10: Halon storage cylinders and halon recovery and recycling equipment. Halon Bank, Estonia.

40. The State budget provided funds for the operations of the Reclamation Centre, as its activities are included in the Estonian Environmental Action Plan. The Centre has a licence to store hazardous waste such as ODS. The Reclamation Centre recovered and recycled about 800 kg of halon 2402 when all of the halon in the TV tower (about 1,800 kg) was replaced with 4 tonnes of Novec 1230 in 2007. There was no halon recovered in 2000 and 2001 from Estonia. The quantities of halon 2402 and 2001 sent by Latvia to the Estonian halon bank are shown in the last row of Table 9. So far, Lithuania has not sent any halon to the bank, as negotiations on the price for the halon failed.

41. The NOU established a database of halon uses by quantity. The quantities of halon 2402, 1301 and 2001 recovered and recycled in Estonia from 2002 until 2008 are shown in Table 9.

Table 9: Halon recovered and recycled in Estonia from 2002 until 2008

Year	Halon 2402		Halon 1301		Halon 2001*	
	Recovered (kg)	Recycled (kg)	Recovered (kg)	Recycled (kg)	Recovered (kg)	Recycled (kg)
2002	1,200	1,200				
2003	445	445	1,777	375		
2004	2,472	1,777	2,219	2,219		
2005	1,338	1,320	80	80		
2006	1,182	1,182	201	201		
2007	1,857	800			100	
2008	442	142	627	627	810	
TOTAL	**8,936**	**6,866**	**2,774**	**3,502**	**910**	
2008 Latvia	1,139				421	

* Halon 2001 is C_2H_5Br or ethyl bromide (Drs David Catchpole and Dan Verdonik HTOC pers. comm. 28 May 2009);

42. Two tonnes of reclaimed halon were exported to the Indian Navy in 2006, and there have

since been requests from India for Estonia to supply more halon from local or other sources (such as Ukraine). In May 2009, the Centre had banked about 1t of halon 1301 and 1.5t of halon 2402.

43. Some of the halon banked at the Reclamation Centre was obtained from ships. Determining the amount of halon on ships was problematic in the beginning because data on halon were not recorded by the Maritime Administration. The NOU surveyed ship owners and, as a result of the responses, estimated that the total halon on 463 ships was about 400 tonnes. Halon decommissioned from ships was transported to the Reclamation Centre, using a small truck with a crane (Figure 11). The ships sometimes had 'BF halon' for fire protection which when deployed can be life-threatening.

Figure 11: Halon decommissioned from ships using truck and small crane, with storage tanks in background. Halon Bank, Estonia.

44. Eight Estonian-flagged ships were fined for not decommissioning halon, which has encouraged them and other ships to replace the halon with alternatives. There are 4-5 companies operating in Estonia that install non-halon alternatives on ships when they arrive at the port for a refit. As of May 2009, the NOU reported that there are no known ships flagged to Estonia that have halon on board, and only halon deemed as critical remains in aircraft and military equipment.

45. Critical uses of halon in the EC are currently limited to mainly aviation and military uses. Recently, the European Commission proposed dates for ending specific uses of halon for critical uses in new equipment, and final dates when halon uses must be replaced with alternatives. If approved by the Member States, the revised list would replace Annex VI in Regulation (EC) No 2037/2000.

46. We assessed the ODS recovery and recycling as successful. A Reclamation Centre has been established which specialises in recovery of ODS from refrigerators and in collecting decommissioning halon. Unwanted refrigerators were collected initially as a result of an awareness programme driven by the NOU, but later the programme became sustainable through the establishment of companies that collect and send the refrigerators to Lithuania. The programme seemed particularly suitable for HCFC recovery and recycling, but less so for CFCs as the programme was too late.

47. We assessed the work on the recovery and recycling of halon as basically useful for Estonian decommissioned halon, but less useful as a halon bank for the Baltic countries which was its original intention. In fact, very little halon has been transferred from Latvia and none from Lithuania, possibly for commercial reasons. The NOU has been successful in finding halon on ships, and in encouraging it to be decommissioned and replaced with alternatives through the imposition of penalties on ship owners that had halon installed.

6.5 IMPACT DRIVER III: ENTERPRISE SUSTAINABILITY

48. There were no investment sub-projects in Estonia because there were no enterprises that were using significant quantities of CFCs. Two companies[17] produced open cell foam for construction purposes using HCFC-22 and HCFC-141b, but they financed their own transition to HFC-134a and HFC-152a.

[17] Henkel Macroflex and Krimelte

49. Estonia wanted SMEs to have been targeted in the Awareness Campaign, in order to quantify the ODS sectoral phase out requirements for possible investment projects. Of the 18 countries reviewed, Estonia remained as the only one that had no financial assistance to assist enterprises to install non-ODS technology. However, Estonia said that in 1999 the new government instigated reforms that resulted in some companies going bankrupt, e.g., refrigeration railcars that contained ODS, while others that remained were required by the government to finance their own ODS elimination.

50. Estonia was not included in the *UNDP/UNEP* project that aimed to phase out all uses of methyl bromide as there were no significant uses of this fumigant.

6.5.1 Servicing sector

51. There have been no reports recently from the companies that received the 3R equipment. As a result, the MoE has drafted an amendment to the Governmental Regulation on ODS and F-gases that required a company to report annually on ODS and F-gas quantities recovered, recycled and reclaimed. The MoE also planned to establish a database to record all users of ODS and F-gases that have equipment that contains more than 3 kg, as such equipment is subject to mandatory annual inspection.

52. The NOU was working with the Statistical Board to ensure that ODS import and export statistics are accurately reported, as there had been problems in the past correlating imports on the basis of ODS licenses issued and other statistics that were being used by the Statistical Board. The NOU planned to ask the Statistical Board to base its information on the ODS licensed for import.

6.6 IMPLEMENTING AGENCIES

53. The NOU is cognizant that finance is the driving force for all the initiatives on ODS, especially recovery, recycling and reclamation. The NOU recommended that UNEP provide this information at the beginning of the project on the economic impact of different legislative and policy options on the potential activities of enterprises and NGOs (such as the Refrigeration Association). In addition, the NOU recommended that issues related to waste products needed to be treated comprehensively by UNEP, including a more informed discussion of policy options related to destruction. The NOU planned to clarify the categorisation of HCFCs as 'waste' with specialists in the MoE, as they had value as a recycled refrigerant.

54. The NOU was not notified of the arrival date of the RR equipment by UNDP, prior to its arrival in January 2001. Consequently, the NOU staff had to arrange for temporary storage, and training of technicians, before the equipment was distributed to companies. The NOU would have preferred to have known the arrival date so that training could have been completed and companies identified in order to allocate the equipment in a timely manner.

6.7 IMPACT THREATS / RISKS

6.7.1 Illegal trade

55. The NOU, on the basis of informal clandestine surveys, was unable to find any evidence of (illegal) CFCs on the Estonian market. The evaluation team noted that the NOU was very active in preventing illegal trade by having trained officers and supportive legislation, and therefore this result reported by the NOU seemed credible.

6.7.2 Recovery, recycling, reclamation and destruction

56. ODS is shipped to Finland (Ekokem OY), Sweden (Sakab AB) or Norway (Stiftelsen Retur Gass) for destruction, as there are no ODS destruction facilities in Estonia. Halon that cannot be

reclaimed can be sent to Sweden (Sakab AB) for destruction when sufficient quantities have been accumulated to make a shipment economic, but so far none has been shipped. The cost was €4-5/kg in 2005. There is a risk that the owners of ODS will not pay for destruction if the price increases above the level that they are willing to pay. The risk of emissions of ODS increases for ODS that is stored and not shipped for destruction.

6.7.3 Methyl bromide

57. Estonia informally attended one of the seminars on the "*UNDP/UNEP Regional Programme on the Phase out of Methyl Bromide in CEITs*", as methyl bromide was only used for QPS in Estonia. In response to the use of methyl bromide in Estonia that was subsequently proven by the NOU to be illegitimate[18], Estonia now requires a permit to be issued for each and every use. No applications for a permit to use methyl bromide for QPS have been requested since the legislation came into force in May 2007, mainly because the only Estonian company that used methyl bromide recently now used a heat treatment instead. The NOU said that the legislation was likely to strongly discourage the use of methyl bromide for any use, and contribute to a permanent phase out of methyl bromide.

58. The NOU has limited resources to check that companies in Estonia have not reverted to the use of methyl bromide. The discovery recently of a company using methyl bromide was the result of a chance encounter by members of the NOU. Although legislation is now in place that requires a permit for methyl bromide operations, there is nevertheless a risk that the NOU's vigilance and permitting system might not be sufficient to deter further methyl bromide use

6.7.4 Government commitment

59. The NOU does not have a dedicated line of funding from the Estonian government budget and instead it must depend on the willingness of the MoE to contract the NOU's services. There is a risk that the MoE budget may not be sufficient to allow it to offer a contract, as resources within government departments are increasingly forced to reduce budgets in response to the economic crisis.

60. The MoE stated that it intended to maintain funding for the activities of the NOU for ever-expanding work on ODS and F-gases, which indicated that the funding for the NOU would be available for in the short term. The NOU intended to focus in the future on ODS (mainly HCFCs) banks, collection and reclamation and of HCFCs, leakage control, assisting the Inspectorate on the implementation of legislation on ODS, providing information to companies on alternatives, amendments to Estonian legislation to improve ODS and F-gas control, and further cooperation with the Tax and Customs Board on ODS controls.

61. The annual contractual arrangement that the NOU has with the MoE reduces the ability of the NOU staff to respond to issues that are pressing, but not in the contract. Contingency funding for the NOU would be allow a degree of flexibility to address such issues, while at the same time maintaining the bulk of the funding to focus on the core business. The budget has not increased in keeping with the 'augmented capacity as a result of the NOU's activities'. Without flexibility in the budget, there is a risk that activities to immediately reduce ODS would have to be postponed until the activity could be included in the next contract.

6.8 IMPACT ON THE PHASE OUT OF OZONE-DEPLETING SUBSTANCES

62. The GEF funding probably helped Estonia to sustain the phase out of ODS, as compliance

[18] Methyl bromide treatment of bark shipped from Estonia to the UK (Northern Ireland), for which DEFRA did not require the use of MB

with the Montreal Protocol was achieved *before* the Project started. Estonia failed to comply with its benchmark target commitments in 1999 and 2000, but did achieve them in 2001 and 2002. From 2002 onwards, Estonia has reported ODS consumption levels that comply with the requirements of the Montreal Protocol.

7 HUNGARY

7.1 BACKGROUND

1. About 5 years before the start of the GEF Project in 1995, Hungary had implemented a range of market reforms that aimed to stimulate a stagnant economy. These reforms included price and trade liberation measures, a new tax system and a market-based banking system[1]. There was a substantial decline in living standards from 1990 to 1994, due to government overspending and insufficient privatization of companies. Hungary's net foreign debt rose significantly in 1993, due largely to consumer subsidies and unprofitable state enterprises. However, toward the end of the 1990's, the living standards had improved due mainly to Hungary's trade with Europe. This closer relationship with Europe helped to pave the way for Hungary's accession to the EU in 2004.

2. The consumption of ODS was reflected in the strength or weakness of the economy. There was a 45% reduction in ODS consumption due to the economic recession in the early to mid-1990's[2]. Hungary estimated that 35-45% of the ODS was phased out by enterprises using their own resources. The GEF Project was therefore used to phase out 15-20% of the remaining ODS in Hungary at that time.

3. Prior the start of the Project, Hungary had acceded to the Vienna Convention in 1988 and the Montreal Protocol in 1989. Later Hungary approved the London Amendment in 1993 and acceded to the Copenhagen Amendment in 1994. As a Party to the Montreal Protocol, Hungary was required to comply with the control schedule in the Montreal Protocol which, *inter alia*, required developed countries to phase out the consumption of halon on 1 January 1994; and to phase out CFCs, methyl chloroform and carbon tetrachloride on 1 January 1996.

4. Although Hungary continued to consume ODS from 1997 to 2002 that should have been phased out in 1996, it remained in compliance with its control obligations by having recourse to an Essential Use exemption that was authorised by the Parties from 1996 to the end of 2003. The exemption was granted by the Parties in response to Hungary's request, and permitted the consumption of CFCs after 1 January 1996. Hungary's maximum Essential Use Exemption in any one year during this period was 10.1 ODP-tonnes, while for the same period of time consumption did not exceed 3.9 ODP-tonnes in any year. Hungary's reported consumption for all other ODS for the same period was zero, apart from HCFCs and methyl bromide for which consumption was permitted.

7.2 INPUTS

5. Three projects provided financial assistance to Hungary to phase out ODS. The first was a GEF/World Bank Project that targeted all ODS for phase out except methyl bromide and HCFCs. The second was a small Project that aimed to reduce the use of methyl bromide,

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1 US State Department. Hungary background note.

2 Ministry for Environment. 1998. Phaseout of ozone depleting substances in Hungary. Account on the Country Programme and on the World Bank-GEF Project for Phaseout of ODS. 76pp.

which was a followed by a third and altogether larger Project on methyl bromide which aimed to phase it out.

7.2.1 GEF / World Bank Project

6. The GEF / World Bank Project was approved on 9 November 1995 and completed at the end of 1998, after two 6-month extensions. The GEF Grant of $6.5 million was matched by $1.5 million from enterprises and $0.05 million from the Government of Hungary. The objectives of the Project were to assist Hungary to transition to non-ODS technology by providing financial support:

    1) To assist 13 enterprises identified in the Country Programme to eliminate their use of CFCs;
    2) To establish a network of refrigerant recovery, reclamation and recycling operations; and
    3) To strengthen the government institutional capacity to manage the phase out of 1,146 tonnes of ODS.

7.2.2 UNEP Project – methyl bromide phase out

7. Hungary's reported consumption of methyl bromide was from 15 to 47 ODP-tonnes from 1993 to 2002. The Project aimed to reduce methyl bromide consumption to zero by 1 January 2005, as required by the Montreal Protocol for industrialised countries.

8. The GEF/UNEP Project "Initiating early phase out of methyl bromide in CEITs through awareness raising, policy development and demonstration/training activities"[3] focused on the development and translation of public awareness materials, demonstration projects, regional training activities, and policy development. It commenced in March 2000 and concluded in September 2002. The total budget was $806,195 consisting of $700,000 from GEF, $37,000 in kind from UNEP, and $106,195 from Canada.

7.2.3 UNDP/UNEP Regional Project – methyl bromide phase out

9. The larger *UNDP/UNEP* Regional Project "*Total sector methyl bromide phase out in countries with economies in transition*"[4] was designed to assist seven CEITs to phase out all uses of methyl bromide except quarantine and pre-shipment by 1 January 2005, in accordance with the Copenhagen Amendment of the Montreal Protocol relevant to developed countries.

10. The Project commenced in Hungary on 31 December 2005[5] and was completed in Hungary on 30 June 2008. Actual costs totalled $691,086 which consisted of GEF $188,068 and co-finance (in-kind) of $503,018. In reality, Hungary had already achieved the objective of the Project when it officially commenced. As a result, Hungary focused mainly on consolidating the alternatives to methyl bromide had been implemented to control soil pests, in order to stabilise the sustainability of the methyl bromide phase out.

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[3] GF/4040-00-10 for CEITs Bulgaria, Estonia, Hungary, Latvia, Lithuania, Poland and Slovakia.

[4] GF/4040-05-05 for CEITS Bulgaria, Estonia, Hungary, Latvia, Lithuania and Poland. Azerbaijan and Uzbekistan were observers.

[5] Date Hungarian Sub-project was signed by Hungary. The Project was approved 1 May 2004, endorsed by CEO Nov 2004 and activities in the Project commenced in March 2005.

7.3 IMPACT DRIVER I: GOVERNMENT COMMITMENT

7.3.1 GEF / World Bank Project

Institutional and legislative strengthening

11. The Government established a Project Implementation Unit (PIU) within the Ministry for Environment and Regional Policy (MERP, now Ministry of Environment and Water (MEW)) with responsibilities to carry out the organisational, technical, financial and administrative activities involved in the preparation and completion of the GEF Project. The PIU cooperated with the Department for Integrated Pollution Control, the Department of Budget and Economic Affairs, and the Department of Finance and Accounting.

12. The PIU established a computerised database on ODS in compliance with national legislation. The system received and verified the ODS data from regional inspectorates before forwarding it to other databases in the Ministry. The database assisted the PIU to comply with the reporting requirements of the Project, and it assisted MERP to comply with the data reporting requirements of the Montreal Protocol.

13. A Technical Advisory Group (TAG) was established within the PIU to assist with solving the technical issues which occurred during project implementation. The PIU hired a procurement expert to assist the enterprises to complete the administrative aspects of the procurement procedures. The TAG carried out on-site inspections to confirm the newly installed equipment was operating correctly. These inspections also identified technical modifications and additional procurements necessary to optimise the newly-installed equipment. The TAG provided comments on the draft reports submitted by companies.

14. With financial and technical support of the GEF Project, the Government amended the 1993 legislation[6] in 1994 and 1996 to ban new uses of the main ozone-depleting substances, to require qualified technicians to work on equipment containing ODS (from 1 January 1997), to require dismantling and disposal of ODS equipment in authorised centres (from 1 January 1998), to restrict the use of halon, to limit the quantity of methyl bromide imported to the 1991 level (from 1 January 1995), and to require record keeping for ODS that was greater than 100kg, and to impose dissuasive sanctions 10-100 times more than the current ODS market price per kilogram. In addition, an environmental product fee was levied on imports of refrigeration equipment containing ODS and ODS refrigerants to cover the cost of equipment disposal.

15. The government implemented legislation during the Project and has continued to adopt legislation after the Project was completed. It is likely that the government of Hungary will remain committed to the phase out of any remaining ODS. However, ODS has become a secondary issue as the primary effort is now directed toward compliance with legislation on F-gases. Many of the activities on F-gases such as qualification requirements and monitoring of leakages in equipment, are also appropriate for controlling the monitoring the use of ODS and its replacements. A decree in 2008 in Hungary combines ODS and F-gases in the same legislation, thereby facilitating control and reporting activities.

16. In Hungary, not all of this work is regarded as the domain of the government. In this regard, MEW is likely to delegate responsibility in 2009 to HRACA to monitor and evaluate all uses of refrigerants (ODS and F-gases) in Hungary.

Customs and border security

17. About 20 Customs officers were trained during the Project, and then these officers passed

[6] MERP Decree 22/193.

on their knowledge on ODS detection and control to their colleagues that operated at each border post. After the Project was completed, in 2000 and 2004 the Hungarian Customs and Finance Guard (VPOP) organised 'Green Customs' meetings in Budapest, in collaboration with UNEP. The information from these meetings was disseminated to Customs officers that were not at the meetings.

18. Although the Customs officers were trained and have the necessary equipment to detect ODS, the NOU reported that the detection equipment was under-utilised because Customs officers considered that any interceptions increased their administrative reporting and reduced their ability to address other more important activities such as detecting illegal imports of drugs.

19. There have been no cases of illegal trade in ODS in the past three years that have withstood legal proceedings following the interception. Dissuasive penalties for illegal trade are contained in EC and national ODS legislation. The MEW and the Customs agencies communicate on an as-needed basis.

20. The evaluation team concludes that Hungary has the key elements in place to combat illegal trade, and that the risks of such trade entering Hungary would be minimal.

7.3.2 UNEP Project – methyl bromide phase out

21. In this Project, Hungary focused on awareness raising activities, including the development and distribution of pest control guides, as well as regional warning and recommendation leaflets that were issued by the Regional Plant Protection Service of Csongrád County. During the Project, Hungary expanded the use of artificial soil (called "rockwool"), which had been used over several years in Hungary's indoor vegetables industry. The area of rockwool was expanded from 70 to 700 ha during the period of the Project. Activities of the "train-the-trainers" type, focusing on methyl bromide alternatives, were delivered by the participating companies and institutions. Hungary reported that the GEF/UNEP Project contributed to the continuing the process of phasing out methyl bromide.

7.3.3 UNDP/UNEP Regional Project – methyl bromide phase out

Institutional response

22. The institutional structure for the project consisted of a Project Coordination Unit (PCU) that was an independent company responsible for project management and administration. The National Ozone Unit (NOU) within the Ministry of Environment and Water (MEW) was the Executing Agency. A National Steering Committee (NSC) provided technical advice to PCU/MEW.

23. The Regional Plant and Soil Protection Service (Ministry of Agriculture and Regional Development) and Corvinus University delivered the Train-the-Trainer (TTT) courses, assisted by two former methyl bromide fumigation companies (Zephyr and Arpad). Kecskemet College monitored and evaluated (M&E) the training. FAO provided training expertise for the Farmer Field Schools (FFS) together with organiser Agro-Mester Ltd. Specialised equipment training was delivered by Imants who provided the rotary spader equipment.

Fumigation equipment

24. In 2003, Hungary consumed 15.8 tonnes of methyl bromide[7]. The most frequent reason cited by farmers for soil fumigation was to control nematodes (55% of farmers), whereas fungi (34%) and weeds (18%) were reported to be less problematic. The major items of

[7] Ozone Secretariat Data Centre, May 2009.

equipment financed by the Project to eliminate methyl bromide use for soil pests were 6 rotary spader machines and two tractors supplied equally to the enterprises Zephyr and Arpad.

25. Both companies reported that this equipment was useful in most cases for avoiding methyl bromide, but its use was relatively expensive and failed to disinfest all parts of the greenhouse (GH) and plastic tunnel (PT) without equipment modification. Soilless cultivation using rockwool is now common practice in the large GH, and bio-control of pests is becoming more prevalent. Arpad, the largest GH grower of paprika and tomatoes, has about one-quarter of their 40 ha of GH under bio-control and expects to double this area in 2010. Farmers operating small production units selected the cheapest pest control which was IPAM (metam-ammonium) at 25% of the price of dazomet.

Training on alternatives

26. Seven trainers delivered 14 Farmer-Field-School (FFS) courses, each course consisting of half-day on 6 non-consecutive days, to about 250 farmers. FFS courses that were delivered in the locations closest to the farmers were well-attended. Five technical publications were produced[8]. Experts participated in a study tour to Spain to see alternatives, and farmers made local visits to Arpad (tomatoes and peppers in glasshouses on rockwool) and Floratom (container growing of plants). Farmers assessed the training as extremely useful, and requested it to continue after the Project finished.

27. M&E results reported that the farmers wanted more practical assistance and less theory; and more economic information on the cost of alternatives to MB. However, this information was difficult to obtain as it was price-sensitive, altered according to growing technologies and other conditions, and was confidential.

7.4 IMPACT DRIVER II: RECOVERY AND RECYCLING PROGRAMME

7.4.1 GEF / World Bank Project

28. This programme aimed to recover, recycle and reclaim as much refrigerant as possible during the transition period between CFCs and CFC-free technology, at a time when imports of CFCs were banned. Therefore, the only available CFC refrigerant to service existing equipment was obtained from the CFCs in the market that were recovered, recycled and reclaimed ('3R'). This programme consisted of two parts:

1) Training of technicians in refrigeration management; and
2) Distribution of equipment for ODS recovery, recycling and reclamation activities.

7.4.2 Training of technicians in refrigerant management

29. HRACA delivered training courses to more than 3,600 trainees between 1994 to 1998 on all aspects of refrigerant handling, including the efficient and environmentally-safe recovery of ODS. A Training Centre and equipment (modern and extensive) was paid for by the GEF Project. Technicians were retroactively reimbursed in part by the GEF Project.

30. As a result of attending the course, the trained technicians received a 'Greencard'. The Greencard was used to show the prospective client that they were certified and qualified to work with refrigerants and refrigeration equipment. However, the Greencard was much more than evidence of qualifications. The President HRACA considered that the Greencard

[8] 1) Greenhouse growing (*sic*) without soil fumigation with methyl bromide (MB); 2) The phase out of MB in Hungary: Information on the implementation of the Project; 3) General information on MB-free growing (used by trainers in FFS); 4) The FAO participatory method; 5) Alternatives to replace methyl bromide for soil-borne pest control in East and Central Europe – Manual (FAO).

promoted equipment owners hiring qualified technicians, rather than those that are not qualified who carry out the work to an uncertain standard for a smaller fee (called 'cobblers' in Hungary). It was also evidence of the government's commitment toward the preservation of best-practice environmental standards for ODS management. Such management reduced emissions of ODS, and at the same time encouraged recovered ODS to be recycled thereby avoiding new refrigerants.

31. The training continued after the Project was completed through a system whereby the trainee or their company paid for their training. The Project therefore had a sustainable impact on the training component. A further 3,000 technicians were trained after the Project was completed, although none in the past 2 years. Technicians were certified for 5 years, so renewal is likely to be from 2010 onwards.

Recovery, recycling and reclamation equipment

32. The Project financed 625 recovery and recycling machines[9]. The Hungarian Refrigeration and Air-Conditioning Association (HRACA) acted as a *defacto* PIU to arrange the importation and distribution. At that time, HRACA had a membership of 450 refrigeration enterprises and entrepreneurs[10] (today about 320). One reclamation unit was purchased for refrigerants, and one for halon (see enterprise Fajro). The purpose was to create a nationwide network of closed-system repairs and maintenance for refrigeration and air-conditioning equipment. An awareness campaign was launched in support of the network. The PIU considers the network that was funded by the GEF Project as a crucial step in the development of the current system.

33. Hungary estimated that about 450 tonnes of ODS were phased out by HRACA's activities, which is 39% of the total phased out in Hungary by the Project. This network lasted for 13 years but is not operational as it is no longer cost effective. The maintenance costs for the recovery units are more than the reimbursement of the ODS recovery costs.

34. The recovered, recycled, reclaimed and destroyed ODS for the period 2002 to 2007 are shown in Table 10. CFC-12 was recovered and recycled in the greatest amounts beginning in 2002.

Table 10: Amount (in kg) of CFC-11, CFC-12 and HCFC-22 recovered, recycled, reclaimed and destroyed in Hungary from 2007 until 2007

Year	Action	CFC-11	CFC-12	HCFC-22
2002	Recovered	1170	42000	21200
	Recycled		42000	21200
	Reclaimed		8956	3246
	Destroyed	1170	250	
2003	Recovered	1168	17000	12400
	Recycled		17000	12400
	Reclaimed		0	405
	Destroyed	1168	157	
2004	Recovered	0	750	9800
	Recycled	0	750	9800
	Reclaimed	0	0	602
	Destroyed	0	0	
2005	Recovered	486	2566	373

[9] 325 Termoflo with Cyclepac filters, 150 Pinacle 5115, 150 Ekotex Micro-R and 620 portable units.

[10] About 320 refrigeration enterprises and entrepreneurs in 2009

Year	Action	CFC-11	CFC-12	HCFC-22
	Recycled	0	42	169
	Reclaimed	0	0	169
	Destroyed	486	2566	214
2006	Recovered	1343	7093	3200
	Recycled	0	42	2608
	Reclaimed	0	0	68
	Destroyed	1343	7093	592
2007	Recovered	3310	5310	708
	Recycled	0	0	604
	Reclaimed	0	0	604
	Destroyed	3310	5310	0

35. The quantities of CFC-11, CFC-12 and HCFC-22 that was recovered, recycled, reclaimed and destroyed reduced significantly from 2004 onwards, compared to the quantities in 2002 and 2003, because enterprises converted to refrigerant blends and fluorinated gases. The requirement in the EC to permit equipment to be refilled only with recycled HCFCs from 1 January 2010 until 31 December 2014 increases the prospect to recover and recycle HCFCs in Hungary. The success of the scheme to recover, recycle and reclaim ODS depended very much on the flow of finances to encourage each activity. The project was discontinued when the costs for equipment repair exceeded the financial return from any of these activities.

36. Since the Project was completed, legislation has been implemented that provides the financial basis for payments to companies that collect and recover ODS and other refrigerants. The payments are derived as a result of EU legislation in force since February 2003 that restricted the use of hazardous substances in electrical and electric equipment (Directive 2002/95/EC) and promoted the collection and recycling of such equipment (Directive 2002/96/EC). The legislation required the purchaser to pay a small fee when the product is purchased that is collected by the government. The fund is paid to companies that collect electrical and electric equipment, and allows consumers to return their used electrical waste including refrigerators without any additional payment. The financial basis of this system has helped to provide a degree of financial sustainability to recovery operations.

Awareness raising

37. An awareness campaign was carried out in the last months of the Project to try to increase the quantity of halon replaced with ODS-free fire extinguishers, and to increase the quantity of halon recovered during replacement.

38. As in many other countries, Hungary undertook these activities without establishing a baseline and performance indicators. It was therefore impossible to evaluate the impact of this programme.

Halon

39. Fajro Ltd is a small company that installs ODS-free fire protection equipment in Hungary. During the term of the Project, Fajro recovered and reclaimed halon. The GEF paid $320,900 for the installation of a hermetically closed halon recovery system and a Kidde-Deugra system for reclaiming halon (Figure 12). Reclaimed halon was used for refilling fire protection systems that qualified as 'critical' – that is, those uses that were without an alternative and listed in Regulation (EC) No 2037/2000. Fajro found it necessary to modify the Kidde-Deugra equipment with an pre-filter to remove contaminants before the halon reached the main body of the unit, which extended the life of the expensive ceramic filter

installed inside the reclamation unit itself and reduced operating costs. The pre-filter was relatively inexpensive to replace, compared to the filter in the main unit.

Figure 12: Halon cylinders ready for halon decommissioning (red), with Kidde-Deugra halon recovery and reclamation equipment (green). Fajro, Hungary.

40. The amount of halons reclaimed by Fajro from 1994 to 2008 was 66 tonnes, which was much less than 2,900 tonnes estimated to have been installed in 1994. However, Fajro could not exclude the possibility that other companies had been involved in halon recovery and recycling, and therefore the majority of the halon that did not need to be reclaimed could have been recovered and recycled (with 'light cleaning') by other companies. However, Fajro was the only company in Hungary that was able to reclaim or 'deep cleaning' the halon.

41. Fajro reported that the costs of halon reclamation had increased to €6-8/kg, depending on the time required, because of increased energy (electrical, transport fuel) costs. Fajro currently has strategic reserves of about 7 tonnes. Fajro contended that the Project, although very useful, missed the main halon peak as the equipment did not become operational until mid-1996. In addition, the slow halon-processing speed of the reclamation unit reduced profitability. Fajro sent halon that was too contaminated for reclamation to either of the two ODS destruction facilities in Hungary, which destroyed halon for about €4 per kg.

42. We evaluated the halon recovery and recycling as only partially successful, mainly because amount that was reported to have been recovered was very small (66 tonnes) relative to the installed base (2900 tonnes). In the time available, it was not possible to discuss halon recovery with other companies.

7.5 IMPACT DRIVER III: ENTERPRISE SUSTAINABILITY

7.5.1 GEF / World Bank Project

43. The GEF financed the replacement of ODS in Hungary in one commercial cooling manufacturer; three foam producers (insulation and two sandwich panel); one aerosol facility; one medical facility; and four facilities that used solvents (for control devices, circuit boards, shoes, and clothes dry cleaning).

44. In general, there were no specific financial incentives provided by the Hungarian government, such as increasing the cost of ODS to reduce the cost of ODS-free substances and technologies. Subsidies and low interest loan facilities that were arranged by the Central Environmental Fund arrived too late to assist companies to efficiently transition to ODS-free technology, so it took longer for the companies to comply with the phaseout of ODS.

Frigolux commercial refrigeration

45. Frigolux Ltd manufactures commercial cooling and freezing equipment. The factory employs 100 and produces 25-30,000 units per year. The GEF paid $440,300 for the replacement of 15.6t of CFC-11, CFC-12 and CFC-502 with HFC-134a in the compressor and cyclopentane for production of the foam insulation. The successful reduction in ODS (CFC-11 and CFC-12) compared with the increase in non-ODS (Figure 13). The number of refrigerators also increased with the ODS-free production system (Figure 13).

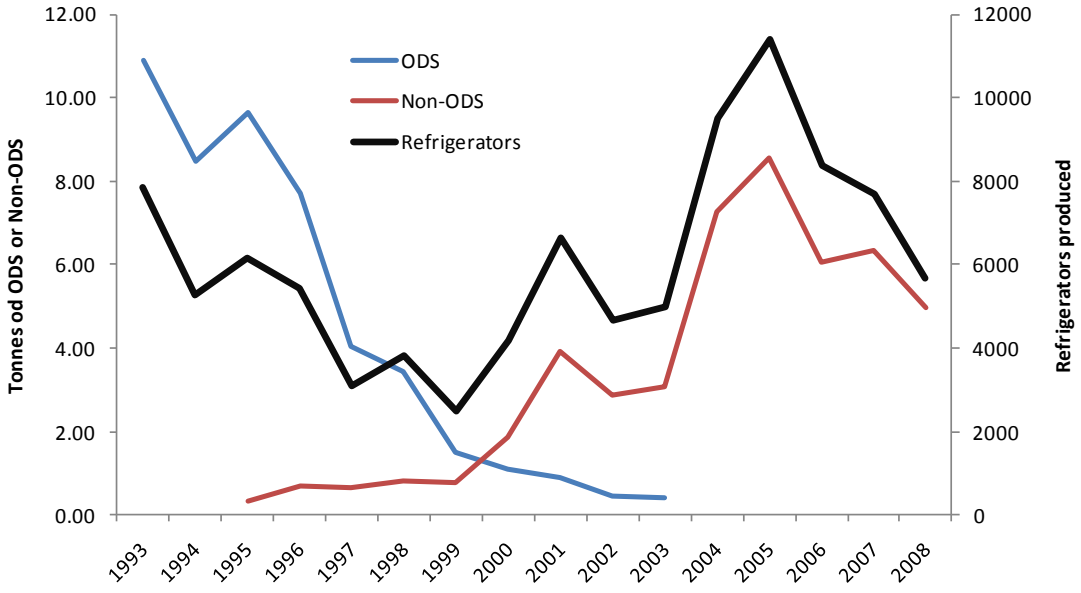

Figure 13: Refrigerator production from 1993 to 2008 using ODS (CFC-11 in the foam and CFC-12 in the compressor), and non-ODS (cyclopentane in the foam; R134a or R404a in the compressor)

46. The number of refrigerators exported increased significantly using the non-ODS methodology (Figure 14). Most of the refrigerators were exported to Germany and most recently to Switzerland which now accounts for almost 60% of export sales. The GEF project was crucial for increasing the competitiveness of the company in these lucrative export markets.

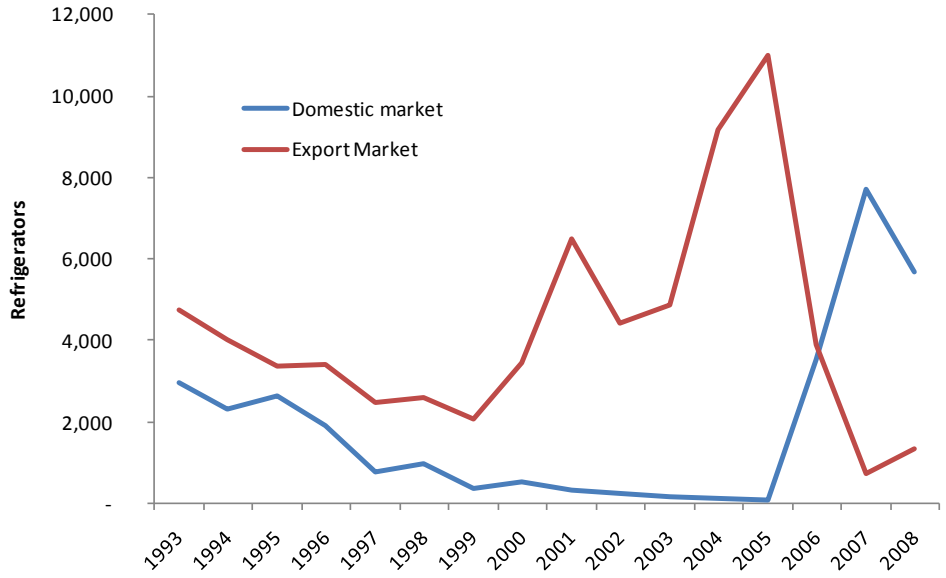

Figure 14: Number of refrigerators sold on the domestic market and exported. The Project installed ODS-free technology in 2000

47. The success of the technology conversion to non-ODS for refrigerator production resulted in the suppliers changing their technology to non-ODS equipment, refrigerants and components. Frigolux negotiated the price for the equipment from a choice of three suppliers. The equipment has been reliable, and the service of spare parts was very satisfactory. Frigolux regarded the transition as essential but incomplete, as R600 is now the commonly used as the refrigerator refrigerant.

Hajdúsági Iparművek hotwater tanks

48. Hajdúsági Iparművek (Hajdu) manufactures a range of household appliances including domestic and commercial hot water tanks, and employed 2,300 in 1993. The Project paid $1,010,700 to replace of 63.3t of CFC-11 with CO_2 propellant polyol-isocyanate PUR foam for the insulation of the hot water tanks. Hajdu undertook thermal insulation tests and as a result developed and launched a new range of tanks. The Project also covered the incremental costs in order to offset the higher price for the new tanks. Production of hot water tanks declined steadily prior to the Project, and then increased after the Project was completed in 1998 (Figure 15). The company did not attribute the increase in production to the implementation of ODS-free technology.

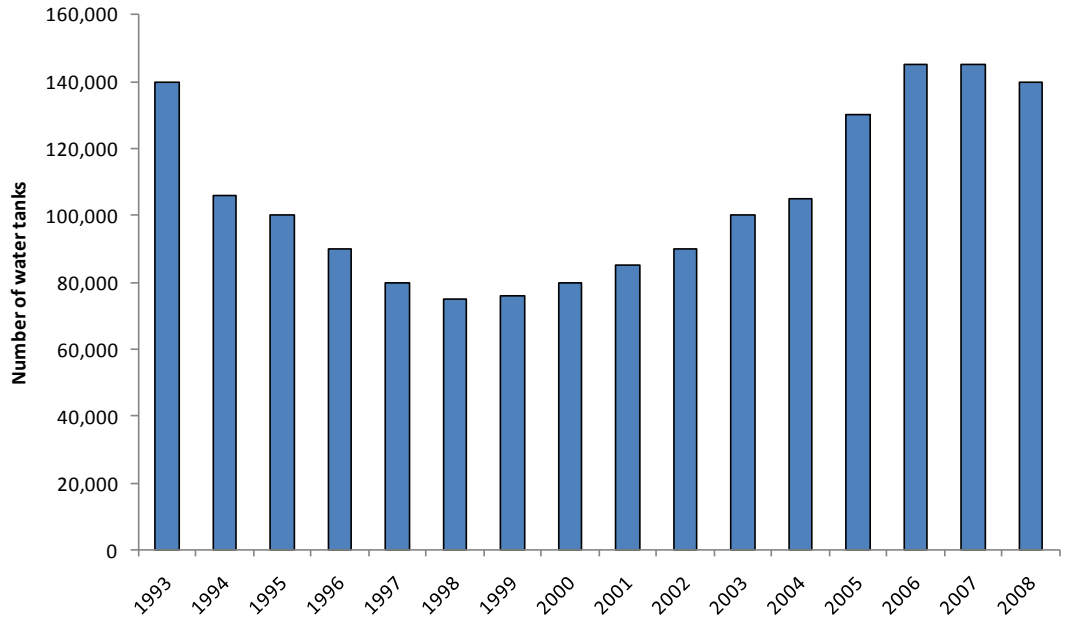

Figure 15: Number of insulated water tanks produced with ODS (before 2001) and non-ODS technology (after 2001)

49. Hajdu was satisfied with the Cannon equipment and the procurement process that was used to select the foaming machine. Hajdu said that the GEF funding promoted innovation and helped at the time to stabilise the finances in the company and to retain staff at a time when production was decreasing. The company is currently working two shifts for 5-days per week. The Project helped with the profitability of about 300 companies that supply equipment and 15 companies that supply chemicals to Hajdu. Hadju said that it planned to change from CO_2- to pentane-blown foam production within the next 3 years because the insulation quality will be improved.

Metalucon sandwich panels

50. Metalucon Ltd is one of the largest domestic producers of sandwich panels in Hungary that are used in halls, farm buildings, gymnasiums and coolstores. The GEF paid $683,200 for the replacement of 45.6t of CFC-11 (and later HCFC-141b) with cyclopentane for the production of sandwich panels. The Project also paid for the costs of certification by the Construction Quality Innovation Ltd, and incremental operating costs in order to offset the higher price for the panels. In 2009, Metalucon reported that the sandwich panel manufacturing equipment was used a great deal in the past, but today its use is about 1-day per month. The factory is operating 4-6h on a 4-day week. Metalucon has difficulty competing with cheaper Kingspan panels produced in Hungary.

Metisol sandwich panels

51. Metisol Ltd manufactures sandwich panels (Figure 16), and employs 36 staff (30 during the Project). The company operates one shift today due to the economic crisis, compared to 3 in 2005. The GEF paid $336,300 for the replacement of 80t of CFC-11 initially with HCFC-141b and then later with CO_2-foaming from polyol-isocyanate. The company had a choice of equipment and they chose Elastogran (Figure 17), which has performed well (the spares remain unused). Elastogran experts trained the technicians about 12 years ago. The same technicians currently operate the machine. The panels are now 30% thicker to have the same insulation value. The company pays the certification costs of about €10,000 every 2 years.

Figure 16: Sandwich panels that contain foam insulation. Metalucon, Hungary.

Figure 17: Sandwich panel manufacturing equipment. Metalucon, Hungary.

52. Metisol said that the Project funds financially advantaged the company in the longer term because it avoided the company purchasing second-hand foaming equipment, whose use would have been curtailed in the short term by legislative restrictions. In addition, the equipment improved the production and image of the company. Metisol referred to the World Bank project on its website. Metisol was critical of the 5 years in the Project that was required to implement the new technology.

Mediroll medical equipment

53. Mediroll Ltd manufactures gas-sterilizing cartridges for the sterilisation of plastic surgical instruments. The GEF paid $47,800 for the replacement of 107t of CFC-12 with HFC-134a, after HCFC-124 provided unsatisfactory. Together with another company, they financed the licensing of the HFC-134a/ ethylene oxide cartridges. Mediroll said that they were not able to provide information as legally they were required to retain information on the Project for 7 years after its completion which was 1998. Staff that were involved in the work had since retired. Furthermore, the gas cartridges could not be manufactured because ethylene oxide was banned in Hungary.

Auto-Mobil Chemical aerosols

54. Auto-Mobil Chemical Ltd produced during the Project about 2 million household aerosols per annum. They currently employ 18 staff. The GEF paid $81,300 for the replacement of 96.8t of CFC-11 propellant and 111-TCA solvent with propane-butane and aqueous cleaner respectively. The storage and filling site were reconstructed with appropriate explosion-proof, high-cost ventilation safety equipment. The project also covered the costs of training in the use of the new equipment, and incremental costs to offset the higher price for the aerosols on the market. The current owner of Auto-Mobile reported that they have neither information on the GEF funding or equipment, nor its benefit for the company.

MMG-AM control and automation

55. MMG-AM Ltd was the largest manufacturer of control and automation devices in Hungary. MEW reported that the company is now in receivership. The GEF paid $1,147,900 for the replacement of 90.5t of CFC-113 propellant and 111-TCA solvent with aqueous solvents, and the installation of two waste-water treatment facilities. The evaluation team could not determine if the ODS had been phased out.

Hitelap printed circuit boards

56. Hitelap Ltd manufactures printed circuit boards for electronic firms using sophisticated and expensive electronic and X-ray technology. The GEF paid $187,100 for the replacement of 32t of 111-TCA solvent with water-based solvents in two machines (Devmaster and Stripmaster), and the installation of waste-water treatment equipment (Figure 18). Both machines some 13 years later were reported by the company to be crucial for its operations. One machine has been refurbished with new control equipment and a high volume pump.

Figure 18: Stripmaster equipment with non-ODS solvent. Hitelap, Hungary.

Figure 19: Printed circuit boards. Hitelap, Hungary.

57. The Project encouraged the expansion of production from 5-600 m^2 to 10,000 – 11,000 m^2 of circuit boards (Figure 19)per year. The Project enabled the company to comply with environmental and safety legislation. The number of staff has increased since the Project from 80 to 92. They have reduced the shifts from 3 to 2 per day for most of their operations due to the current economic crisis.

Tisza shoe company

58. Tisza Ltd had in 1994 the production capacity for 700,000 polyurethane soles per year for shoes. The GEF paid $123,900 for the replacement of 23.6t of CFC-11 and 111-TCA solvent with new release agents, and sole washing device. The company financed a new sprinkler system and connections to an existing waste-water treatment plant. Soon after the plant was operational, Tisza established a daughter company that contained the GEF-paid equipment. The daughter company went into liquidation shortly afterwards, and the fate of the equipment is unknown.

BRG Communications telecommunications

59. BRG Communications Ltd manufactures portable telecommunications equipment. The GEF paid $11,600 for the incremental operating costs after the company paid for the implementation of flux-free soldering technology. The modern soldering technology removed the need for 1.5t of CFC-113.

Rutitex dry cleaners

60. Rutitex Ltd is a chain of laundries in Hungary that dry-clean about 10% of the clothes submitted by customers. The company works 2 shifts and employs about 7 staff in each of 4 sites. The GEF paid $346,300 for the replacement of 7.9t of CFC-113 and CFC-11 with 4 machines that operate on perchloroethylene solvent, and a system for capturing the sludge

waste for each machine. The waste is accumulated in a 44-gallon drum and taken for disposal at a waste treatment facility, thereby protecting worker safety[11] (Figure 20).

61. The Project enabled early amortization of the CFC-operated machines and enabled compliance with environmental legislation. His competitors that were not funded replaced their dry-cleaning equipment with open-top cleaners that were subsequently banned under the VOC directive, and they went bankrupt.

Figure 20: Used perchloroethylene dry-cleaning solvent captured in tank for later disposal. Rutitex, Hungary.

Summary of ODS phase out by enterprises

62. There were a large number of investment projects in Hungary, compared to other CEITs. It was not possible to assess the sustainability of four of the companies that were responsible for phasing out the most ODS as there was no information provided by three of them (total 227t) and one had recently gone into receivership (91t). However, the six remaining companies (244t) were assessed as more or less successful in the market today, and therefore the GEF finance of their conversion to non-ODS technology had a sustainable impact. Some of these companies reported that after the conversion to non-ODS technology, their production increased, they exported to more markets including more lucrative ones, and they became more competitive internationally. They became compliant with environmental legislation that was not only related to ODS. As a result, the companies became more financially stable than prior to the Project. Two of the companies wanted to be converted to a further technology that would improve their competitiveness still further.

7.5.2 UNDP/UNEP Regional Project - methyl bromide phase out

Zephyr agricultural services

63. Zephyr Ltd is the distributor for Nemasol (51% metam sodium) and an owner of two spaders and a tractor (Figure 21). The rotary spader was neither particularly well suited to the GH and PT conditions, nor to driving on the road to farmers' properties, but the company undertook no significant modifications to improve both aspects. After MB was banned, the quantity of Nemasol for nematode control increased 8 times. Nemasol is about half the cost of MB. Despite the reduced cost of the alternative, Zephyr was not able to put the rotary spaders to full use because of the increase in the use of soilless cultivation, which now extended to about 50% of the company's previous MB-fumigated area.

Figure 21: Rotary spader adapted for use in glasshouses with nematocide as liquid (front tanks) or granules (red rear tanks). Zephyr , Hungary.

64. Zephyr provided a range of services (fertilizers, fumigation) and advice to growers including

[11] Long-term exposure to perchloroethylene can cause leukemia and cancer of the skin, colon, lung, larynx, bladder, and urogenital tract

training (3 courses provided in the Project). Zephyr expressed an interest in being more active in bio-control. The company valued the Project because it laid the foundation for an expansion of more sustainable pest control methods. However, it took too long to execute because of administrative and procurement delays, to the extent that the company missed the season for MB-free fumigation.

65. A recent development had increased the prospect for greater use of the rotary spaders. A German company had recently purchased land for the production of strawberry runners, which was a new crop for Hungary. Strawberry runners have been traditionally produced in the EU in Poland, the Netherlands and Spain. Countries that produced strawberry runners were required to obtain an exemption ('critical use') from the Parties to the Montreal Protocol for the use of methyl bromide after 1 January 2005. As the equipment and nematacide for strawberry runner production is now available to Zephyr, due to the funding for the GEF project, Hungary is in a position to produce strawberry runners without methyl bromide. Production of strawberry runners presented a new business opportunity for Zephyr.

Arpad glasshouse

66. Árpád Ltd uses underground thermal energy to heat about 40ha of glasshouses for tomato and pepper production on soilless media (Grodan rockwool) (Figure 22). The company founded Árpád Biokontroll in 2003. Árpád replaced pesticides with a range of predatory insects (Figure 23) and mites to control pests on 9.8 ha of tomatoes and peppers (red and sweet). This area was expected to double in 2010. Árpád Biokontroll had expanded its business to become the agent for Biobest, who is an international producer and marketer of beneficial insects and mites for biological and integrated crop protection.

Figure 22: Sweet peppers and tomatoes grown in rockwool soilless media without methyl bromide. Arpad, Hungary.

Figure 23: Insect predators replace pesticides (left) in large glasshouses (right). Arpad, Hungary.

67. Other growers affiliated to Árpád were being trained in bio-control methods. Árpád offered 10-15 courses each year. The cost of bio-control was now about equal to pesticide control, but the market paid 10-15% more for food produced from a bio-control program. Árpád helped to establish the growers packing and marketing cooperative DélkerTész Szentes in 2002, which represented 530 growers (80% of total) and shipped 30% of the product out of Hungary in supermarket-ready packaging. The company packed 48 tonnes of produce per day in 2.5 shifts. They were developing a brand image for the area and the production methods.

68. Árpád was satisfied with the soil fumigation equipment that they received in the Project. They modified the equipment to improve coverage in the glasshouse by removing one of

the tanks. Stability was improved with a weight on the front. The machinery was used mostly in the summer season. Árpád predicted that the use of the equipment would decrease further as bio-control programmes become more widespread.

Summary of the contribution of companies to the phase out of methyl bromide

69. Both Zephyr and Árpád have driven the methyl bromide phase out in a way that is a model for other companies to emulate. They have adopted the alternative technology, modified it where necessary, and treated the soil for nematodes without the use of methyl bromide for several years after the Project was completed. The use of the spaders has declined with the expansion of artificial soil in which nematodes were no longer pests. Árpád in particular is a pioneer in bio-control technology in glasshouses which is very successful. The programme has had a catalytic effect on the growers locally as the cost of bio-control was about the same as chemical control. The programme to eliminate methyl bromide stimulated a revolution in the production of food with minimal chemical input, and Árpád is one of the best leaders of this revolution.

7.6 IMPLEMENTING AGENCIES

70. Hungary commented that the process of training for, and familiarisation with, the World Bank procurement procedures substantially increased the procurement duration. Only 25% of finance had been disbursed to enterprises by 31 December 1996, but increased to 80% by May of 1997. The Bank provided a 3-day training programme and booklets on procurement, which were reported to be helpful.

71. The Project termination was delayed for several reasons: MERT was under-resourced at the beginning of the Project, and the approval of the GEF Council was delayed. Project implementation was further delayed by the requirement for certain components of the high pressure foaming machines to be replaced by ones containing an explosion-proof design suitable for use with cyclopentane, in order to comply with Hungarian safety standards.

72. The Project was useful for ensuring that Hungary remained in compliance with the EC Regulation from 1 January 2006, by improving the prospects of a sustained phase out of methyl bromide through the provision of pre- and post-harvest fumigation equipment, by supplementing Hungary's knowledge on the use of alternatives, and by providing information and equipment to Hungary on postharvest IPM and non-chemical methods of pest control.

7.7 IMPACT THREATS / RISKS

7.7.1 Illegal trade

73. At the time of the Project, the PIU considered that the Customs officers should have been trained in ODS detection of illegal ODS *before* the legislative ban on ODS was implemented in 1996, in order to be better prepared to counteract the 'surge' in illegal ODS imports which undermined the implementation of alternatives to ODS. This risk is no longer applicable as Hungary has a customs officers trained to detect illegal ODS, and has put in place legislation to support them in this activity.

7.7.2 Recovery, recycling, reclamation and destruction

74. Hungary has an ongoing programme to recover, recycle and reclaim ODS, and to destroy any that is not re-usable. The legislation that has supported the training of technicians and the programme in general was reinforced in the past 2 years with the requirement for a more formalised training, inspection, monitoring and reporting programme for F-gases. It is inevitable that ODS will be included in the same requirements since F-gases and ODS are installed in similar equipment. The prospects for any reduction in attention to ODS in the

training and recovery programme seem unlikely.

7.7.3 Methyl bromide

75. All farmers have eliminated the use of methyl bromide. However, the majority of vegetable-producing farmers are still dependent on chemical fumigation, which may not be sustainable due the toxicological review required under Regulation (EC) No 91/414 that has led to restrictions on the use of many fumigants and the elimination of many of them. The possibility of going back to methyl bromide is not an option as there is now a diverse array of legislation in the EU that closes off this option. While the bio-control procedures are the most sustainable, they are also the most knowledge-intensive, so training will become key. Companies such as Árpád with their bio-control programmes will become the norm, not the exception. The training infrastructure and methodology developed in this Project could be used to expand the use of soilless media and bio-control by all farmers. Marketing and branding of products that have been produced as a result of these biocontrol programmes has been initiated, and the revenue from them could be expanded to broaden the marketing opportunities.

7.7.4 Government commitment

76. The government of Hungary, by its policies, legislative measures and actions, has demonstrated that it is fully committed to the phase down and elimination of ODS. Hungary's approach to ODS control and management was reinforced several years before it joined the EC in 2004, and has continued after that time. There is very little risk that this commitment by Hungary to continue to eliminate ODS will waiver.

7.8 IMPACT ON THE PHASE OUT OF OZONE-DEPLETING SUBSTANCES

77. The objectives of the GEF/World Bank project were fully met. The ODS that was used by enterprises was eliminated, which was one of the factors that assisted Hungary to continue to fully comply with the ODS phase out schedule in the Montreal Protocol.

78. MEW expressed general satisfaction with the outcome of the Regional Project on methyl bromide. There was a need for better monitoring of the technical efficacy of the alternatives and their cost-effectiveness. Árpád and Zephyr as two of the principle enterprises also provided comments which are included above.

79. The sustained phase out of methyl bromide since 1 January 2004 has maintained Hungary's compliance with the Montreal Protocol and with EC legislation on ozone-depleting substances. Therefore, the objective of the Regional Project to phase out methyl bromide in Hungary was achieved.

80. The Project strengthened Hungary's stakeholder understanding of environmental legislation, as well as promoting greater ministerial and institutional cooperation. It provided a springboard for the companies involved in the phase out of methyl bromide to explore more environmentally-friendly techniques, which may eventually lead to a non-chemical treatment.

8 KAZAKHSTAN

8.1 BACKGROUND

81. Kazakhstan declared independence from the Soviet Union in 1991. The years following independence have been marked by significant reforms to the Soviet command-economy and political monopoly on power. There was a significant increase in company privatisation and expanded economy activity in the mid-1990's. Since 2000, Kazakhstan has enjoyed significant economic growth, partly due to its large oil, gas and mineral reserves.

82. In 1997, Kazakhstan used ozone-depleting substances (ODS) for refrigeration (61%), foam (22%), halon (16%) and solvent (1%) uses. The increased consumption of ODS reflected the strengthening of the economy in the late 1990s. Kazakhstan's CFC consumption had almost doubled from 1,206 ODP-tonnes in 1991 to 2,218 ODP-tonnes in 1993[1]. Kazakhstan's ODS consumption in 1998 when the country programme was being formulated was 1971 ODP-tonnes[2], of which 52% were CFCs that should have been phased out 2 years earlier. At that time, Kazakhstan did not produce or export ODS, but imported ODS from the Russian Federation.

83. The Republic of Kazakhstan acceded to the Vienna Convention and the Montreal Protocol on 26 August 1998; and the London Amendment on 26 July 2001. Kazakhstan has yet to ratify the Copenhagen, Montreal and Beijing Amendments. As a developed country, Kazakhstan was required to comply with the requirements of the Montreal Protocol which required to phase out of the consumption of halon on 1 January 1994; and CFCs, methyl chloroform and carbon tetrachloride on 1 January 1996.

84. Kazakhstan was in non-compliance with the Montreal Protocol each year from 1996 to 2001 due to the consumption of CFCs and halon, at time when consumption of both should have been zero. Kazakhstan notified the Parties in 1996 that it expected to be in non-compliance until at least 2004. The Parties to the Montreal Protocol noted[3] in 2001 that Kazakhstan committed to benchmark targets for ODS that:

    1) Reduced CFC consumption to 162 (2002), 54 (2003) and zero (2004) ODP-tonnes;
    2) Established a system for licensing imports and exports of ODS by 1 January 2003;
    3) Banned imports of ODS-containing equipment by 1 January 2003;
    4) Reduced halon consumption to 5.08 ODP-tonnes in 2002 and zero by 2003;
    5) Phased out CTC and methyl chloroform consumption by 1 January 2002;
    6) Reduced methyl bromide consumption to 2.7 (2002), to 0.44 (2003), and zero (2004) ODP-tonnes[4].

85. The Parties in 2001 urged Kazakhstan to work with the relevant implementing agencies to

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1 Ozone Secretariat Data Centre. 28 April 2009. Data reported by the Parties under Art 7 of the Montreal Protocol.
2 Ozone Secretariat Data Centre. 28 April 2009. Data reported by the Parties under Art 7 of the Montreal Protocol.
3 Decision XIII/19. 2001. Compliance with the Montreal Protocol by Kazakhstan.
4 Decision XVII/35: 2005. Potential non-compliance in 2004 with the controlled substances in Annex A, Group I (CFCs) by Kazakhstan, and request for a plan of action

reduce its consumption of ODS. The Parties noted in 2005 that Kazakhstan had not implemented a ban on ODS-containing equipment, and that CFC consumption in 2004 was 11.2 ODP-tonnes instead of zero, both being commitments given by Kazakhstan in 2001. From 2004 until 2007, Kazakhstan has reported consumption in excess of the quantities applicable to developed countries in the Montreal Protocol for HCFCs. Similarly for 2006 and 2007, Kazakhstan reported consumption in excess of the quantities applicable to developed countries in the Montreal Protocol for methyl bromide.

8.2 INPUTS

86. The GEF budget was approved on 9 February 2000 and completed on 31 July 2005, including one extension that delayed closure by 19 months. The main causes of the delay were administrative and implementation difficulties. The total budget was $6,182,291 which consisted of $5,433,452 from the GEF, $110,000 from the government of Kazakhstan and $638,839 from private enterprises.

87. The Project aimed to phase out 679 ODP-tonnes of ODS by:

1) Establishing a network of refrigerant recovery, recycling ("3R") and reclamation operations that would provide sufficient CFCs to service existing equipment; and to undertake training in the best practices of refrigerant management to minimise emissions of CFCs in the stationary and mobile air-conditioning systems;
2) Eliminating the use of CFCs used in flexible and rigid foam production;
3) Eliminating the use of CFC-113 as a solvent in the manufacture of liquid chlorine;
4) Establishing a halon bank to service existing fire protection systems until halon-free fire protection systems are installed; and
5) Strengthening the government institutional capacity to coordinate and manage the phase out of ODS, including providing training to Customs officers to improve the monitoring and control of ODS. UNDP and UNEP were the Implementing Agencies for the investment and technical assistance sub-projects respectively.

88. The budget allocated to each of these sectors is shown in Table 11.

Table 11: Summary of GEF Programme

Title	Project Number	IA	Prodoc Signature	Duration	Phase-out target (ODP-tonnes)	GEF budget* ($)
Country Programme & Project Preparation in Kazakhstan and Tajikistan (50% of combined UNDP & UNEP budgets)	RER/98/G41	UNOPS /UNDP UNEP		1 year	N/A	171,500
National Programme for recovery & recycling of refrigerants	KAZ/00/G31	UNOPS /UNDP	Sept 2001	3 years	359.6	2,545,219
Terminal Umbrella Project, Rigid Polyurethane Foam	KAZ/00/G33	UNOPS /UNDP	Sept 2001	3 years	104.9	1,154,374
Technical Assistance Project, Flexible Polyurethane Foam	KAZ/00/G34	UNOPS /UNDP	Sept 2001	3 years	45	285,120
Replacement of CFC-113 in the cleaning of oxygen manufacturing equipment at Pavlodar	KAZ/00/G35	UNOPS /UNDP	Sept 2001	3 years	6	106,920
National halon management scheme programme	KAZ/00/G36	UNOPS /UNDP	Sept 2001	3 years	101.9	163,231

Title	Project Number	IA	Prodoc Signature	Duration	Phase-out target (ODP-tonnes)	GEF budget* ($)
Train the Trainers	GF/4040-01-13	UNEP			N/A	1,091,275
Institutional Strengthening					N/A	
Total					**617.4**	**5,517,639**

* This amount includes UNOPS / UNEP Executing Agency Support Cost and Project Support Services given by the UNDP country office; IA = Implementing Agency

89. The Project was initially developed and coordinated by a National Ozone Unit (NOU) established in the National Environmental Centre for Sustainable Development (NECSD) within the Ministry of Natural Resources and Environmental Protection (MNREP). NECSD was supported by an interdepartmental commission consisting of MNREP, and representatives from the Ministries of Energy; Industry and Trade; Transport; Communications and Tourism; Defence; Health and Sport; State Revenues (includes Customs Committee); Agriculture; and Science & High Education. The Agency of Statistics was also a member of the commission.

90. About 2 years after the start of the Project, a National Ozone Office[5] (NOU) was established in the Climate Change Coordination Centre (CCCC)[6] in June 2002. Its mandate is to serve as the national implementation and coordination agency for projects on ozone layer protection (OLP) decided by the MNREP. Today, there are 6 staff within CCCC that work on OLP. About 30% of the funding received by the CCCC is used for OLP. CCCC is funded through commercial contracts with clients and by grants received from international donors. The MNREP contracts CCCC for specific tasks, such as the maintenance of a database on ODS (contracted since 2003). The CCCC competes with the Kazakhstan Scientific and Research Institute of Ecology and Climate (KSRIEC) for funds. Work in the future on the phase out of HCFCs may be contracted to the Institute, with a sub-contract to CCCC. In this context, the UNEP funds for institutional strengthening that were approved for two 3-year periods (from 2002 – 2005; December 2008 to 2011) were regarded by the NOU as relatively small but important for their ongoing activities.

8.3 IMPACT DRIVER I: GOVERNMENT COMMITMENT

8.3.1 Institutional and legislative strengthening

91. Legislation was developed by the NOU and submitted for approval by MNREP. The legislation, which is summarised in Table 12:

1) Publicized the Montreal Protocol restrictions on trade in ODS and equipment[7];
2) Restricted ODS activities associated with the repair, servicing and assembling of ODS equipment[8];
3) Banned the import of Annex A, B & E substances and products that contain them[9];
4) Required companies to have a licence to import/export ODS[10], and a simplified version of the same requirement published 3 July 2007; and

[5] Called NOU in this report to allow comparison with other CEITs, even though the acronym is NOU
[6] Decree of 13 June 2002. The CCCC is a NGO / consulting organization which is institutionally located outside of the government.
[7] Decree No 681, 10 July 2003.
[8] Resolution No 19. 8 January 2004.
[9] Decree No 617. 22 June 2005.
[10] Resolution No 19. 8 January 2004.

5) Promulgated the permissible levels of ODS emissions from enterprises[11].

Table 12: Legislation in Kazakhstan regulating the production, consumption, export and import of ozone-depleting substances

Date	Number	Title and short description
November 1999	Decree No. 1716	• Introduced a legal system for regulation of ODS import and export
13 June 2002	Registry number	• Establishment of the Climate Change Coordination Centre
10 July 2003	Decree No. 681	"*On adoption of import and export prohibitions for transportation of goods and means of transport, the list of goods forbidden to be placed under certain customs regimes and also prohibitions and restrictions on carrying out operations with goods placed under certain customs regimes*" • Banned the import of some types of ODS
8 January 2004	Resolution No. 19	"*On Environmentally Dangerous Activities and their Obligatory Licensing*" • Licensing of ODS activities including the repair, assembling and servicing of ODS-containing equipment; • Import/export licensing of ODS and ODS-containing products. Import and export of ODS were added to the List of ecologically dangerous economic activities • Ban on the import of products containing ODS • Quotas limits for carbon tetrachloride, methyl chloroform and methyl bromide
22 June 2005	Decree No. 617	• Ban on the import of CFCs, halons, CTC and methyl chloroform. • This decree was replaced by Decree No 508 in 2007.
9 January 2007	Decree No. 212	"*Environmental Code*" • Introduced registration and control over ODS consumption.

92. The NOU in 2005 also prepared documentation for the ratification of the Copenhagen (1992) and Beijing Amendments (1999)[12]; prepared in 2009 documentation for HCFC quotas for effect after 2010; and prepared documentation that required companies to report on the ODS imports/exports to the Ministry and Customs Service.

93. Legislation in Kazakhstan required all companies operating with ODS to pay an "ecological insurance" (see page 102 Section 8.5: Enterprise Sustainability), which deterred both the import and the use of these refrigerants by SMEs. The larger servicing companies reported it was affordable, whereas the smaller companies complained that its cost was too high.

94. All companies were also required by legislation to submit a form annually to the MNREP on the type and quantity of ODS that they used or imported. Since 2004, the NOU maintained a database on the quantity of ODS installed in companies, and the quantities of ODS that each company had import/export. However, there were also no statistics provided to the evaluation team as a result of an analysis of the information submitted by companies. There were no inspections of the companies by environmental Inspectors to verify the reports received and to follow up on cases of non-compliance. The requirement for

[11] Decree 350. 13 December 2007.

[12] Ratification status of Kazakhstan, as at 10 May 2009. Kazakhstan ratified the Vienna Convention and Montreal Protocol on 26 August 1998, and the London Amendment on 26 July 2001.

companies to have a permit when working with ODS was suspended recently, because the government did not want do discourage work during the current economic crisis.

95. In general, the legislation has been approved by the government too slowly to fully support the reduction and phase out activities. For example, the Copenhagen and Beijing Amendments have not been ratified by the government. Both amendments bind countries to specific actions on methyl bromide and HCFCs. To some extent, Kazakhstan has compensated for this by already putting in place legislation that controls both ODS.

8.3.2 Customs and border security

96. Work undertaken by Kazakhstan to combat illegal trade consisted of training of customs officers, and legislation that supported activities undertaken by the Customs agency.

97. In 2003, 61 Customs officers were trained in two courses[13] on the different types of ODS and equipment packaging and hazardous chemicals. They were provided with "*Guidelines on ODS import/export regulation in the Republic of Kazakhstan*" which was included as a module in subsequent training courses. The Customs Agency reported that they received 100 Refrigerant Identification Machines (RIMs), as supplied by the Project to Customs officers for use at the border. In Kazakhstan, there are 168 border points and about 5,000 customs officers.

98. The RIMs were deployed mostly on the border with China. They were reported to be simple to use but not particularly practical, as the batteries ran down quickly and their portability was reduced when they were plugged into mains power. Some MAC equipment examined at the border gave false positives, and they relied mainly on MAC size to determine whether it was legal to be imported or not. They did not have connector equipment to take an ODS sample from the circuit of a refrigerator or compressor. If a sample of ODS were to be taken, the only laboratory that could determine the type of ODS was not accredited for this purpose, as a special column was needed for the gas chromatograph equipment which had yet to be purchased. Very seldom were trucks turned back as a result of customs checks, which was estimated to be once per year.

99. The Customs reported that there was no legislation in place that could prevent the entry of illegal ODS, even if the officers were to intercept it. The Customs Agency anticipated that MNREP would develop the legislation in cooperation with the Customs Agency, which would then empower officers to intercept illegal trade and prosecute smugglers successfully. However, legislation had been adopted in 1999, 2003 and 2004 (see Table 12) that established a list of ODS and ODS-containing products and their transport.

100. It was not clear why Customs reported that there was no legislation in place to combat illegal trade in ODS, particularly as Kazakhstan had intercepted illegal trade in ODS in the past and had taken potential violators to court. In 2007, Customs officers seized 7 cylinders of HCFC-22, 2 cylinders of HFC-134a and 1 cylinder of R409A that were hidden on a train travelling from Russia to Kazakhstan[14]. As the HCFC-22 imports were not licensed they were classed as illegal, and a criminal case was launched against the train company within 5 days of the interception. Kazakhstan did not report on the outcome of the case.

101. The impact of the Kazakhstan's work on border security has been partially successful. The Customs were not aware of the legislation that had been implemented in Kazakhstan to control illegal trade in ODS, possibly because the training was undertaken 5 years ago and that the officers in place now were not those that received the training. The NOU did not

[13] Astana 3-5 March 2003; Almaty 22-24 December 2003.

[14] Rodichkin, S. 2008. Illegal Transport of ODS in the region of the Regional Intelligence Liaison Offices (RILO) WCO for CIS countries in 2007. UNEP regional ozone network for Europe and Central Asia. Paper No 52.

report that further training of Customs officers had taken place more recently. Given that the legislation is in place and that it does empower Customs to take action on illegal trade, and that Customs have received ODS detection equipment and training, it remains for Customs to be more proactive in monitoring ODS and the border and in taking action when illegal trade is detected (see Threats / Risks section below).

102. In order to address the illegal trade, on 15 December 2007 Kazakhstan launched a programme in cooperation with China at the «Kalzhat - Dulat» and «Maykapchagay - Zimunay» border crossings. Kazakhstan customs required the exporter to provide a description of the imported goods in Russian or English to facilitate an understanding of nature of the goods being imported.

8.3.3 Awareness raising

103. The NOU carried out Awareness Raising workshops in 2005 and 2006 that targeted at the general public and industry, which were reported by the newspapers, radio and TV. Contests were held on the Ozone Day, there were posters by children, and essays on ozone and climate change issues. A brochure was published called "*Ozone Story*". T-shirts, caps, and pens with UNEP and OLP logos were distributed.

104. As in many other countries, Kazakhstan undertook activities on Awareness Raising to shore up support from the public, government and business stakeholders for legislation and activities that would restrict and eventually phase out ODS. A baseline and performance indicators to measure the benefits of ODS reduction as a result of the awareness programme were never developed. These could have been, for example, before and after data on the number of ODS-free refrigerators bought by the general public, an increase in ODS refrigerators being sent for recycling, demand for information on the website (as number of hits) on ODS-free alternatives. It was therefore impossible to evaluate the impact of the awareness programme.

8.4 IMPACT DRIVER II: RECOVERY AND RECYCLING PROGRAMME

105. This programme aimed to recover, recycle and reclaim as much refrigerant as possible during the transition period between CFCs and CFC-free technology, at a time when imports of CFCs were banned. Therefore, the only available CFC refrigerant to service existing equipment was obtained from the CFCs in the market that were recovered, recycled and reclaimed ('3R'). This programme consisted of two parts:

1) Training of technicians in refrigeration management; and

2) Distribution of equipment for ODS recovery, recycling and reclamation activities.

106. In Kazakhstan there was also a programme to recover and bank halon for fire protection uses where alternatives to halon had yet to be developed. Halon banking was important in many countries as the consumption of halon was required to be zero in 1994, which meant that only recycled halon could be imported if there was insufficient recovered and banked material available locally.

8.4.1 Training of technicians in refrigerant management

107. Training was undertaken to improve the skills of technicians that repair, service and assemble ODS equipment. In 1999, there were about 5,600 technicians that worked in 340 registered refrigeration service enterprises (RSEs)[15], covering domestic, commercial, industrial, transport (car, truck) and railway wagons. In the 3R sub-project, a total of 394 technicians were trained in 6 workshops in 2002 to 2003 in all the regional centres of

[15] NECSR-MNREP. December 1999. Country Programme for the phase out of ODS. Table 2.7, page 20.

Kazakhstan. A train-the-trainers programme was carried out 3-5 March 2003. In 2004, 2,160 specialists were trained from 355 companies, 4 NGOs, 5 Regional Environmental Protection Administrations, universities and the military. In 2004 and 2005, 811 specialists were trained in good practices in MAC domestic, industrial and automobile conditioners. The total number trained in the 3R sub-project was therefore 3,365 personnel in 51 training sessions in all regions of the country. A trainee that passed the course received a Manual and a certificate.

108. The training centres provided documentation and examples of 3R equipment. Guidelines were published entitled "*Good Practices in Servicing Refrigeration and Air Conditioning Systems*". The NOU attempted to establish a Refrigeration Association, but this was unsuccessful because of rivalry between potential association leaders. One of the larger companies formed an association with some companies, but it was not considered representative of refrigeration enterprises in Kazakhstan.

109. The refrigerant training syllabus was comprehensive and included retrofitting of refrigeration equipment, leak detection and prevention of emissions, typical failures in refrigeration, blends and alternative refrigerants, safety when working with refrigerants, recycling and recovery of refrigerants, licensing systems for import/export, storage and destruction of contaminated ODS, and guest lectures on the ozone layer from 3-4 invited experts. The course covered both theory and practice, with individual attention provided to each technician to ensure they knew how to use the recovery machines. Several companies commented positively on the course and appreciated the ability of technicians to be able to start work on recovering ODS as soon as they had completed the training (see Polair comments on page 103 in Section 8.5: Enterprise sustainability).

110. Training has been ongoing almost every year after the Project finished, but with fewer trainees. The NOU reported that 60 technicians were trained in 2005, and then 12 or 13 in each year since 2006. None were trained in 2008. The KSRIEC in cooperation with the NOU expects to deliver a 4-day training course later in 2009 to technicians from 15 companies (fewer than expected because of the economic crisis). The fees paid by the students covered the trainers' costs, which indicated that the programme was sustainable.

111. The NOU reported that about 1,800 technicians that worked on refrigeration and air-conditioning equipment were called '*independents'* and might not have completed a training course. The Taxation Department and the Ministry of Ecology were reported to "*pursue*" independents that advertise for work on refrigeration equipment without the necessary qualifications, as a result of informal advertisements placed in the street by independents. This suggested that the training programme was sustainable, albeit at a lower level. However, given the number of technicians that have yet to be trained (1,800), the evaluation team assessed the training component as partially successful.

8.4.2 Recovery, recycling, reclamation and destruction

112. The 3R sub-project provided 695 recovery machines, 50 manual pumps/bags and 59 recovery and recycling machines. A refrigeration expert in Kazakhstan chose the type of equipment, and some of the major companies helped to distribute it to the RSEs. All of equipment was used, except the 500 litre bottles which were considered too large. The most useful sizes were the 10, 20 and sometimes 40kg bottles. The 3R equipment was sought after by enterprises because it avoided the need to purchase CFCs, which were not readily available. Further comments on the value of the 3R equipment were provided by 5 enterprises: Oasis, Combitech, Polair, Torg Teknik and Auto Klimat (see page 102 Section 8.5: Enterprise sustainability).

113. The criteria that qualified companies for the 3R equipment appeared to include only

attendance at a training course. There was neither a financial viability test of the companies, nor a test of their equipment that was needed to submit reports on recovery and recycling, such as fax or computer. The NOU estimated that 30% of the companies had never reported any data.

114. Companies reported that the 3R equipment enabled them to save on CFC purchases and thereby increased profit margins. However, companies reported that the concept for the 3R programme was generally too late as most of the CFCs had already been emitted. In general, the equipment was widely reported to have been used during the project, but not afterwards.

8.4.3 Unwanted refrigerators

115. Unwanted refrigerators are a source of ODS that can be recovered and recycled. Legislation adopted in 2005 banned the disposal of unwanted refrigerators in a landfill, and required municipalities and companies to put in place procedures to manage the environmentally-safe recovery of ODS.

116. Used refrigerators were sent to the metal recycling facility, after the ODS was removed from the compressor circuit but not from the foam (which contains about twice the quantity of ODS as the compressor).

8.4.4 ODS destruction

117. The NOU reported that there were no ODS destruction facilities in Kazakhstan and no legislation on destruction of ODS. The NOU anticipated that a facility would be constructed in the future in Kazakhstan for the destruction of POPs chemicals, which would also be suitable for destroying ODS. There are cement kilns in Kazakhstan, but their modification for ODS destruction would cost about $200,000. Shipment of unwanted ODS to the European Union for destruction was considered too costly.

118. Many companies reported that they were running out of space to store contaminated ODS and, moreover, they were frustrated by the lack of solution to the problem. One of the enterprises preferred contaminated ODS to be accumulated at a central facility, rather than the present decentralised system which was less secure.

119. Some companies and the NOU were concerned that the effort to recover and reclaim ODS was being undermined by the lack of destruction. There was no provision for destruction in the original project design. There is now a risk that the unwanted recovered ODS will be emitted by private companies due to storage constraints and /or leakage from containers overtime. .

8.4.5 Amount of ODS recovered and recycled

120. In return for receiving the 3R equipment, RSEs were required to report on the amount of refrigerant recovered, recycled and reclaimed. However, no legislation had been put in place that mandated all companies to report annually to the Ministry of Environment (MoE) on the amounts recovered, recycled, reclaimed and destroyed. The NOU reported that only about 30% of the 700 users of 3R equipment actually submitted reports to the NOU on ODS recovered and recycled. Reports were not received from those that did not have access to fax or email.

121. Some companies reported on the lack of legislation also discouraged their ongoing 3R activities, as there was no legislation that banned emissions of ODS and instigated fines. The '*ecological insurance*' on virgin HCFCs dissuaded smaller companies from using them altogether, and encouraged them to use other refrigerants without having to pay the cost of the insurance. There appeared to be some confusion on the cost of the insurance and how it was applied to companies, and whether or not it applied to recovered HCFCs. It

seemed timely for the government to clarify such issues, particularly as one company estimated that half of the refrigeration and air-conditioning equipment in Kazakhstan currently relied on HCFCs.

122. The targeted ODS was more than 350 ODP tonnes recovered and recycled, which was about half of the total ODP targeted in the whole GEF Project. It was difficult to assess the success of the recovery and recycling programme because information was not available on the quantities that had been recovered and recycled in Kazakhstan. Legislation was not in place that required mandatory reporting. Although reporting by companies was a condition of receiving the equipment, the NOU reported that it had not seen the results from the 3R reports that were sent to the Environmental Research Institute for collation and analysis of the ODS recovered, recycled and reclaimed by the RSEs.

8.4.6 Halon

123. The GEF budgeted $163,231 for equipment[16] that would allow halon to be recovered and reclaimed. Halon 1211 is required by the aviation industry for fire protection on aircraft, in the absence of an ICAO-approved alternative to halon. The NOU was required to undertake a targeted awareness campaign to make halon users aware of the halon bank and its reclamation service, and alternatives to halon that should be used to replace halon. The Ministry of Emergency's State Fire Department (SFD) received the equipment in 2004 (originally scheduled for August 2002), which was installed at the Polygon Research Centre (PRC) about 18 km from Almaty (Figure 24).

Figure 24: Cylinders of halon at the Polygon Research Centre, Kazakhstan.

Figure 25: Little-used halon recovery and reclamation equipment. Polygon Research Centre, Kazakhstan.

124. Two experts were trained on how to use the equipment installed at PCTC (Figure 25), but they left some time ago and they had not been replaced. The last change of the filters was August 2003, suggesting that the use of the facility terminated shortly afterwards. The SFD was not aware of reclamation centres in the region, or how technicians could be financed if they were to be trained. The SFD is not financed by the central budget of the Department of State Enterprise. Instead, the SFD is required to contract its services by, for example, undertaking research for companies in the SFD's Research Institute or extracting contamination from soil.

125. SFD surveyed halon users from 2002 until 2006 and established a database of the halon type, quantity and location. The database was not updated after 2006 because there was no financial support for this activity. Although the database was not available, the SFD

[16] Remtec International C700 Halon recovery unit, leak detectors, manual, filter drier assembly, scales, standards and other equipment; and a Merlin M-75 Re-circulating Chiller

recalled that 85t of halon 2402 had been stockpiled over a 4-year period. A further 5t of halon is available in enterprises in Kazakhstan but SFD did not want to collect it because of the cost of storage. SFD reported that legislation was not in place that required halon to be recovered, which made the process of collection more difficult. Finance from the central budget was available under emergency situations, or if there was a specific decree that required their services. Both criteria did not apply to halon.

126. The SFD published a book "*Reduction of Halons in Kazakhstan*", which described actions required by Parties under the Montreal Protocol and some halon alternatives. SFD also published an article in a technical journal and attended a conference in Belarus. The book was used by the NOU as part of an awareness raising campaign on ODS in general, but there was no specific campaign targeted at halon users.

127. A Halon Management Plan was not developed by the SFD as their mandate covers past incidences rather than preventative actions. In this regard, the NOU said that a Plan was developed, in cooperation with the MNREP.

128. The SFD was in the process of developing a small scale destruction facility to test the potential to destroy about 2t of halon 1301. Although SFD was not aware of the value[17]of halon on the international market, they were aware of the administrative requirements that had to be completed when halon was shipped to purchasers, which acted as a disincentive to shipment.

129. The programme on halon recovery in Kazakhstan generally lacked leadership and direction. There was no evidence of a Halon Management Plan (HMP), and there was no specific campaign directed at companies to recover halon. Experts were trained in the past on how to use the equipment received from the sub-project, but they left and were not replaced. As a result, the halon recovery and reclamation equipment is currently not used.

130. Despite these deficiencies, more than 80 tonnes of halon had been collected. There is an international demand for halon in uses where alternatives have yet to be developed or implemented. The revenue from sale of halon have been used by other countries to support the development of an HMP, targeted awareness activities, further halon collection, the cost of training experts, and administrative costs associated with further halon shipments. Such revenue can be important to national organisations that depend to some extent on external/contractual funding to support their activities.

8.5 IMPACT DRIVER III: ENTERPRISE SUSTAINABILITY

8.5.1 Refrigeration and air conditioning sector

131. The 3R sub-project, which was financed by the GEF for $2,545,219, provided assistance for training seminars on environmentally-safe procedures when repairing, maintaining and installing air-conditioning and refrigeration equipment. The impact of this programme, as well as the past and ongoing value of the 3R equipment to the profitability of companies, were discussed with 5 companies in Kazakhstan: Oasis, Combitech, Polair, Torgtekhnika and Auto Klimat.

Oasis refrigeration equipment retailer

132. Oasis Ltd was established in 1993 and assembles and sells refrigeration equipment such as over-shelf counters, ice-cream freezer chests, vertical cabinets and quick-freeze cabinets.

[17] TEAP - HTOC. 2006. The price of halon 2402 in the Russian market had increased from $5.50 per kg in 2000 to $18-25 per kg in 2006. Some of the increases in value were due to Forex fluctuations. Assuming the price in 2009 was about $50 per kg, the value of 85t of halon 2402 in Kazakhstan would be about $4.2m. *In*: Halon 2402 Supply and Demand. Page 26.

It has shops in 6 cities in Kazakhstan with 5-10 refrigeration technicians in each. Oasis stated that it was satisfied with the training that had been provided to technicians, especially the practical aspects. New technicians that joined the company were sent on the first available course.

133. Oasis was provided with 5 recovery units and one reclamation machine. They were used in 2003 but little recently as there are no CFCs and HCFCs were relatively new, so there was no reason to use them. There was no requirement to submit reports since the sub-project had been completed, so there were no data on the amounts recovered and reclaimed. Spare parts were available and he was satisfied with the operation of the 3R equipment.

134. The switch from CFC-12 to HCFC to 404A systems was driven by equipment that was now imported from Europe, whereas in the past Russia was the source of CFC-based equipment. Many small shops with CFC refrigerators had been replaced by supermarkets with 404A systems, most imported from Germany. Customers were prepared to pay more than twice the price[18] of an HCFC-22 system for 404A as they were aware of the negative publicity surrounding the use of CFCs and the requirement to adopt new refrigerants. Demand for equipment was much less during the economic crisis, compared to more than 100 display cabinets per month in better economic times. Oasis paid the 'ecological insurance' to use the HCFCs, which was not considered particularly expensive when spread over the costs of all the shops in the chain.

Combitech refrigeration service centre

135. Combitech is a refrigeration servicing centre that was provided with 5 recovery units and one reclamation machine. Combitech was satisfied with the training of technicians. The 3R equipment reduced the need to purchase about 90% of the CFCs as only 20 cylinders were purchased per year instead of 200, which increased profitability. Combitech intended to recover HCFCs in the future, as the 'ecological insurance' of 500,000 tenge (about $3300 per annum) was steep, but did not apply to recycled HCFC-22. They had been unable to find spare parts for one of the recovery machines[19]. They had accumulated about 120 kg of contaminated ODS as a result of the 3R operation, which was a problem as destruction was not available in Kazakhstan.

Polair refrigeration service centre

136. Polair is a refrigeration servicing centre that has 12 technicians. Polair received 12 recovery machines, 8 of them remained in Almaty and the others were sent to Polair shops in other cities. Two of the recovery machines were lost when they were sent to be repaired in Almaty, as the repair company went bankrupt. The company was satisfied with the training, and in particular the individual attention given to each of the trainees by the trainers to ensure that each trainee knew how to operate the 3R equipment. They were sometimes not able to recover the CFCs as they had leaked from the equipment, or the customer equipment had been serviced by a 'person off the street'

Figure 26: Smaller cylinders and equipment (blue) used for ODS recovery and storage (left) with unused large tank (right). Polair, Kazakhstan.

[18] 2020 tenge for 404A vs 900 tenge for HCFC-22 system. $1 = 150 tenge (May 2009)

[19] Yokogawa GA500 refrigerant gas analyser

(unqualified). At that time there were no regulations requiring qualifications.

137. The company had stored blends of refrigerants that were not able to be recycled as the percentage composition of the blend altered when in use. Polair had limited storage space and preferred the small cylinders for ODS as the large one was too difficult to move (Figure 26). Unusable ODS was storage problem.

138. Polair was recently fined for working with HCFC-22 without 'ecological insurance'. The company was asked to pay 1 million tenge ($6600 per annum) in 'ecological insurance' to continue the use HCFC-22, which was a large increase from 120 tenge 2 years previously. Polair intended to switch to other refrigerants rather than make the payment.

139. Polair believed that CFC-12 was still being imported from Russia and China, and that such imports were becoming less necessary since about 50% of the equipment in Kazakhstan operated on HCFC-22. Customs were unable to distinguish between R404A (allow import) but not HCFC-22 (reject import), because their training was insufficient.

Torgtekhnika refrigeration servicing centre

140. Torgtekhnika is a refrigeration servicing centre that used to have 120 refrigeration technicians in the past, but now had just five. The company received one recovery machine, which was still in the box unused. Torgtekhnika said that the ban on the import of CFCs effectively ended the potential to recover and recycle CFCs, the 'ecological insurance' to work on CFCs was dissuasive, and most importantly, the recovery machine arrived too late as most of the CFCs had already gone. The company received the equipment after the director had attended a training course. The company planned to sell the machine to another company so that it could be used.

Auto Klimat car air conditioning service

141. Auto Klimat was reported to be the only garage in Astana that recovered and replaced ODS in mobile air-conditioning (MAC) systems (Figure 27). The owner had several national awards for his services that benefit the environment. He received one recovery and reclamation machine from the project, and he invested in one more. He said that the other garages in Astana vented the ODS when servicing MAC units. Recovering the gas was profitable for him and the environment, as it saved about 60-70 kg per year from being emitted. He did not top up CFC MAC units because he did not want to pay the 'ecological insurance' when using CFCs, but instead retrofitted them with HFC-134a.

Figure 27: ODS recovery equipment from mobile air conditioning. Auto Klimat, Kazakhstan.

142. He had salvaged some very large unused cylinders from another refrigeration service centre in the 3R project to store about 280 litres or 70 kg of contaminated ODS in his garage. This was a problem as storage space in his garage was very limited. He was not aware of any destruction facility and wanted a solution to be available for the waste ODS.

Summary of sustainability of refrigeration-based enterprises

143. The Evaluation team assessed the performance of the companies involved in recovery and recycling of ODS as successful. The servicing companies generally valued the training that had been provided to technicians to improve their skills in refrigerant handling. Many of

them were not convinced by the high price of the ecological insurance that acted as a deterrent for work on ODS, and there was confusion on how it was being applied and its cost. It appeared to disadvantage smaller companies as larger ones were able to recuperate the cost from a larger customer base. Some complained of the increase in ODS that could not be recycled that was taking up valuable space in their facilities. With no options for destruction there is a risk companies will vent the unwanted ODS (see on page 100: ODS destruction).

8.5.2 Foam sector

Trademarket Company systems house

144. Trademarket Company (TC) is a privately-owned Systems House (SH) that in 1998 supplied 16 companies (680 workers in total) with chemicals for the manufacture of small-scale rigid and spray insulation foam. Apart from TC's operations as a SH, the company has a diverse range of operations that includes rigid foam[20] (Figure 28) and concrete block production, and spray foam applications.

145. About 105t of CFCs were used in Kazakhstan for rigid foam applications such as thermal insulation for cold rooms, refrigerators and display cabinets; and for insulating pipes used in the oil industry and central heating schemes. UNDP, together with the SH and companies, selected a water-based system. Other options such as HCFC-22, HCFC-141b/HCFC-22 blend or HFCs were either seen as interim solutions discouraged under GEF policy as they were ozone-depleting, limited in application because of safety concerns, higher cost or unsuitable for spray foam applications.

Figure 28: Rigid foam production for thermal insulation in buildings. Trademarket Company, Kazakhstan.

Figure 29: System House storage of chemicals for foam production. Trademarket Company, Kazakhstan.

146. In the Project, TC received one blending unit to meter and mix polyols with catalysts, stabilizers and additives, laboratory equipment to determine all relevant chemical and mechanical properties of systems and products, one high-pressure foam dispenser and spray foam machines. The chemicals are stored on site by the Systems House (Figure 29). The sixteen recipient companies received new spray foam machines, compressors and auxiliaries. The GEF budget was $1,154,374 which included equipment, trials and training, but not incremental operating costs of $416,000 which the companies contributed in co-finance.

[20] TC manufactures about 200t and imports 300t each year for the Kazakhstan market

147. About 5 years after the sub-project was completed, 4 of the companies went bankrupt as they were not able to absorb the costs of re-location when the land they rented was sold. Some of the remaining companies ended their use of the water-based system and instead implemented HCFC-141b, as they reported this improved the foam's insulation quality.

148. The use of HCFCs to blow the foam is contrary to the agreement by the SH and the companies to use only zero-ODP technologies[21]. The SH thought that the companies would revert back to water-based systems again when HCFCs are banned from import. The GEF funding improved occupational health & safety (OH&S) as the workers reported less breathing problems than with the old system, and the chemicals were more precisely measured. The rigid foam was regarded as superior by the market to imported Chinese foam that in the past contained chalk as an additive which made it less durable. The equipment provided in the sub-project replaced low-quality Russian spray foam equipment, making their businesses more profitable as operational downtime was reduced. The subproject enabled TC to employ 8 additional staff and to expand production.

149. Trademarket Company (TC) also reported that most of the companies that replaced CFCs in blowing flexible foam operations went bankrupt. Prior to the implementation, most flexible foam manufacturers in Kazakhstan used water and methylene chloride (MTC) as blowing agent, but some still used CFCs in situations where MTC use was problematic. The GEF budgeted $285,120 to replace 45 ODP-tonnes of CFCs in 17 companies through the co-use of low-index-additive (LIA) technology, which aimed to improve OH&S and environmental performance.

150. TC reported that the change to LIA increased the price of the flexible foam, and about 2 years after the sub-project was completed most of the companies went bankrupt, as they were unable to compete with cheap flexible foam imports from Russia. The Russian imports today accounted for 90% of the flexible foam market in Kazakhstan. The Russian flexible foam was produced using MTC.

151. It was noted that approximately 25% of the GEF funds were directed toward the elimination of ODS use in the rigid (20% of the funds) and flexible (5% of the funds) foam-producing companies. Some of the companies in the rigid foam production did not adhere to their contractual obligations that required only the use of ODS-free technology, but instead reverted to HCFC-blown foam after the sub-project was completed. There was no evidence that the NOU had tried to persuade the companies to remain with ODS-free methodology. Most of the companies in the flexible foam operations went bankrupt because the technology installed under the Project could not compete with cheaper imports (see also Implementing Agencies).

8.5.3 Solvent sector

Pavlodar Chemical Company

152. Pavlodar Chemical Company (PCC) is a former chemicals weapons facility[22] that today produces a range of civilian chemicals including caustic soda, chlorine, sodium hypochlorite, ammonium chloride, lubricating oil additives, flotation agents, antifreezes, phenol-formaldehyde resins, and plasticizers for PVC resins. Parts of this plant are now owned by private companies and investors, including JSC "Kaustic" (since 2007) and Reagent-Vostok for the operational parts of PCC. Russian funding of the plant ceased in

[21] The Company letter of Commitment specifies that 'only zero-ODP technology will be used'; and 'UNDP or its designate will be permitted to verify … the operations without the use of CFCs.'

[22] Bozheyeva, G. 2000. The Pavlodar Chemical Weapons Plant in Kazakhstan: History and legacy.

1992 after Kazakhstan became independent. The main chlorine production line was closed in 1993 because it was based on mercury electrolysis, and it was forced to buy chlorine more expensively for synthesising other chemicals from the Russian Federation. Many of PCC's products are now made more cheaply in Russia. The plant was closed twice due to bankruptcy from 1996 to 2000, and more recently in 2007 until part of it was bought by Kaustic. The GEF budget of $99,000 aimed to finance the replacement of 6 ODP-tonnes of CFC-113 with MTC as a solvent that removed oil contaminants from various oxygen processing systems that could cause an explosion if not removed. The grant also paid for a machine to recover and reclaim the MTC.

153. The MTC equipment (Figure 30) was installed but it was not operational as it was not certified. Certification according to Force Majeure Industry standards was expected to cost $150,000 to $180,000. Certification was only be performed by a specialised research centre that was accredited to conduct '*sanitary, technical and epidemiological tests*'. Kaustic explained that all modifications to the chemical facility required certification. The lack of certification of the equipment is not affecting the plant's current operations which are shut down until 2010 pending the installation of new oxygen-generating equipment. Kaustic was unsure of whether they would be able to pay for the certification costs (see further comments on the lack of certification are made on page 107 in Section 8.6: Implementing Agencies).

Figure 30: Unused methylene chloride equipment purchased to replace CFC-113 solvent. Pavlodar Chemical Company, Kazakhstan.

8.6 IMPLEMENTING AGENCIES

154. The GEF requires a prefeasibility study to be undertaken for each project in order to determine its scope. An example of where miscommunication led to confusion and ultimately the failure to complete a sub-project is shown in the case of equipment provided to the Pavlodar Chemical Company (PCC).

155. UNDP/UNOPS did not undertake a sufficiently detailed prefeasibility study at the outset to determine the scope of the sub-project. UNDP Country Office reported that they did not have the economic and financial expertise to contribute to such a study at the time of project design. Consequently, the responsibility for the costs of certifying the solvent equipment was never made clear to PCC. PCC expected the sub-project to pay, since the costs of certification were estimated by the company to be twice the value of the equipment and therefore a financially significant component of installing and operationalising the equipment.

156. When the process of certification was not initiated, PCC informed UNDP in writing and personally that they were disappointed that certification was not included in the sub-project. UNDP informed PCC that certification was not included in the budget. When the sub-project was completed, UNDP assigned a consultant whose expertise was not solvents, but who agreed to complete the handover arrangements because he was in the area at the time. Furthermore, sub-project funds of $20,000 were paid to UNDP for technology transfer, training and for certification, but these were not delivered. The handover of the equipment to Kaustic occurred on 26 October 2006.

157. On a topic related to institutional strengthening, Kazakhstan is the first of four countries to receive a requested extension of the grant for institutional strengthening. Kazakhstan received funding from UNEP from 2002 until 2005. The extension to the term was approved by the GEF in 2006. Funding commenced in December 2008. UNEP-DTIE in Paris was not able to explain the reason for the 2.5 year delay between funding approval and disbursement, and advised that all financial issues were covered by UNEP in Nairobi. The NOU was dependent on other additional sources of revenue in the period between UNEP funding.

158. In the foam sub-projects, the evaluation team found no evidence to show that UNDP/UNOPS had tried to predict in advance which foam-producing companies were likely to revert to ODS technology, perhaps on the basis of production procedures, product insulation criteria, financial viability or other factors. About 20% of the companies went bankrupt when they could not sustain the costs of moving to new premises, which suggested that the financial viability of some of the companies was marginal at the start of the sub-project. The flexible foam sub-project that eliminated the remaining use of CFCs in this sector was not sustainable. Almost all of the companies went bankrupt about 2 years after the sub-project was completed because of cheaper imports from Russia of MTC-blown flexible foam.

8.7 IMPACT THREATS / RISKS

8.7.1 Illegal trade

159. Some companies reported that CFCs from the Russia Federation and China could still be purchased on the market, and the price was about $5/kg. The presence of inexpensive CFCs on the market and illegal imports present a risk to further progress in the phase out of ODS consumption in Kazakhstan.

160. The Customs Agency believes that more than 5,000 officers are needed to control illegal trade along their very long border. However, only 61 out of 5,000 Customs officers in Kazakhstan have attended the training courses, and had been issued with refrigerant identifiers. This is equivalent to less than 1.5% of the officers in the Agency being trained and equipped to detect illegal shipments of ODS. The Customs Agency reported that the equipment used to detect and differentiate different types of ODS was not particularly suitable, which gave the impression that they were not widely used. The refrigerant identifiers were not certified and their recorded readings were not acceptable as evidence in legal proceedings. Legislation was in place to support Customs in its work to apprehend smugglers of ODS and equipment, but this did not appear to be widely known by the Customs Agency. There were no procedures in place to precisely identify the refrigerant intercepted, as the central laboratory had not been equipped or accredited for this purpose. One company reported that Customs officers could be bribed to make decisions in favour of the importing company, particularly if the paperwork was shown to be in order. The combination of relatively small number of customs officers trained to detect ODS, rarely used detection equipment, lack of knowledge by Customs of ODS legislation, few interceptions ODS and bribery of customs officers threatens Kazakhstan's ability to be effective in combating illegal trade in ODS.

8.7.2 Recovery, recycling, reclamation and destruction

161. In the 3R sub-project, there was general satisfaction with the training courses and the practical guidance given to technicians. Based on the estimates of total number of personnel that work on refrigeration and air-conditioning equipment, it appears that about 70% have received training in courses delivered during the project. The number of technicians trained since the project has slowed considerably to only about 2% of the total.

Failure to continue with the training program risks more unqualified personnel becoming involved in commercial refrigeration management, leading to higher emissions of refrigerants.

162. Suspension of the requirement for enterprises to register when using ODS, because of the economic crisis, may weaken the ability of the government to track and monitor the number of businesses becoming involved in ODS which, in turn, may lead to poor management of ODS refrigerants and increased emissions.

163. Although more than 800 mobile air-conditioning technicians were trained, there was only one garage in Astana (the capital) that we visited that recovered and reclaimed ODS from MACs. The servicing of MACs in 1998 consumed 110 ODP-tonnes per year, or 17% of the ODS consumption in the refrigeration sector. The training in this sector was expected to reduce ODS use by 9% per year. The government, by not enforcing the restrictions on emissions of ODS when servicing equipment, risks undermining the effort that has gone into the training to recover and store ODS.

164. Unlike in some other CEIT countries, there is no Greencard system that is used by technicians to prove to potential customers that they are qualified and registered to work with refrigerants and refrigeration equipment. This system would be useful for encouraging the customers to hire trained rather than 'independents'. There is no system in place to encourage training or re-training that .would allow technicians to keep abreast of changes in new refrigerants and equipment, in order to ensure that environmental and occupational safety standards continue to be met.

165. An Association of Refrigeration in Kazakhstan was not present to offer leadership on training and other issues. The lack of such an organisation increases the risk that the government will not be able to develop practical policies and activities related to the use of refrigerants.

8.7.3 Halon

166. Although halon consumption has been reported as zero from 1 January 2003, the programme for collecting and safely storing halon has been in abeyance for at least 5 years, which increased the prospects for unintentional halon emissions.

8.7.4 Government commitment

167. A relatively large NOU of six staff within the independent CCCC was able to direct about 30% of its activities to ozone layer protection. The funding for the NOU originated entirely from international donors and successful bids for contracts to undertake work for companies and national organisations. The government, while not providing any funding from the central budget, provided strong political support. Indeed the NOU is well connected to other departments and organisations that facilitated its work on ozone layer protection. T he risk of this level of commitment changing in the near future as low. There is a risk that funding of the NOU from international donors, however, would not be able to continue if the NOU was not fully integrated into the Ministry, which would then threaten the future viability of the NOU.

168. The government does not appear to be committed to implementing legislation in a timely manner, which increases the risk of Kazakhstan exceeding the control measures applicable to developed countries (see Impact on the phase out of ODS).

8.7.5 Methyl bromide

169. Kazakhstan phased out methyl bromide in 2001, CTC in 2002 and halons in 2003. Although the consumption of methyl bromide was reported as zero for each year from 2001 to 2005, it was not sustainable as consumption resumed in 2006 when 19.8 ODP-tonnes were reported (similar consumption to 2000), which increased to 60 ODP-tonnes in 2007. The

NOU advised that methyl bromide was being used to fumigate soil in glasshouses for the production of tomatoes, and in grain elevators. These uses are non-QPS and subject to phase out under the Montreal Protocol. Methyl bromide uses for QPS and non-QPS activities require clarification, followed by decisive action by Kazakhstan to end the consumption of methyl bromide for non-QPS uses.

8.8 IMPACT ON PHASE OUT OF OZONE-DEPLETING SUBSTANCES

170. The objectives of the phase out of ODS in the Project were partially met as 564 ODP-tonnes were eliminated during the 4-years of the Project, compared to the target of 679 ODP-tonnes.

171. Kazakhstan failed to comply with the Montreal Protocol's benchmarks of zero consumption of CFCs by 1 January 2004, as Kazakhstan reported 11.2 ODP-tonnes of CFCs consumed during that year. The benchmarks provided by the Montreal Protocol provided Kazakhstan with an additional 8-9 years to phase out CFCs and halon beyond the year of compliance for developed countries. From 2005 onwards the reports submitted by Kazakhstan to the Ozone Secretariat have shown that Kazakhstan has remained in compliance with Annex A (Group I and II), B (Group I, II, and III), C (Group II) substances, but not Group E (methyl bromide). Kazakhstan reported consumption of methyl bromide of 19.8 ODP-tonnes in 2006 and 60 ODP-tonnes in 2007, when there should have been zero consumption from 1 January 2005.

172. The funding by the GEF for institutional strengthening has not resulted in an institutional structure that is fully responsive to the requirements of the Montreal Protocol. Kazakhstan continued to report consumption of other ODS in excess of the quantities permitted by the Montreal Protocol for developed countries after the end of the Project. Kazakhstan reported increasing consumption of HCFCs that exceeded the permitted levels in the Montreal Protocol in each year from 2004 to 2007.

173. Although consumption is in excess of levels permitted for developed countries, Kazakhstan is remains in compliance as the country has yet to ratify the Copenhagen and Beijing Amendments which bind Parties to comply with the control measures established for methyl bromide and HCFCs in these Amendments.

174. Delays in compliance and difficulties in achieving consumption levels applicable to developed countries appeared to be mainly due to delays the Kazakhstan faced in adopting legislation relevant to controlling ODS.

9 LATVIA

9.1 BACKGROUND

1. As in many of the countries that became independent of the former Soviet Union[1], many of them in the early to mid-1990's had steadily reduced imports of ODS, in anticipation of the imminent closure of CFC and halon 2402 production in the Russian Federation. They wanted to eliminate their dependency on predominantly Russian imports by putting in place procedures that would avoid disruption to the national users of equipment, when the supply in Russia ceased.

2. As a developed country Latvia was required to, *inter alia*, phase out the consumption of halon on 1 January 1994; and to phase out CFCs, methyl chloroform and carbon tetrachloride on 1 January 1996. Consumption of CFCs by Latvia was reduced from 4,737 ODP-tonnes in 1989 to 665 ODP-tonnes in 1995[2], during a period of severe economic turmoil. Despite this significant effort, Latvia was in non-compliance with the Protocol because 307[2] ODP-tonnes of Annex A substances were reported as consumed in 1996. Latvia continued to report CFC consumption in each year from 1996 to 2000 inclusive. In 1995, the foam sector accounted for about 2% of the ODS consumption, refrigeration 29% and aerosols 63%.

3. Latvia met three times with the Protocol's Implementation Committee to discuss its compliance status with the requirements of the Montreal Protocol. In 1996, Latvia notified the Committee that it would be in non-compliance with the Montreal Protocol, and that despite efforts it was making to eliminate ODS using its own finances, the state of non-compliance was likely to continue into the future[3]. Latvia was urged by the Parties to ratify the London Amendment, and funding agencies were recommended to consider providing financial assistance. At the second meeting in 1997, the Committee noted that Latvia had not yet ratified the London Amendment. The Committee recommended that international assistance should be provided, particularly from the GEF, to assist Latvia to realise the ODS reduction and phase out objectives established in its country programme[3].

4. At the third meeting in 1998, the Committee noted that Latvia had made significant progress in reducing the consumption of CFCs[3]. This had been achieved by applying a tax on CFC imports, in agreement with the industry. Latvia had also made progress in determining the quantity of installed halon, with the intention that decommissioned halon could be stockpiled for critical uses. The Committee noted that ODS was being used in aerosol applications, for which there were cheaper alternatives available, and that ODS phase out projects were being initiated rather late. In Decision X/24, the Parties noted Latvia's commitments:

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1 Latvia became independent from the Soviet Union in 1990.

2 Ozone Secretariat Data Centre, updated 13 May 2009.

3 Decision X/24 (1998): Compliance with the Montreal Protocol by Latvia. See also earlier Decisions VIII/22 (1996) and IX/29 (1997) as a result of discussions with representatives from Latvia in the Implementation Committee.

1) To observe the ban on the production and import of Annex A, Group II, substances imposed on 12 December 1997;
2) To limit consumption of Annex A, Group I, substances to no more than 100 metric tonnes in 1999; and
3) To ban the production and import of Annex A, Group I, and all Annex B substances by 1 January 2000;

5. The Committee noted that Latvia would need to apply strictly apply its import quota restrictions already in place to meet these commitments.

6. In 1996, Latvia had acceded only to the Vienna Convention and the Montreal Protocol. It was not until 1998 that Latvia accepted the London and Copenhagen Amendments. Since that time, Latvia has accepted the Montreal Amendment in 2002 and the Beijing Amendment in 2004.

9.2 INPUTS

7. Three Projects provided financial assistance to Latvia to phase out ODS. The first was a UNDP/UNEP Project that targeted all ODS for phase out except methyl bromide and HCFCs. The second was a Project that aimed to reduce the use of methyl bromide. The third was a larger Regional Project to phase all uses of methyl bromide, except those used for quarantine and pre-shipment.

9.2.1 UNDP/UNEP ODS Phase Out Project

8. The GEF Project was approved on 9 July 1997 and completed in December 2007, after a new start date of July 2003 was agreed, with several extensions when additional time was necessary to finalise sub-project implementation associated with institutional strengthening. The GEF Grant budget was $1,439,691.

9. The objectives of the Project were to assist Latvia to eliminate 223 ODP-tonnes of mainly CFCs per year by providing financial support: 1) To establish a network of refrigerant recovery, reclamation and recycling operations (UNDP); 2) To train the trainers in refrigerant recovery and recycling (UNEP); 3) To assist one foam enterprise and two aerosol enterprises to eliminate their use of CFCs (UNDP); and 4) To strengthen the government institutional capacity to manage the phase out of ODS (UNEP).

10. The Project was prepared by an International Project Coordinator (IPC) in the Latvian Environment, Geology and Meteorology Agency (LEGMA). The Ministry of Environment (MoE) subsequently established a National Ozone Unit (NOU) in September 2004[4]. Since that time, the MoE has been the competent authority responsible for ozone layer protection in Latvia.

11. Several organisations assisted the MoE to implement legislation on ozone layer protection including LEGMA (Statistics on quantity of ODS used and purposes); the State Plant Protection Service (SPPS, methyl bromide use and emissions); the State Revenue Service – Customs Department (import and export of ODS to non-EU countries); the State Environmental Service (SES, Inspectorate that visits companies to determine the use and emissions of ODS); the State Fire-Fighting and Rescue Service (halon and alternatives); the Civil Aviation Administration (halon); and the Marine Administration (halon and alternatives). The Latvian Refrigeration Engineers Association (LREA) is an NGO that assisted with technical training on refrigerant management.

[4] Decree 233 of 1 April 2004: Ozone Layer Protection Regulations

12. During the Project the NOU was had a staff of 1.5 FTE[5]. They were assisted by contracted and voluntary assistance from local experts, according to the budget and sub-project. Today, the NOU is 0.25 FTE as the one person remaining allocated most time to non-ODS issues. As in other Ministries and departments, the MoE has had to reduce staff in response to the economic crisis[6]. However, the NOU has put in place legislation that empowered other services (such as Customs officers and the SES inspectors) to undertake independent work on ODS. The results of their work were reported to the NOU which, in effect, obviated the need for a large NOU.

9.2.2 UNDP/UNEP Projects on the phase out of methyl bromide

13. The GEF/UNEP Project "Initiating early phase out of methyl bromide in CEITs through awareness raising, policy development and demonstration/training activities"[7] focused on the development and translation of public awareness materials, demonstration projects, regional training activities, and policy development. The Project commenced in March 2000 and concluded in September 2002. The total budget was $806,195 consisting of $700,000 from GEF, $37,000 in kind from UNEP, and $106,195 from Canada. The Project focused on the development and translation of public awareness materials, demonstration projects, regional training activities, and policy development.

14. The larger *UNDP/UNEP* Regional Project ""*Total sector methyl bromide phase out in countries with economies in transition*"[8] was designed to assist seven CEITs to phase out all uses of methyl bromide except quarantine and pre-shipment by 1 January 2005, in accordance with the Copenhagen Amendment of the Montreal Protocol relevant to developed countries. Latvia aimed to phase out 8.83 ODP-tonnes per year of methyl bromide in the postharvest sector. The Project was approved by the GEF on 1 May 2004, officially started on 21 September 2006, and completed in October 2008. The GEF provided $255,434 in financial assistance for phosphine fumigation equipment[9], for the procurement of Integrated Pest Management (IPM) equipment[10], and $32,000 for study tours, training on phosphine fumigation, other alternatives and IPM procedures.

15. LEGMA took initial responsibility for its implementation, prior to the MoE assuming responsibility. MoE sub-contracted the Baltic Environmental Forum to provide technical assistance in April/ May 2007. MoE and BEF also cooperated with SPPS, the Ministry of Agriculture and the State Health Agency. SPPS has a general mandate for maintaining national plant health and plays major role in the agrochemical registration process, education, training and supervision. The SPPS had a Fumigation Division until 2004, which used about 800 kg of methyl bromide per year for commercial QPS fumigations in Latvia.

9.3 IMPACT DRIVER I: GOVERNMENT COMMITMENT

9.3.1 UNDP/UNEP ODS Phase Out Project

Institutional and legislative strengthening

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5 Full-Time-Equivalent.

6 Financial Times 12 May 2009 "Latvian economy slides by 18%". In general, Latvia's financial performance in 2009 is likely to be the worst among the 27 Member States, as GDP reduced by 18% in 2009 (compared to a 10% increase in 2008).

7 GF/4040-00-10 for CEITs Bulgaria, Estonia, Hungary, Latvia, Lithuania, Poland and Slovakia.

8 GF/4040-05-05 for CEITS Bulgaria, Estonia, Hungary, Latvia, Lithuania and Poland. Azerbaijan and Uzbekistan were observers.

9 Materials and equipment for sealing silos, recirculation system for silos, blowers for aeration, safety equipment, phosphine detectors and measure equipment

10 Industrial vacuum cleaners, insect and rodent monitoring kits (floor traps, pheromone traps); and heat treatment materials such as ThermoNox mobile heating units, electrical distribution system, infrared heat measurement gun, ventilators-blowers

16. Relevant legislation implemented in Latvia at the time of the Project included an ODS licensing system; a tax on imports of ODS in 1997; import quotas for CFCs, HCFCs and CTC; provisions for qualifications and certification of personnel that work with refrigerants; provisions to recovery and recycle ODS; a ban on halon imports effective 1 January 1997; and a voluntary freeze by importers and users on ODS consumption. Subsequently, Latvia banned CFC imports on 1 January 2001. A 2002 Latvian regulation on ODS that was implemented to harmonise as much as possible Latvian legislation on ODS with Regulation (EC) No 2037/2000 before Latvia joined the EU on 1 May 2004. However, a new regulation[11] on ODS and fluorinated gases came into force on 1 January 2006 to fully implement the requirements of EU legislation, which replaced all previous versions on ODS legislation.

17. As an EU Member State, the European Commission requires Latvia to submit annual reports on emissions control of ODS (minimum qualification requirements), the use of MB and alternatives, critical uses of halons, the use of CFCs in medical products that control asthma, the phase out of halon on ships and in aircraft, and the quantity of ODS recovered, reclaimed, recycled and destroyed.

18. In summary, the government has put in place the structure that it believed was able to be responsive to the work on ozone layer protection. The time to put this structure in place took longer than expected, and the project was delayed by about 4 years as a result. The MoE commented that additional time was needed to establish the appropriate institutional arrangements to implement an effective and efficient Project to phase out of ODS. The MoE cited the formation of the SES from a number of bodies in 2005 as a good example of the structure that was needed to efficiently deliver on the objectives of the Project.

19. Since that time, the government has continued to implement a multi-stakeholder approach that involves different services, administrations and ministries to undertake activities on monitoring and reporting ODS use. The requirements of the stakeholders are supported by legislation. In this way, the NOU itself can remain relative small with a strategic role, knowing that other stakeholders are involved in ozone layer protection.

Customs and border security

20. In May 2006, about 40 SES Inspectors in two workshops were informed by the NOU of ODS legislation and methods to identify ODS. In December 2006, more than 40 Customs Officers were trained on the different types of ODS and equipment packaging and hazardous chemicals. They were provided with a fact sheet for identifying ODS, a brochure on ODS and its alternatives, and relevant information on ODS legislation. There was no refrigeration identification equipment supplied in the Project that could be used by Customs officers at the border. The training for Customs Officers was financed with funds from the Institutional Strengthening sub-project.

9.3.2 UNDP/UNEP Projects on the phase out of methyl bromide

21. The GEF/UNEP Project "Initiating early phase out of methyl bromide in CEITs through awareness raising, policy development and demonstration/training activities"[12] aimed to assist Latvia to comply with the phase out deadline for methyl bromide of 1 January 2005. The project consisted mainly of awareness raising activities on the uses of methyl bromide and its alternatives, policy development for methyl bromide phase out, identification of alternatives, diffusion of demonstration results, adoption of alternatives, and

[11] Decree 688 "Regulations on Ozone Layer Depleting Substances and Fluoride Greenhouse Effect Gases, which are Refrigerating Mediums", adopted 6 September 2005.

[12] GF/4040-00-10. Prof Reuben Ausher Review reported in October 2003.

implementation of national programmes. Workshops were held in Hungary (23-25 April 2001, soil uses) and Bulgaria (28-30 May 2002, postharvest uses). The work undertaken by Latvia in this project could not be determined as Latvia did not respond to the UNEP survey on the usefulness of the Project[13].

22. Fumigator training courses during the Project were delivered annually during the winter by SPPS over the course of a week, consisting of theory and practical exercises. SPPS certified technicians that passed the course. A 1-week training and technology transfer course was delivered by a service contracted to UNEP on 7-11 May 2007. The information provided in Latvian in the course included a Training Manual, and PowerPoint presentations: Heat treatment; PH_3 fumigation, re-circulation system, and pest resistance management; Rodent control; IPM, chemical and non-chemical methods of insect control; Alternatives used elsewhere; and Safety procedures and equipment.

23. The equipment for delivery to Latvia was delivered in 2006 and 2007 and transferred to Dobele Dzirnavnieks Flour Mill in Dobeles. It was not possible to obtain information from the NOU on the number of heat treatments in mills in Latvia using the equipment provided by the Project. It was not possible to obtain information from the NOU on the IPM equipment and procedures, such as the vacuum cleaners and pheromone traps provided by the Project. Therefore it was not possible assess the impact of the heat and IPM treatments.

24. We conclude that the information provided by the training probably helped to broaden the understanding of alternatives to methyl bromide, but little to increase the expertise of most of the fumigators since many were already familiar with the application of phosphine which became the replacement for methyl bromide.

9.4 IMPACT DRIVER II: RECOVERY AND RECYCLING PROGRAMME

25. This programme in the *UNDP/UNEP* phase out project aimed to recover, recycle and reclaim as much refrigerant as possible during the transition period between CFCs and CFC-free technology, at a time when CFCs were subject to import quotas in Latvia. Therefore, the only available CFC refrigerant to service existing equipment was obtained from the CFCs in the market that were recovered, recycled and reclaimed ('3R'). This programme consisted of two parts:

    1) Training of technicians in refrigeration management; and
    2) Distribution of equipment for ODS recovery, recycling and reclamation activities.

9.4.1 Training of technicians in refrigerant management

26. In response to the investment Project on the recovery and recycling of CFCs, the LREA was formed by 10 companies in 1998. It is a non-profit making society. Currently, the membership consists of 105 companies. The mandate of LREA is to represent the views of the enterprises, to organise seminars and workshops, to produce guide books on best practice, to deliver training and certification services for refrigeration personnel, to process consumer claims for grievances against companies in their association, and to provide technical advice to the government on future legislation.

27. Prior to the start of the Project, LREA representatives visited Amu-Gruppen AB (Sweden) in 1998 to learn best practice in recovery and recycling operations, and how to establish a training and certification scheme. While there, 14 technicians were trained and 2 trainers.

[13] Ausher, R. 2003. Evaluation of the Project GF/4040-00-10 on the early phase out of methyl bromide in CEITs.

Since 2005[14], LREA has trained 3-5 trainees per month on refrigerant management. In total 180 technicians have been trained. About 15h of the 40h course is spent on F-gases. The trainee or their company pays for the cost of the course. Not all trainees passed the course. In March 2009, for example, all of them failed either the theory or the practice.

28. The training syllabus covers ozone depletion and the greenhouse effect, the operating principles of refrigeration, properties of refrigerants, emission reduction, equipment (commercial, domestic, low temperature), and 8 Latvian decrees[15] affecting the use and management of ODS and F-gases.

29. Certification is valid for 3 years, and a blue licence issued by LREA is evidence of the qualification. Certification can be extended by evidence of employment in refrigeration management in the past 2 years, possession and availability of equipment to recover recycle refrigerants, and a record of reports filed each year to SES on ODS and F-gases.

30. We conclude that the LREA was essential for establishing the training and maintaining a credible programme of courses after the Project finished. LREA offers the training as part of its core business, which is likely to expand because of recent legislative requirements that involve fluorinated greenhouse gases used as refrigerants. The training appears to be comprehensive and renewable, both features that help with keeping technicians up-to-date with the latest technology.

9.4.2 Recovery, recycling and reclamation equipment

31. The LREA distributed 40 recovery and recycle machines to companies, and 2 reclamation units for CFC-12 to 2 Reclamation Centres. LREA said that some of the companies report ODS recovered to the SES, and that they have a list of companies that still have the equipment. Companies that did not receive the equipment purchased their own because they improved company profitability by avoiding the need to purchase CFCs, and because the equipment was necessary for them to obtain certification.

32. Service companies and owners of equipment that use more than 100 kg of refrigerants and 'non-refrigerants' submitted a Form[16] annually that supplied information to SES on the name of the substance, the source (import or EC), the quantity at the beginning of the year, the quantity added, the intended use, the amount recycled/regenerated/destroyed, and the amount remaining at the end of the year. SES collected the information and passed the raw data to the LEGMA. There are currently 107 companies in the database, a number that has remained relatively constant in the past 3 years.

33. SES is a single authority that replaced 8 regional boards (for the administrative districts) and different sectors (ships, waste etc) that were present when the Project was being formulated, so the government structure today in Latvia is more streamlined. SES also has about 70 Environmental Inspectors that follow up on potential cases of non-compliance with legislation on chemicals management and pollution control.

34. Analysed data from the Forms were not available, which would have been useful to see progress on the phase out of ODS. The MoE agreed to supply the data from 2004 to 2008, since data prior to 2004 were not considered reliable. It would have been useful for the government to use the compiled and analysed data to improve policies and legislation on ODS. The MoE reported that SES inspectors made 487 checks in 2008 (compared with 10

[14] Names of technicians trained and certified from 2005 – 2007 (102); in 2008 (72); and in 2009 (6).

[15] Decree 158 on hazardous substances; Decree 233 on ODS; Decree 688 on ODS and F-gases; Decree 923 on WEEE; Decree 399 on workplace safety; Decree 61 on workplace protection on ships; Decree 165 pressure vessels; Decree 518 supervision

[16] Decree 688 on ODS and F-gases

in 1998) and issued 44 infringement notices to companies involved in ODS.

35. Revers Refrigeration[17] at one of the Reclamation Centres received a small RTI 220 recovery and recycle unit which was still in operation (Figure 31), and a larger CFC-12 reclamation unit RTI RRC750 which has not be used for 4-5 years. Revers Refrigeration estimated that its market share is about 5-7% of the refrigeration business in Latvia.

Figure 31: RTI recovery and recycle equipment (left) and stored ODS (right). Revers Refrigeration, Latvia.

36. Prior to 2004, Revers Refrigeration received ODS for reclamation 2-3 times per month, typically very small quantities but once 100 kg. There was a charge to the servicing companies of 20-30c/kg for regeneration of the CFCs. The supplies of CFCs dried up before the end of the project. No CFCs were destroyed as all of them were recycled. The quantities recovered, recycled, regenerated and destroyed were reported to the MoE but were not made available to the evaluation team. The RTI RRC750 regeneration unit could be used for HCFC-22 since only regenerated HCFC-22 could be used to refill equipment from 1 January 2010[18].

37. In February 2005, the RAL Quality Assurance Association reported that Latvia had neither procedures in place for the recovery of ODS from the compressor of discarded refrigerators, nor from the foam. Today, the MoE advised that a Finnish company (Kuusarkoski OY) collects unwanted refrigerators and sends the refrigerants for destruction in Finland; and a second company (JSC Bao) extracts the ODS from the compressor and sends it for destruction within the EU.

38. We have some evidence that indicated minimal use of the ODS recovery and recycling machines in Latvia during and after the Project. There was some evidence that a ODS monitoring and recording system was in place. However, we were not able to obtain information on the amount of ODS recovered and recycled at any time in the past 10 years.

9.4.3 Halon

39. The Reclamation Centres in Latvia were not supplied with equipment to recover halon. Instead, decommissioned halon was shipped to the Regional Centre in Estonia. The NOU was not able to provide information on the number of ships that had replaced their halon with alternative for fire protection since 2000. Latvia used halon only for critical uses listed in Regulation (EC) No 2037/2000, which limited their use to mainly aviation and military uses. A list of the quantities of halon used for these purposes was not provided.

9.4.4 Awareness raising

40. The NOU undertook an extensive campaign of Awareness Raising over a 12 month period, beginning in December 2005, to educate Latvian school children on the value of protecting the ozone layer called "*Protect and be Protected*". The NOU worked with 5 experts/teachers across different disciplines. These initiatives included: 37 press releases; Information on ODS regulations provided to NGOs, state authorities and private

[17] No website. Revers Refrigeration, 4c Katalkalna Street, Riga. Tel +371-6724-8316; Fax +371-6724-9062

[18] RTI Technologies confirmed in April 2009 that the RRC750-SP1-UNDP equipment supplied in the Project would also reclaim HCFCs without any modifications, despite the label on the equipment mentioning only R12.

companies; Publishing and regularly updating a webpage; Development of portable experiments; Video on ozone layer protection; Launch of campaign "Ozone Layer Friendly School" with competitions; Production of 1,500 "3mm"[19] posters and 600 maps; Development of teaching aids for multi-level education; Two publications; Five regional training workshops for teachers of primary school as well as teachers of chemistry, biology, geography and physics; Manufacture of special souvenirs, prizes and certificates (sponsored as much as possible); Production of a Latvian version of the Ozzy Ozone video; and a Closing Ceremony with 142 Ozone Layer Friendly Schools.

41. The NOU surveyed the knowledge of pupils after the campaign and found they correctly answered most of the basic questions and more than half of the difficult ones on ozone layer protection. The information developed in the Awareness Raising campaign is now used by schools that want to be accredited as a Green School, so there is the potential for sustainability of the campaign.

42. It is possible that ozone layer protection will continue to be in the public mind in Latvia for some time in the future, as a result of the Awareness Raising campaign that involved more than 100 schools. Knowledge on ozone layer depletion and alternatives is one of the criteria for a school being accredited as a Green School. Embedding the programme in the curriculum of Green Schools will foster ozone layer protection in future generations of school children. Their knowledge gained as children may also alter their behaviour as adults by discouraging exposure to high levels of UV radiation that is damaging to human health.

43. As in many other countries, Latvia undertook extensive activities on Awareness Raising to shore up support from the public, government and business stakeholders for legislation and activities that would restrict and eventually phase out ODS. As in other countries, a baseline and performance indicators to measure the benefits of ODS reduction were never developed. These could have been, for example, before and after data on the number of ODS-free refrigerators bought by the general public, an increase in ODS refrigerators being sent for recycling, demand for information on the website (as number of hits) on ODS-free alternatives. It was therefore impossible to evaluate the impact of the awareness programme.

9.5 IMPACT DRIVER III: ENTERPRISE SUSTAINABILITY

9.5.1 UNDP/UNEP ODS Phase Out Project

44. There were two companies that received GEF financial assistance to phase out ODS in Latvia in the *UNDP/UNEP ODS Phase Out Project*: Ritols (spray foam); and Kvadro (household aerosols).

45. There were two companies that received GEF financial assistance in the *UNDP/UNEP Regional Project on the phase out of methyl bromide Project* to phase out methyl bromide used in the postharvest sector: Dobeles and Labibas Sargs.

Ritols foam spray

46. Ritols is a privately owned company in Riga that was established in 1991. The GEF paid $106,000 for the replacement of 12.5t of CFC-11 with a water-blown system for the production of rigid polyurethane spray foam insulation. At the time of the Project, Ritols accounted for 80% of the consumption of CFCs in the foam sector. Ritols operated three teams that apply foam insulation to residential and public buildings, production facilities, tanks and pipelines. Three Intergan machines were supplied in 1999. Two of the machines

[19] The thickness of the ozone layer

were cannibalised to keep the third machine operational.

47. Ritols reported that the supply of spare parts for the equipment was not affected by Intergan's sale to Technisol (NL). Ritols was very satisfied with the procurement process, and the procedures for selecting the equipment. Ritols generally amortizes equipment after 10 years, so they were satisfied with the performance of the equipment so far, taking into consideration that the materials used in the machines are quite abrasive and the machines were almost 10 years old.

48. The change to the new technology required the use of the same safety suits. Ritols was unsure if the equipment for producing CFC-free foam encouraged both other companies operational at the time in Latvia to purchase CFC-free equipment. Ritols also valued contacts that the company had made with EU counterparts as a result of the Project, in particular the EU 7th Framework Programme FORBIOPLAST, which aims to use plant rather than petrochemical sources for PU foam. Ritols operations continue 4-5 days per week despite the economic crisis, their work mostly involves improving the insulation of existing rather than new buildings.

Kvadro household aerosols

49. Kvadro is a contract-filler aerosol company established in 1991. The facility, located about 15 km from Riga, makes about 7 million aerosols per year for household, automotive, pest control and cosmetic uses. Kvadro has a staff of 4-5 people that operate the line and a small laboratory facility with 3 staff. The Project financed the replacement in 2001 of 5t per year of CFCs by conversion to hydrocarbon (propane-butane) propellant (Figure 32).

50. At the time of the Project, Kvadro accounted for only about 2% of the consumption of CFCs in Latvia in the aerosol sector. The other two companies (Aerosols-1 and Lars-M) were the original targets for the GEF funding at the time as they consumed about 50% of the CFCs in the aerosol sector, but they went bankrupt while the project was being formulated. The Aerofil equipment for that was intended for installation in the other company was instead installed at Kvadro.

Figure 32: Aerosol manufacturing facility (top) and propane-butane tanks (below). Kvadro Aerosols, Latvia.

51. Kvadro attributed the company's ability to double their production since the end of the Project in 2001 to the GEF funding of the Aerofil equipment (Figure 33).

52. Kvadro said they chose Aerofil (UK) instead of Coster (IT), Terco (USA), or Pumasol (CH) equipment as the Aerofil line offered the flexibility to manufacture a range of products for clients that varied in volume from 35 to 90 ml. They were very satisfied with the installation by Aerofil experts that spent about 6 months in Latvia completing the installation and testing the plant. They were very satisfied with the availability and quick delivery of parts from Aerofil. The MoE worked well with UNDP to formulate the project and to procure the equipment. The technology is highlighted on their website as an asset to potential clients. Kvadro continue their normal operations of 8h per day / 5 days per

week, despite the economic crisis.

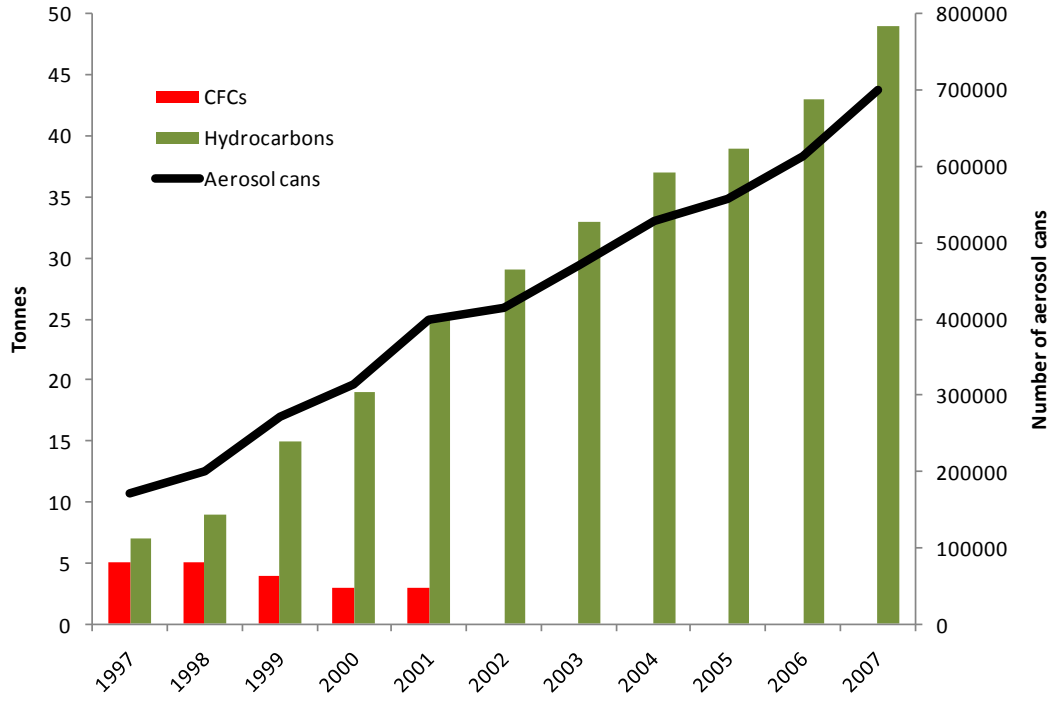

Figure 33: Replacement of CFCs with hydrocarbon technology for the production of household aerosols, and impact on production

53. These investment subprojects phased out about 7% of the original quantity of CFCs targeted in the foam and aerosols sector, mainly because the two largest consumers of CFCs (Lars-M and Aerosols-1) went bankrupt before the Project started (see further comments on page 121 Section 9.6: Implementing Agencies). The replacement of CFCs with non-ODS was successful in the two remaining companies. Both companies were successfully operating in Latvia 2009 using the equipment that was originally supplied in the Project.

9.5.2 UNDP/UNEP Projects on the phase out of methyl bromide

SJC Dobeles grain processor

54. SJC Dobeles, as the largest grain processing company in Latvia, produces flour, grits, pearl barley, bran and pet food for the wholesale and retail trade. In June 2008, Dobeles was purchased by Tartu Veski which belongs to the Estonian enterprise Tiigi Keskus, which is also the owner of German company Saalemuhle Alsleben that operates some of the most modern mills in Europe. Dobeles successfully replaced methyl bromide with phosphine (PH_3) to kill pests in grain silos and in the mill.

Labibas Sargs fumigation services

55. Labibas Sargs employs more than 50 staff employees including licensed fumigators, and is the only company[20] in Latvia that used MB to a large extent for the treatment of grain in silos/elevators. Labibas Sargs customers are 4 large and 2 small mills, a chocolate factory and some food and feed factories. The company undertakes grain handling procedures such as cleaning and drying of grain, quality checks, grain storage, and supervises the loading and unloading of large vessels.

56. Labibas Sargs first started fumigation of stored grain in silos with phosphine in 1986. The

[20] There are about 10 other fumigation companies including Sia TTR, Dzidra, Desina, and Pest Baltic that did not use methyl bromide, and only used PH_3

first mill was fumigated in Latvia in 1989. However, the MoE advised that the use of PH_3 was banned by the Russian authorities at that time, which initiated more widespread use of methyl bromide for silo and elevator fumigation.

57. SPPS said that the last fumigation with methyl bromide of flour mills and elevators in Latvia was carried out in 2004, and from that time onwards PH_3 has been used. Normally all silos and elevators are fumigated once per year for 4-5 days as a preventive action, depending on the ambient temperature.

58. SPPS said the cost of the PH_3 treatment was $0.56-0.93 per tonne of grain, compared to about $1.00 per tonne with methyl bromide. There was no impact on the mill and elevator operations as each silo was treated separately. The treatment efficacy was often validated using live insects in small cages, strategically placed in different parts of the silo or elevator. The J-system was not used because it was too expensive, even though it was supplied as part of the Project equipment.

59. In the investment projects, we conclude that the replacement of methyl bromide with phosphine has been successful in the postharvest sector in Latvia. The costs of the two fumigants were quite similar, there were no special application requirements or safety issues, and the level of pest control in the silos and mills appeared to be similar. Indeed, phosphine seemed to be used as a drop in replacement for methyl bromide. The combination of affordability and ease of application makes it likely that the replacement of methyl bromide has been sustainable.

9.6 IMPLEMENTING AGENCIES

60. In the UNDP/UNEP Project, two sub-projects were formulated for two of the largest aerosol companies in Latvia that consumed 63% of the ODS in the Project, but the investment funds were never used as the companies went bankrupt. This showed the importance of financial viability tests since if they had been carried out the precarious financial situation of both companies could have been detected. This would have avoided unnecessary time and energy invested with these companies, and the funds could have been directed toward other companies in Latvia to phase out significant quantities of ODS.

61. In the methyl bromide Regional Project, Latvia wanted more attention paid to non-chemical methods of pest control, since this was their stated preference at the start of the Project. Instead, they felt UNDP/UNEP had narrowed the type of pest control to only a chemical approach, whereas Latvia would have preferred to implement a chemical treatment *only* when a non-chemical treatment had been unsuccessful.

62. Latvia would have preferred more discussion with the IAs on the choice of equipment, such as equipment that could identify pests through DNA analysis, which was initially approved by UNDP and then declined. In general, Latvia thought that a demonstration project on postharvest alternatives to methyl bromide would have helped in the selection of the most appropriate equipment and procedures prior to the start of the UNDP/UNEP Regional Project.

63. In response, UNDP/UNEP said that Latvia was four years late in signing agreements to begin the Project, which impeded their ability to schedule equipment. During this period, it was difficult to obtain informal reports from Latvia on when the Project could start, and any reasons for the delay. However, when the Project did commence albeit later than anticipated, both chemical and non-chemical equipment were supplied. The choice of techniques, and the priority that was given to each, was the sole prerogative of the host country and its companies involved in the transition to methyl bromide alternatives.

64. The MoE said that the involvement of two organisations (UNDP/UNEP) in Latvia resulted in

more work for the Ministry, since both agencies did not appear to coordinate activities well between themselves. In addition, UNDP was late in the procurement of equipment which was needed for the training activities and for sustaining the methyl bromide phase out.

9.7 IMPACT THREATS / RISKS

9.7.1 Illegal trade

65. LREA stated that it had no evidence of large equipment containing CFCs and therefore the expected demand for CFCs would be expected to be low. This may have reduced the risk of illegal imports of CFCs.

9.7.2 Methyl bromide

66. SPPS believed that the PH_3 fumigation is sustainable for the next 20-30 years, providing the insects did not become resistant to the treatment and PH_3 is not banned. The MoE expressed an interest in the use of a commercially-available resistance testing kit, and information on procedures for overcoming resistance once detected.

9.7.3 Government commitment

67. The NOU had not examined the ODS data supplied by other agencies, departments and ministries. Such an examination would allow the NOU to provide support for any amendments that the NOU might wish to improve the implementation of the legislation on the control of ODS in Latvia, and to put in place procedures that improve the management and phase out of ODS. There is a risk that a disruption to one of the ODS control measures would not be detected in a timely manner, which could result in more ozone depletion than would otherwise be the case.

68. There is a risk that ozone layer protection will be accorded lower priority for funding in times of economic crisis, and that other environmental initiatives currently underway will be seen has higher priority for funding.

9.8 IMPACT ON PHASE OUT OF OZONE DEPLETING SUBSTANCES

9.8.1 UNDP/UNEP ODS Phase Out Project

69. Latvia's objective to phase out 223 ODP-tonnes was achieved, but without significant financial assistance provided by the GEF UNDP/UNEP Project. Although the Project was approved in July 1997, implementation did not begin until 1999 (Ritols) and 2001 (Kvadro). Prior the implementation of the Project, two aerosol companies went bankrupt prior to the start of the Project, which eliminated the need to phase out 201 ODP-tonnes. Only Kvadro aerosol company (5 ODP-tonnes) and Ritols spray foam company (12.5 ODP-tonnes) remained, and the CFCs were phased out in these companies in the project. Moreover, the consumption of CFCs had already been reduced in one year by more than 90%[21] from 1996 to 1997, possibly as a result of the strict enforcement by Latvia of the legislation that banned the import of CFCs. Therefore, more than 90% of the CFCs were phased out by two companies that went bankrupt and there was no longer a need for the sub-projects to eliminate the use of CFCs.

70. The aerosol company bankruptcies also assisted Latvia to comply with Decision X/24 of the Parties to the Montreal Protocol. The consumption of Annex A was reduced by to 21.6 ODP-tonnes, which was well within Latvia's commitment given in Decision X/24 of 100 tonnes. Latvia reported zero ODS consumption for CFCs in 2001.

71. The GEF Project may have had the benefit of improving the institutional strength, which

[21] Consumption of CFCs was 307 ODP-tonnes/1996; 23.0/1997; 25.3/1998; 21.6/1999; 35.2/2000; and 0/2001.

assisted Latvia to comply with the ODS legislative requirements of the EU prior to accession to the EU on 1 May 2004.

72. The MoE has established legislation which requires other services, administrations and ministries in Latvia to monitor and report on the compliance of companies with ODS legislation. The legislation parallels EC legislation on the control and phase out of ozone-depleting substances.

9.8.2 UNDP/UNEP Projects on the phase out of methyl bromide

73. Latvia imported on average 4.2 ODP-tonnes of methyl bromide per year from 1996 to 2003. Latvia did not import in 4 of those years, which resulted in zero consumption reported for some years to the Ozone Secretariat[22], although methyl bromide was probably still used. Based on a request from the European Community on behalf of Latvia in 2005, the Parties approved a critical[23] use exemption of 2.5t[24] of methyl bromide for use in grain in Latvia that was applicable from 1 January 2006.

74. However, the European Commission did not licence the import of any methyl bromide for critical uses by Latvia in 2006, despite the approval of the Parties, as the Commission believed that an alternative to methyl bromide was available. Decision IX/6 of the Montreal Protocol, which guided the Commission in its decision, required Parties to ensure that methyl bromide was only licensed when an alternative was not available or could not be used.

75. The Commission's decision to not allocate a methyl bromide quota to Latvia for critical uses fully supported the UNDP/UNEP Regional Project which aimed to replace methyl bromide with an alternative. The Project provided Latvia with phosphine fumigation equipment, it supplemented Latvia's knowledge on the use of phosphine, and it provided information and equipment to Latvia on IPM and non-chemical methods of pest control. Collectively, this equipment and knowledge provided Latvia with the potential to replace methyl bromide in a way that was sustainable.

76. Latvia continues to use phosphine for pest control in flour mills and grain elevators, more than 3-years after methyl bromide ceased to be used for these purposes. Therefore, the objective of the Regional Project to phase out methyl bromide in Latvia was achieved. The sustained phase out of methyl bromide maintained Latvia's compliance with the Montreal Protocol as 2006 was the only year that Latvia resorted to a critical use exemption for methyl bromide.

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[22] Consumption of MB was 15 ODP-tonnes/1996; 0/1997; 9/1998; 0/1999; 0.5/2000; 8.8/2001; and zero from 2002.

[23] Exemptions must comply fully with Decision IX/6 of the Montreal Protocol and are intended to be limited, temporary derogations from the requirement to phase out methyl bromide by 1 January 2005 for all uses except QPS.

[24] Report of the 17th Meeting of the Parties. 2005. Page 43.

10 LITHUANIA

10.1 BACKGROUND

1. Lithuania proclaimed its renewed independence from the Soviet Union on 11 March 1990, the first Soviet republic to do so, and began its transition to a market economy the following year. Owing to the availability of inexpensive natural resources, the industrial sector had become excessively energy intensive, inefficient in its utilization of resources, and incapable of manufacturing internationally competitive products[1]. At that time, more than 90% of Lithuania's trade was with the former Soviet Union, which supplied Lithuanian industry with raw materials for production and a market for its outputs.

2. In 1997, exports to former Soviet states were 45% of total Lithuanian exports. The economy had survived the early years of uncertainty and several setbacks, including a banking crisis, and seemed poised for solid growth. However, the collapse of the Russian rouble in August 1998 caused a recession in Lithuania and forced the reorientation of trade toward the EU which increased over time to 63% in 2006. The process of privatization and the development of new companies slowly moved Lithuania from a command economy toward a free market. Lithuania has privatized nearly all formerly state-owned enterprises. Today, more than 79% of the economy's output is generated by the private sector.

3. Like many of the countries that became independent of the former Soviet Union in the early 1990s, Lithuania at the time had made a significant effort to reduce imports of ODS, in anticipation of the imminent closure of CFC and halon production in the Russian Federation. They wanted to eliminate the dependency on predominantly Russian imports by putting in place procedures that would avoid disruption to the users of equipment when the supply in Russia ended. In 1995, approximately 55% of the ODS (mostly CFC-12) was used for refrigeration and air-conditioning, 13% for aerosol production, 20% for degreasing and cleaning and 12% for other purposes.

4. In 1996, Lithuania had acceded only to the Vienna Convention and the Montreal Protocol. It was not until February 1998 that Lithuania ratified the London and Copenhagen Amendments. Lithuania has most recently accepted the Montreal and Beijing Amendments on 17 March 2004. As a developed country and a signatory to the London and Copenhagen Amendments by the beginning of the Project in May 1998, Lithuania was required to comply with the control schedule in the Montreal Protocol which, *inter alia*, required the phase out of the consumption of halon on 1 January 1994; and the phase out CFCs, methyl chloroform and carbon tetrachloride on 1 January 1996.

5. Largely as a result of the severe economic turmoil but also because of its participation in the Montreal Protocol, Lithuania reduced its consumption of CFCs from more than 4,000 ODP-tonnes in 1990 to 289 ODP-tonnes in 1996. Despite this significant effort, in 1996 Lithuania was in non-compliance with its control obligations under the Montreal Protocol because of

[1] US State Department. Background note: Lithuania.

the consumption of ODS that should have been phased out in that year.

6. In 1998, after a meeting with the Protocol's Implementation Committee, the Parties to the Protocol encapsulated Lithuania's commitment to a phase-out plan with interim benchmarks in a Decision[2] that aimed:

   1) To ban the import of CFC-113, carbon tetrachloride and methyl chloroform by 1 January 2000; and
   2) To reduce the consumption of Annex A and B substances by 86 per cent from 1996 levels by 1 January 2000;

7. Lithuania was encouraged in the same Decision by the Parties to strictly apply the existing import licensing system and to work with the Customs authority to ensure that imports of ODS ceased. Lithuania did not produce or export ODS. An application to the Parties by Lithuania to allow the import of CFCs for servicing was rejected by the Parties. Instead Lithuania was encouraged by the Parties to increase the recovery of existing ODS or to import recycled material to satisfy its servicing requirements[3]. A previous Decision by the Parties in 1997 had advised the GEF to consider favourably Lithuania's request for financial assistance for projects to implement the country programme to phase out ODS.

10.2 INPUTS

8. Three Projects provided financial assistance to Lithuania to phase out ODS. The first was a UNDP/UNEP Project that targeted all ODS for phase out except methyl bromide and HCFCs. The second was a small Project that aimed to reduce the use of methyl bromide. The third was a larger Regional Project which aimed to phase all uses of methyl bromide, except those used for quarantine and pre-shipment[4].

10.2.1 UNDP/UNEP ODS Phase Out Project

9. The GEF Project was approved on 5 May 1998. The investment sub-projects were completed in June 2001, with UNDP as the Implementing Agency. The Institutional Strengthening sub-project was completed by 31 March 2005, with UNEP as the Implementing Agency. The GEF Grant budget was $4,692,583. Lithuania provided $3,595,075 in co-finance from the beginning of the project for government participation in all activities including the provision of office space, transport and communications.

10. The objectives of the Project were to assist Lithuania to eliminate approximately 390 ODP-tonnes of mainly CFCs per year by providing financial support:

    1) To assist Lithuania to prepare the country programme, and to identify technical assistance & investment actions that would enable ODS phase out;
    2) To establish a network of refrigerant recovery, reclamation & recycling operations, as well as training in the best practices of refrigerant management;
    3) To assist a refrigerator manufacturer, an aerosol enterprise and a compressor manufacturer to eliminate their uses of ODS; and
    4) To strengthen the government institutional capacity to coordinate and manage the phase out of ODS.

11. The Project was prepared by the Chief Engineer of the Atmospheric Protection Board within the Ministry of Environment (MoE), who became the International Project Coordinator (IPC) for the Project. Lithuania established a National Ozone Unit (NOU) in 2002, which was staffed by 3 Full-Time-Equivalents (FTE) until May 2005. The MoE was supported by a

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[2] Decision X/25: *Compliance with the Montreal Protocol by Lithuania*. See also Decisions VIII/23 and IX/30.

[3] Imports of recycled material do not contribute to a Party's officially reportable ODS consumption under MP Art. 7

[4] Lithuania decided to include QPS as part of the methyl bromide phase out programme

National Ozone Committee whose members were drawn from the Ministry of Industry and Trade (MIT), the Ministry of Agriculture (MoA), the Engineering Ecology Association, and the Technical University. Since 2002, the MoE has been the competent authority responsible for coordinating all activities on ozone layer protection in Lithuania.

12. Several organisations assisted the MoE to implement legislation on ozone layer protection including the Customs Department (import and export of ODS to non-EU countries); the Labour Education and Training Service (LETS); the Ministry of Social Labour (MSL); and the Ministry of Education and Science (MES). LETS, MSL and MES collectively provided vocational education programmes, including the syllabus on refrigerant management. The MoE cooperated with the State Fire-Fighting and Rescue Service (halon and alternatives); the Civil Aviation Administration (halon); and the Maritime Authority (halon and alternatives). The National Refrigeration Association (NRA) is an NGO that was responsible for delivering training programmes during the Project on best practices in refrigerant management, and for certifying trainees.

13. During the Project, the IPC was assisted by the MoE and other local experts, contracted according to the budget and sub-project. From 2002 until today, the NOU has been led by one person[5]. From April 2005, when the Institutional Strengthening programme concluded, the NOU has assigned 1.5 FTE to address issues on ODS.

14. To leverage the effectiveness of the NOU with few staff, the MoE has put in place legislation that empowers other services (such as Customs officers and inspectors) to undertake work on ODS according to the legislative requirements, and to report the results of their activities. The NOU shares concerns and coordinates policy development with other units that work on climate and F-gases in order to harmonize requirements at the national level and to facilitate implementation by industry.

10.2.2 UNDP/UNEP Projects on methyl bromide

15. The GEF/UNEP Project "Initiating early phase out of methyl bromide in CEITs through awareness raising, policy development and demonstration/training activities"[6] focused on the development and translation of public awareness materials, demonstration projects, regional training activities, and policy development. The Project commenced in March 2000 and concluded in September 2002. The total regional budget was $806,195 consisting of $700,000 from GEF, $37,000 in kind from UNEP, and $106,195 from Canada. The Project focused on the development and translation of public awareness materials, demonstration projects, regional training activities, and policy development.

16. The larger UNDP/UNEP Regional Project ""*Total sector methyl bromide phase out in countries with economies in transition*"[7] was designed to assist seven CEITs to phase out all uses of methyl bromide except quarantine and pre-shipment by 1 January 2005, in accordance with the Copenhagen Amendment of the Montreal Protocol relevant to developed countries.

17. This Regional Project aimed to phase out 6.2[8] ODP-tonnes per year of methyl bromide used in grain silos and elevators in Lithuania. The Project was approved by the GEF on 1 May 2004, officially started in Lithuania on March 2005[9], and completed in June 2008. The GEF

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5 Head of Chemical Substances, Division of Environmental Quality, MoE. Also responsible for Strategic Approach to International Chemicals Management.

6 GF/4040-00-10 for CEITs Bulgaria, Estonia, Hungary, Latvia, Lithuania, Poland and Slovakia.

7 GF/4040-05-05 for CEITS Bulgaria, Estonia, Hungary, Latvia, Lithuania and Poland. Azerbaijan and Uzbekistan were observers.

8 MB - PIRMBProject08rev1, page 6. Annex 1 shows costs TBD for the demonstration of methyl bromide alternatives.

9 Activities on the ground started in July 2006

provided $276,829 of financial assistance to Lithuania for phosphine fumigation[10] and Integrated Pest Management[11] (IPM) equipment; and $41,000 for study tours, training on phosphine fumigation, IPM procedures and other alternatives.

10.3 IMPACT DRIVER I: GOVERNMENT COMMITMENT

10.3.1 UNDP/UNEP ODS Phase Out Project

Institutional and legislative strengthening

18. In 1994, Lithuania introduced a permitting system for the import of ODS. In 1996, Lithuania's Action Plan[12] included an environmental protection goal to reduce ODS by introducing legislation from 1996 to 1998 that would control ODS import, export and use. Legislation in 1999 introduced the requirement for a license to store ODS; import quotas for ODS; a ban on the use of CFCs for use in new refrigeration and air-conditioning equipment, in aerosols and in the production of foam; and restrictions on the use of methyl bromide. In 2003, Lithuania introduced a ban on new uses of ODS. Regional environmental protection departments were responsible for implementing and enforcing the legislation, by permits for use and inspections of companies. Environmental taxes or subsidies were not introduced as import quotas became the most efficient legislative instrument for controlling ODS imported by only 3 importers.

19. The 2004 legislation harmonised as much as possible Lithuanian legislation on ODS with Regulation (EC) No 2037/2000 at the time Lithuania joined the EU on 1 May 2004[13]. A separate regulation on fluorinated gases came into force in 2006 in Lithuania[14]. The NOU is not responsible for work on F-gases, but cooperates with the personnel that are involved in F-gases.

20. During the Project and since that time, the government has continued to increase the institutional strength to address ozone layer protection issues across a range of ministries and departments. Legislation in Lithuania, which was established by the initiative of the NOU, now involved different authorities, services, departments and Ministries who monitor and report on the compliance of companies with ODS legislation. The legislation transposed EC legislation on the control and phase out of ozone-depleting substances.

21. As a result of EU membership from 1 May 2004, the European Commission has required Lithuania to submit annual reports on emissions control of ODS (minimum qualification requirements), the use of methyl bromide and its alternatives, critical uses of halons, the use of CFCs in medical products that control asthma, the phase out of halon on ships and in aircraft, and the quantity of ODS recovered, reclaimed, recycled and destroyed.

22. The Lithuanian government is committed to undertake activities that continue to reduce ODS, and to provide information to the European Commission, in compliance with EU regulations and directives. Member States continue to undertake these activities because of a desire to comply with national environmental objectives, which also has the benefit of avoiding infringement action which has been instigated in the past when a Member State has not complied with the requirements of the EU legislation.

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[10] Materials and equipment for sealing silos, recirculation system for silos, blowers for aeration, safety equipment, phosphine detectors and measure equipment

[11] Industrial vacuum cleaners, insect and rodent monitoring kits (floor traps, pheromone traps); and heat treatment materials such as ThermoNox mobile heating units, electrical distribution system, infrared heat measurement gun, ventilators-blowers

[12] Decree No I-1550. 25 September 1996. Lithuanian Republic Parliament

[13] LAND 50-2004: Ozone-Depleting Substances Management Requirements. In force from 1 May 2004. It implemented Regulation (EC) No 2037/2000 from the date that Lithuania joined the EC.

[14] This regulation transposed into national legislation Regulation (EC) No 842/2006 on F-gases.

Customs and Border security

23. The MoE and Customs also work closely together on legislation. MoE provides Customs with the latest decisions adopted under the Montreal Protocol on curtailing illegal trade, and any guidance documents that have been developed. Customs was informed by the NOU of possible illegal imports of CFC-12 and smuggling cases, with examples of the most likely violations. Customs check points were informed of possible illegal imports of CFC-12. The Customs codes were revised to facilitate cross-checking of imports.

24. Five Customs officers were trained on the different types of ODS and equipment packaging and hazardous chemicals, who then transferred the information to other officers. Training for Customs Officers was financed with funds from the Institutional Strengthening sub-project.

25. There was no refrigeration identification equipment supplied in the Project for officers to use at the border. Instead, Customs focused on the validity of the labelling of imports, any documentation and accompanying certificates, conformity with the chemical inventory system ECICS, and containers importing the ODS.

26. There were no illegal imports of ODS in the past three years. On one occasion in 2006, the Customs identified potential illegal imports of CFCs from the Republic of Korea, but it transpired that they were in transit to Russia. On an earlier occasion in 2005, illegal transfer of ODS to ships was suspected, but with further investigation it transpired that the company involved had applied an incorrect customs code.

10.3.2 UNDP/UNEP Projects on methyl bromide

27. The GEF/UNEP MRP "Initiating early phase out of methyl bromide in CEITs through awareness raising, policy development and demonstration/training activities"[15] was a forerunner to the larger Regional Project which would assist CEIT countries to comply with the phase out deadline for methyl bromide of 1 January 2005.

28. The Project covered awareness raising on the uses of methyl bromide and its alternatives, policy development for methyl bromide phase out, identification of alternatives, diffusion of demonstration results, adoption of alternatives, and implementation of national programmes. Workshops were held in Poland (25–27 October 2000, regional policy development workshop), Hungary (23-25 April 2001, soil uses) and Bulgaria (28-30 May 2002, postharvest uses)[16]. At that time, Lithuania had not yet ratified the Montreal Amendment but it had an import / export license system in force since August 2000 which limited the use of methyl bromide to 10 tonnes. In response to the Workshop in Poland, Lithuania prepared a series of regulations on methyl bromide which were released in July 2003[17].

29. The Regional Project which followed in 2004 aimed to phase out all non-exempted uses of methyl bromide, to minimise the demand for critical use and quarantine and pre-shipment applications, and to introduce sustainable pest control methods. At that time, JSC Grudu Pirkliai Ltd was the largest and only fumigation company that used methyl bromide to control pests in silos and grain elevators. The company employed 6 qualified fumigators, and used about 11 tonnes of methyl bromide per year. Two other fumigation companies that operated in Lithuania already used phosphine.

30. A National Steering Committee (NSC) was established. It was chaired by the Secretary of the

[15] GF/4040-00-10. Prof Reuben Ausher Review, reported in October 2003.
[16] Ausher, R. 2003. Evaluation of the Project GF/4040-00-10 on the early phase out of methyl bromide in CEITs.
[17] LAND 50-2003: Ozone-Depleting Substances Processing Requirements. 8 July 2003.

MoE. The NSC consisted of members from the MoE, the State Plant Protection Service (SPPS, chemical registration and extension work), the State Grain and Seed Service, the Grain Processors Association, and a fumigation company. The MoE cooperated closely with the Ministry of Agriculture (for the registration of chemicals), the Ministry of Health (for fumigator certification) and the Ministry of Labour (for safety requirements). SPPS has a general mandate for maintaining national plant health and plays major role in the agrochemical registration process, education, training and supervision.

31. The MoE met with representatives of the Grain Processors Association, as part of the awareness campaign on alternatives to methyl bromide for grain. Companies that were using phosphine were also informed of the aims of the Regional Project. SPPS was informed of the need to protect the ozone layer and the regulatory requirements for alternatives. The State Environmental Health Centre and Ministry of Health were informed of the need for alternatives to methyl bromide. Information on alternatives in the EU was posted on the MoE website.

32. A training programme was delivered by a training company contracted to UNEP. The company provided theoretical and practical information to 28 participants. Ten of them became trainers and trained a further 10 participants. Training materials on alternatives to methyl bromide for grain were translated into Lithuanian and posted on the MoE website.

33. There were a number of other initiatives that increased the stakeholder understanding of alternatives to methyl bromide. A workshop for 22 participants was held on 18-22 September 2006, which demonstrated the use of heat for disinfestation of pests, and advanced phosphine fumigation technology. The industry organised a training session on the use of the speedbox technology for 17 participants on 14-15 June 2007 at the Jonavos Grudai company. Two participants visited Poland to see firsthand the high pressure CO_2 equipment that had been installed for disinfesting imported herbs and mushrooms. Five participants attended a postharvest regional seminar on non-chemical methods in Poland. The MoE also attended a meeting with the European Commission to determine the prospects for research on non-chemical, sustainable methods of pest control. The NOU visited the Netherlands as part of a study tour organised by UNEP to see the commercial application of controlled atmospheres at ECO_2 Ltd for controlling pests in grain and other commodities.

10.4 IMPACT DRIVER II: RECOVERY AND RECYCLING PROGRAMME

34. This programme aimed to recover, recycle and reclaim as much refrigerant as possible during the transition period between CFCs and CFC-free technology, at a time when imports of CFCs were banned. Therefore, the only available CFC refrigerant to service existing equipment was obtained from the CFCs in the market that were recovered, recycled and reclaimed ('3R'). This programme consisted of two parts:

1) Training of technicians in refrigeration management; and
2) Distribution of equipment for ODS recovery, recycling and reclamation activities.

35. In response to the investment sub-project on the recovery and recycling of CFCs, the National Refrigeration Association (NRA) was established in Lithuania in 1998. It is a non-profit making society. In 2008, NRA membership consisted of 15 companies that accounted for most of the refrigeration market in Lithuania. The mandate of NRA is to collect information on refrigeration equipment, air-conditioning and other activities; to provide the legislative framework for the development of proposals; to represent the views of the enterprises in the government, management institutions, and international organisations; to participate in public programmes that help solve environmental problems; to publicize the activities of the association by organising seminars and other

events; and to deliver training and certification services for refrigeration personnel.

36. At the time of the Project, the NRA focused on its implementation in Lithuania and did not assist any other countries in the region to achieve the objectives of the Project on the recovery and recycling of ODS.

10.4.1 Training of technicians in refrigerant management

37. In order to receive the equipment, personnel from the companies were required to participate in seminars on refrigerant management. There were 132 technicians trained from 1993 to 1996 in service enterprises, and 90 technicians in from industrial enterprises. By the end of 1996, there were 29 personnel in service and industrial enterprises that had not been trained. There were two seminars that provided practical demonstrations on the use of the equipment for recovery and recycling. In 2008, NRA trained 50 trainees on refrigerant management.

38. Training programmes were prepared by the vocational education and training establishments and registered in the Register of Programmes for Studies and Training. The Lithuanian Labour Market Training Authorities issued certificates to technicians and managers that passed the course. Trainees paid about $268 to attend each 40h course, which consisted of 15 hours theory and 25 hours of practical tuition. Not all trainees pass and about 5% of them fail either the theory or the practice and must re-take the course. Certification is valid for 5 years. The NRA reported that there are no unqualified technicians working in Lithuania. Unqualified workers and their managers can be penalised under national legislation if they are found to be working without qualifications, which acted as a deterrent.

39. In Lithuania, ODS waste is classified as 'hazardous' and subject to EU law applicable to its recovery, transport and disposal[18]. All companies that manage ODS waste must also be licensed, and technicians must be trained and certified. Legislation adopted in 2006 specified that from 1 January 2008 only qualified personnel such as technicians and managers were permitted to service ODS contained in refrigeration & air-conditioning equipment, and heat pumps[19]. Lithuania transposed EC legislation on waste into national legislation[20].

10.4.2 Recovery, recycling and reclamation equipment

40. The Project financed 50 recovery and recycling machines and 3 reclamation units. The MoE with the assistance of the Association distributed them to 16 companies, including the reclamation units to 3 Reclamation Centres for processing CFC-12. The companies that received the equipment were selected on the basis of a survey that determined the extent of their servicing activities. Companies that did not receive the equipment purchased their own because they allowed CFCs to continue to be used, and because the equipment was necessary for them to obtain certification.

41. Thirteen of these companies are still using the machines. Many other servicing companies paid for their own machines. The machines were retrieved from two companies that were not actively using the machines, and they were redistributed to the other companies. The MoE, in collaboration with the Association, is currently considering assigning 3 more machines to other companies in order to maximise their use. Spare parts for the machines were purchased with the residual Project funds. When the parts were depleted, the companies purchased their own.

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[18] Regulation (EC) No 1013/2006 on the shipment of waste.

[19] Resolution 695 of 10 July 2006. State certificate required by personnel that handle refrigerants (F-gas, ODS).

[20] Order No. D1-190 of the Minister of Environment dated 30 March 2007.

42. The Reclamation Centre was not supplied with equipment to recover halon. Instead, halon decommissioned in Lithuania was intended to be shipped to the halon Regional Halon Bank in Estonia. Lithuania identified 23 companies and institutions that use halon. The NOU supplied relevant information on the decommissioning requirements for halon to these companies and institutions. So far, no halon has been shipped from Lithuania to the Regional Halon Bank in Estonia.

43. Legislation in Lithuania adopted in 2004 banned the disposal of unwanted refrigerators in a landfill, and required municipalities and companies to put in place procedures to manage the environmentally-safe recovery of ODS under the Waste Management Act[21]. However, in February 2005, the RAL Quality Assurance Association reported that Lithuania did not have procedures in place for the recovery of ODS from the foam of unwanted refrigerators, only the compressors which contained only about 30% of the refrigerator's ODS.

44. There are currently 107 companies that use refrigerants for servicing refrigeration and air conditioning equipment. These companies are required by legislation[22] to complete a Form annually (for use in the previous year) on the name of the substance, the source (import or EC), the quantity at the beginning of the year, the quantity added, the intended use, the amount recycled/regenerated/destroyed, and the amount remaining at the end of the year. Legislation in place mandates all companies to also report annually to the MoE on the amounts recovered, recycled, reclaimed and destroyed[23].

45. The quantities of recovered and recycled ODS are shown in Table 13. There were no reports of reclaimed ODS. The NOU said that although there were more than 250 companies involved in ODS recovery and reporting up to 2005, the number reporting reduced to about 180 in 2008 because ODS use has been replaced by alternatives.

46. According to the MoE records, recovery and recycling of ODS was successful as the machines were used when repairing and dismantling refrigeration equipment. In contrast, the reclamation machines were little used because the price of new ODS was low, technicians did not trust the quality of the reclaimed ODS, there was an administrative burden for enterprises that handled contaminated ODS as it was categorised as 'waste', and the reclamation machines could not reclaim blends of refrigerants which were common at the time.

47. Recovery and recycling is mandatory under Lithuanian legislation. There are penalties established for deliberate emissions of ODS and for failing to report on ODS recovered and recycled. The MoE also sent letters to the refrigeration servicing companies and regional inspectors that explained the requirement to recover ODS, and the penalties for not doing so.

48. There are no ODS destruction facilities in Lithuania. In 2008, 5.8t of a mixture of CFC-12 and CFC-11 were shipped to Germany for destruction at RCN Chemie GmbH. The cost for destruction including transport cost was paid for by the owner of the ODS waste. This single shipment was the only ODS waste sent for destruction in the past 3 years.

10.4.3 Replacement of halon for fire protection

49. Lithuania reported that halon for fire protection had been replaced by ODS-free alternatives where possible, thereby eliminating all non-critical uses. Most of the halons are very ozone-depleting and therefore there are benefits to the ozone layer in this recovery and replacement programme.

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[21] LAND 50-2004. Article VI: Environmental control of controlled substances

[22] Order of the ENV. Minister Nr D1-206 of 2004 as amended Nr D1-463 of 2006 and amended Nr D1—365 of 2007

[23] LAND 50-2004: Art VII: Reporting to MoE by 1 March each year.

50. Determining the amount of halon on ships was problematic because no data were available at the time of the Project. During 2006-2008 Lithuania decommissioned the halon systems on 28 ships and recovered 2,526 kg of halon[24] including BF2[25]. According to the information available to MoE, today we do not have Lithuanian-flagged ships with halons. The BF2 and halon were replaced with ODS-free fire-protection equipment. The recovered halon has not been transferred yet to the Regional Halon Centre in Estonia. One additional ship with 214 kg of halon 2402 changed flag and is no longer under Lithuanian jurisdiction. Another ship is a special-purpose search and rescue ship with 420 kg of halon 2402 that was transferred to the military.

51. Lithuania recently decommissioned and recovered 1,624 kg of halon from the TV Tower. Any remaining halon is installed in certain military and aviation equipment, where it does not have to be decommissioned, as it use for military and aviation purposes is in accordance with the critical uses listed in Regulation (EC) No 2037/2000. Lithuania has a list of the quantities of halon used for these purposes, which has reduced as a result of the awareness campaign.

Table 13: Quantities of ODS recovered and recycled in 2000, 2005, 2006 and 2007 (kg).

	2000*		2005		2006		2007	
	Recov.	Recy.	Recov.	Recy.	Recov.	Recy.	Recov.	Recy.
CFC-12	16,195		414	0	527	0	0	0
CFC-12 & CFC-11			0	0	0	0	5,837	0
HCFC-22	6,978		7,178	6,760	5,346	1,992	8,588	3,978
HCFC-124			12	12	12	0	171	171
HCFC-142b			8	8	8	0	101	101
Halon 1301			0	0	0	0	334[1]	0
Halon 2402			0	0	1,033[2]	0	1,727[1]	12
Total			7,612	6,780	6,926	1,992	16,513	4,017

* April 2000 to January 2001; blank = no report; Halon 2402 sometimes included cylinder weight; Excludes halon recovered from ships; [1]includes halon from ships; [2]includes halon from 45 ships; Recov = Recovered; Recy = Recycled

10.4.4 Awareness raising

52. The NOU undertook extensive Awareness Raising activities from 2002 to 2005 that targeted a diverse audience including the general public, school children, government departments, the fire service and companies involved in ODS. Awareness Raising activities included: Flood-lit posters for more than a year in the major cities; seminars to halon alternatives companies, ODS importers, distributors and users; booklets on the ozone layer for school children; information on alternatives posted on the website of the MoE; and, in cooperation with the NRA, a series of seminars delivered to companies on ODS. The Awareness campaign evolved out of the Project formulation process during which the major uses of ODS were defined, and the alternatives that could replace them. Gaps in knowledge were identified, and priorities were set for putting in place solutions over a 5 year period.

53. The NOU reported that the awareness campaign was essential for making companies aware

[24] Pers Comm 27 May 2009, Mrs Varvara Daubarienė, Chief Desk Officer of Chemicals Division, MoE

[25] 75% Ethyl bromide (= halon 2001) + 25% $C_2Br_2I_4$ (= halon 24024) is known as BF2 or 'Blend B' (Drs David Catchpole and Dan Verdonik HTOC pers. comm. 28 May 2009)

of their legal obligations, and government departments and inspectors aware of their enforcement implications. The NOU reported that the GEF funding was essential for carrying out training on the detection of ODS and, importantly, the alternatives that would reduce the use of ODS. Once people were made aware of the problem, they were able to focus on the challenges of eliminating the use of ODS. The awareness programme was essential for creating a change in attitude at all levels of society in Lithuania.

54. There was neither a baseline established, nor performance indicators developed, that could be used to monitor the impact of the awareness raising campaign on the ozone layer recovery. Therefore, it was not possible to assess the impact of this awareness raising campaign.

10.5 IMPACT DRIVER III: ENTERPRISE SUSTAINABILITY

10.5.1 UNDP/UNEP ODS Phase Out Project

55. There were three companies that received funding to phase out ODS in Lithuania: Snaigė domestic refrigerator manufacturer; the aerosol company Vilnius Buitine Chemija; and the compressor manufacturing enterprise Oruva.

Snaige domestic refrigerator producer

56. Snaigė is the only domestic refrigerator and freezer manufacturer in the Baltic. Both conversion processes: 1) CFC-11 → R141b → cyclopentane-blown rigid polyurethane insulation foam in the doors and cabinets, and 2) CFC-12 → HFC-134a → R600a in the compressor, were paid for by a GEF grant of $2,009,162 from 1996 to 2000 for all the steps including line testing and power performance parameters, except the conversion CFC-11 → R141b, as Snaigė was not able to fulfil the GEF criteria for retroactive financing for work completed before the start of the Project[26]. A total of 112 ODPS-tonnes of CFCs were eliminated, equivalent to 29% of the ODS consumption in Lithuania in 1995. The elimination of ODS and replacement with non-ODS resulted in an increase in the production of refrigerators (Figure 34).

57. Snaigė commented that they would have preferred that the conversion to have been completed in one step, as this would be been more economical and less disruptive to their production. However, Snaigė acknowledged that the GEF funding enabled the company to put in place modern production and refrigeration technologies that improved competitiveness, increased production capacity, improved environmental compliance, improved manufacturing quality and working conditions, reduced production costs & labour, and reduced the energy demand of refrigerators. The 30% savings in energy consumption promoted sales of refrigerators on EU markets as purchasers could claim government-funded rebates e.g. Netherlands. The number of models increased from 7 (before 1997) to 25 after the Project.

[26] The GEF funding criteria did not permit the allocation of funds for conversion from one ODS (typically CFCs) to another ODS (typically HCFCs) as this was not regarded as sustainable. In addition, the GEF Strategy published in February 1997 permitted funding to be considered for costs incurred less than 12 months prior to the approval of the relevant sub-project, but only 15% of these costs could be financed retroactively.

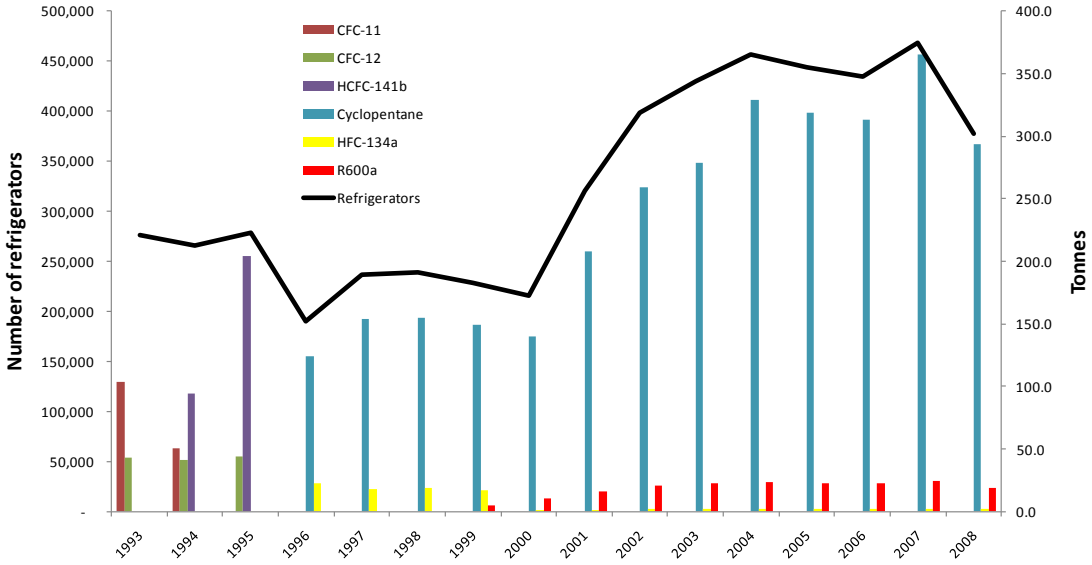

Figure 34: Number of refrigerators produced by Snaigė using CFC-11, CFC-12, HCFC-141b, cyclopentane, HFC-134a and R600a (in tonnes) in each year from 1993 until 2008

58. Snaigė said that UNDP experts performed very well in all stages including problem identification and solutions, procurement, liaison and coordination. Production of refrigerators doubled after the Project was completed. The supply of compressor components for R600a was difficult in the beginning, but became easier as more compressor companies became involved. Snaigė exports up to 97% of its products to almost 40 countries around the world. Since the Project was completed and in 2002, Snaigė purchased five other similar companies in the Russian Federation and Ukraine[27]. Although the company's production capacity is 650,000 refrigerators per year, about 377,000 units were produced in 2008 and it expects to manufacture about 200,000 units in 2009. Snaigė has recently halved its Lithuanian workforce to 700 and is working 4 days per week[28] due to the economic crisis, whereas from 2000 to 2007 it operated 24h/day for 5 days per week.

Vilnius Buitine Chemija aerosols

59. Vilnius Buitine Chemija (VBC) was a contract-filler aerosol company. The GEF provided $467,615 to VBC from 1998 to 2000 to replace 245.6 ODP-tonnes per year of CFCs with hydrocarbon propellant, equivalent to 63% of the reported ODS consumption in Lithuania in 1995. Aerofil equipment was installed, and the personnel were trained in plant safety. Aerosol Baltija purchased Baltic Chemicals International (previously VBC) in 2004 and reported sales of aerosol products for 2005 to 2008 (Figure 35). Sales have increased in the past two years compared to the number of aerosols produced before the Project was implemented.

60. Aerosols were exported in 2008 to Russia (36%), Lithuania (29%), Sweden (28%), Finland (6%) and other countries. In contrast, aerosols in 1996 were mostly exported to Uzbekistan, Russia, Kazakhstan, Tajikistan, Ukraine and Estonia. Aerosol Baltija reported that spares are readily available for the Aerofil equipment, but it now requires upgrading

[27] "Techprominvest" in Kaliningrad in 2002, which also contained GEF-funded equipment salvaged from Calex (Slovakia) when Calex went bankrupt; "Snaigė Ukraine" in 2002; "Moroz Trade" in Moscow 2004; "Liga-servis" in Russia in 2005; and "Almecha" in Lithuania in 2006.

[28] Financial Times. 20 April 2009.

to improve productivity, even though the number of aerosols produced in 2007 was twice the amount in 1995. The company operates 8h/day for 5 days per week, which has been a typical working period for its operations over the past 5 years.

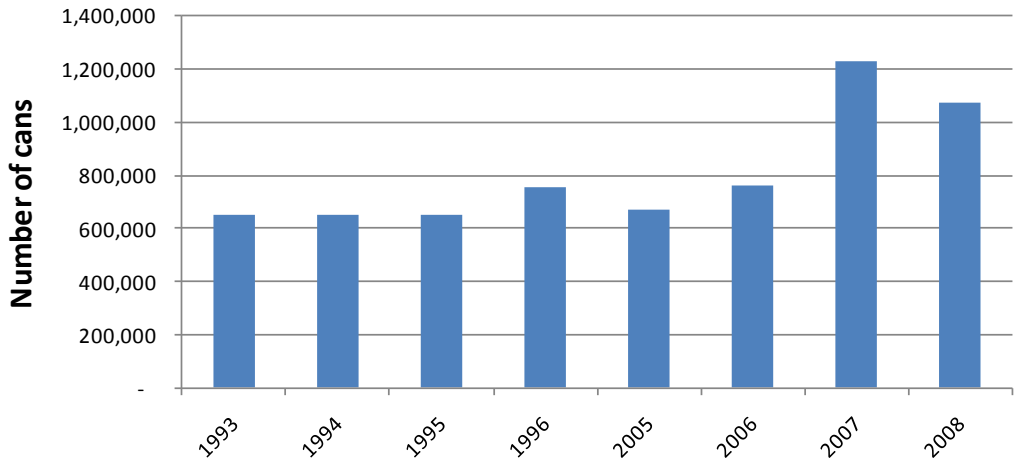

Figure 35: Number of aerosol cans manufactured with CFCs (1993 to 1996, by Vilnius Buitine Chemija) and with hydrocarbon propellant (2005 to 2006, by Aerosol Baltija). Discontinuous company ownership precluded production reports in missing years

Oruva compressor producer

61. Oruva used to be a company that was 84% privately owned and who produced compressors for domestic refrigerators. The GEF provided $1,728,500 of financial assistance to replace 20 ODP-tonnes per year of CFC-based compressor production technology with technology for producing HFC-134a- and R600a-based compressors on a large-scale. In 1996, more than 2,600 worked at the 4.6 ha factory that had a capacity of 1.2 million compressors annually.

62. Before the Project started, Oruva had already converted the factory to allow small-scale production of HFC-134a- and R600a-based compressors, which were not eligible for GEF retroactive finance. The number of units per year had been reduced from 1.058 million in 1993 to 136,000 in 1996 (an 87% reduction). About 85% of the production in 1996 was exported to Ukraine, Bulgaria, Baltic countries and the Caribbean.

63. The company reported that it had entered bankrupt procedures[29] and that liquidation of the company had commenced on 4 March 2009. UNOPs reported that Oruva was being managed by a Bankruptcy Administrator in 2001. At that time, the ownership of the newly installed equipment was discussed. Oruva had assumed ownership of the equipment in its accounting system, before UNDP had transferred ownership. The possibility of repaying the Project for the cost of the equipment was considered, depending on Oruva's post-bankrupty operational status. It was not possible for the evaluation team to obtain further information.

Summary of ODS phase out by enterprises

64. The investment Projects were assessed as largely successful. The refrigerator producer Snaige reported that it benefited significantly by being involved in the Project – production increased (units, models), and the plant operated more efficiently because its labour input was reduced. The ODS-free technology had improved its environmental performance and the energy efficiency of its refrigerators, making them attractive to cost-conscious

[29] Court Proceedings of 24-09-2008, which came into force on the 07-10-2008.

consumers in the international markets. Its competitiveness had improved which strengthened its financial position, enabling it to buy out other companies locally and abroad. The second company VBC aerosols also reported improved sales, although it would be difficult to attribute this impact to the Project as this increase occurred under a different company and much later after the project ended. These two companies together succeeded in phasing out 95% of the targeted ODS in the investment sub-projects in Lithuania. In the third company, it was not possible to determine whether or not 20 ODP-tonnes of ODS had been eliminated in the production of compressors at Oruva as it had recently gone into liquidation.

10.5.2 UNDP/UNEP Projects on methyl bromide

Grūdų pirkliai fumigation services

65. Grūdų pirkliai UAB is the main company involved in Lithuania in the methyl bromide project. The equipment was delivered to Grūdų pirkliai on 6 December 2008. Phosphine from speedboxes was registered in Lithuania in 2008, based on an application from the manufacturer, which allows the speedboxes to be used.

66. Mills have been heat-treated in Lithuania using equipment provided by the Project to both Lithuania and Latvia. The owners of the equipment in both countries have agreed to share the equipment as the number of heat-generating machines supplied to each country alone was not capable of generating sufficient heat in the mill to disinfest the pests. The equipment to implement the IPM procedures, such as the vacuum cleaners and pheromone traps provided by the Project, were installed in a flour mill in Lithuania. The equipment for the IPM procedures was also transferred to Grūdų pirkliai.

10.6 IMPLEMENTING AGENCIES

67. The equipment arrived two years before the training of technicians was undertaken. There were administrative difficulties setting the dates for the training because the NOU had not at that stage been established. The NOU would have preferred that UNDP delayed delivery of the equipment until after the training had been carried out.

68. The NOU wanted more information on ODS destruction as this was considered an important element that was not fully explored during the implementation of the ODS recovery and recycle project. The NOU considered ODS 'destruction', 'licensing' and 'illegal trade' were excellent topics for regional seminars in the Project, but they were not discussed.

10.7 IMPACT THREATS / RISKS

10.7.1 Illegal trade

69. Lithuania considered that it had sufficient internal controls in place to detect and intercept ODS, and to take action against companies that violated the law. Customs are obliged by legislation to provide import/export data by company and by substance to MoE every 6 months. There are Inspectors in 8 regional departments that collect the information and provide it to MoE. The Inspectors are responsible for regulating companies which includes checking ODS stockpiles, storage, and import documentation. The Inspectors cooperate with the MoE and Customs in combating illegal trade by reporting any irregularities to both organisations.

70. The NRA reported that it coordinates activities with the Customs Department. The Association confirmed that there was no illegal trade in CFCs in Lithuania, mainly because there was no longer any equipment containing CFCs to create the demand. Information provided by Customs from 2004 to 2008 showed there were no serious violations of the legislation on ODS. In general, Customs returns substances or products that are not prohibited in the exporting country.

71. Although refrigerant identifiers are acknowledged by many countries as important for intercepting illegal trade in ODS, they have not been provided to Lithuanian Customs Officers at the border. All of the EU-CEITs in the Project subsequently became the border for the EU from 1 May 2004, as there are no border controls within the EU. Accession established the requirement to not only protect Lithuania from illegal trade, but also countries in the heart of the EU. Refrigerant identifiers would help to reduce the risk of ODS being smuggled via Lithuania to the other member states in the EU. The NOU suggested that the risk of illegal trade could be reduced through regional cooperation in programmes on labelling and identification of ODS, which would improve the ability of Customs officers to undertake checks at the border for ODS.

72. The MoE predicted that there was small risk of illegal imports of virgin HCFCs in the near future, as only recycled HCFCs can be used in the EC from 2010. Shipment of virgin HCFCs could also take place to some extent within the EU.

10.7.2 Recovery, recycling, reclamation and destruction

73. The NRA was very useful in organising the distribution of equipment for the recovery and recycling of CFCs. Since that time, the NRA continues to be very useful for delivering training courses and accrediting technicians on the best practices for refrigerant management. However, the amount of training has reduced because of the economic crisis, which increases the risk of unqualified technicians servicing refrigeration and air conditioning equipment.

74. Recovery during the repair process is likely to be more profitable than during the refrigerator dismantling phase. NRA confirmed that the reclamation units provided by the Project are also suitable for the processing HCFCs. The MoE commented that enterprises are likely to become more active in HCFC recovery after 1 January 2010, when only recovered and recycled HCFCs can be used. The new EC Regulation on ODS, which is likely to come into force in 2009, stipulates that the recovered HCFCs cannot be placed on the market. This restriction, in effect, makes them useable only for the enterprise that recovers them and could reduce their value for recovery.

10.7.3 Methyl bromide

75. Methyl bromide was replaced with phosphine, a chemical alternative that may not be sustainable in the longer term. Chemicals are required to pass stringent toxicity tests to show safety in all environments. With prolonged use under sub-lethal conditions, pests can develop resistance thereby rendering phosphine ineffective for pest control. The NOU wanted more emphasis on finding non-chemical solutions, rather than chemical ones, to ensure that the phase out of methyl bromide was sustainable.

10.7.4 Government commitment

76. The Lithuanian government is committed to undertake activities that continue to reduce ODS, and to provide information to the European Commission, in compliance with EU regulations and directives. Member States continue to undertake these activities because of a desire to comply with national environmental objectives, which also has the benefit of avoiding infringement action which has been instigated in the past when a Member State has not complied with the requirements of the EU legislation.

77. The government is therefore committed to the protection of the ozone layer and the risk of this being reduced appears minimal.

10.8 IMPACT ON THE PHASE OUT OF OZONE-DEPLETING SUBSTANCES

10.8.1 UNDP/UNEP ODS Phase Out Project

78. Lithuania's objective to phase out of 390 ODP-tonnes as a result of the Project was fully met. For the CFC component, Lithuania phased out 112 ODP-tonnes in the domestic refrigerator production facility, 245.6 ODP-tonnes in the aerosol company and 20 ODP-tonnes in the compressor facility. More than 16 ODP-tonnes of CFCs were recovered in 2000, which would have been available for servicing of equipment that still depended on CFCs.

79. The GEF finance also assisted Lithuania to comply with Decision X/25 of the Parties to the Montreal Protocol. The consumption of Annex A and B substances was reduced by 87% from 1996 levels by 1 January 2000 (86% was required in Decision X/25). Lithuania reported zero ODS consumption for CFCs, carbon tetrachloride and methyl chloroform in 2001. In response to the Parties request for greater emphasis on recovery and recycling to meet the servicing needs, Lithuania with the financial assistance of the GEF deployed recovery and recycling equipment to 16 companies. The amount recovered would have helped to address the CFC servicing requirements at the time, thereby avoiding the need to import CFCs.

80. The success of the GEF Project had the benefit of assisting Lithuania to comply with the ODS legislative requirements of the EU, prior to accession to the EU on 1 May 2004. Lithuania eliminated 91% of the targeted ODS through the successful implementation of two investment sub-projects at Snaige and at (now called) Aerosol Baltija. The objectives were met without an extensive Awareness Campaign.

10.8.2 UNDP/UNEP Projects on methyl bromide

81. Lithuania phased out the consumption of methyl bromide from 1 January 2005[30], as there have been no requests to the Parties on behalf of Lithuania by the EC for the critical uses of methyl bromide. The prospects for a sustained phase out of methyl bromide was improved through the provision of phosphine fumigation equipment in this Project, and by supplementing Lithuania's knowledge on the use of phosphine and IPM / non-chemical methods of pest control. Lithuania's ability to engage at a regional level on ways to assess, manage and ultimately to reduce ODS was enhanced by the Project.

82. The sustained phase out of methyl bromide since this time has maintained Lithuania's compliance with the Montreal Protocol and with EC legislation on ozone-depleting substances. Therefore, the objective of the Regional Project to phase out methyl bromide in Lithuania was achieved. This Regional Project strengthened Lithuania's stakeholder understanding of environmental legislation, as well as promoting greater ministerial and institutional cooperation. It provided a springboard for the Grain Processors Association to explore more environmentally-friendly techniques, which may eventually lead to a non-chemical treatment.

[30] UNEP Ozone Secretariat Data Centre. 22 April 2009. Lithuania's consumption of methyl bromide for non-QPS uses was 6 ODP-tonnes in 2001, 2002 and 2003; and not reported from 1 January 2004 as the EC reported as a region.

11 POLAND

11.1 BACKGROUND

1. Poland's first free parliamentary elections in 1991 signalled the beginning of elected governments and progress toward a free market economy. The policies introduced by the government from that year onwards promoted Poland's participation in the global economy and expanded the scope of private enterprise[1].

2. As in many of the countries that became independent of the former Soviet Union, many of them in the early to mid-1990's had steadily reduced imports of ODS, in anticipation of the imminent closure of CFC and halon production in the Russian Federation. They wanted to eliminate their dependency on predominantly Russian imports by putting in place procedures to avoid disruption to the national users of equipment, when the supply in Russia ceased. In Poland's case, consumption of CFCs was reduced from 4,939 ODP-tonnes in 1990 to 1,756 ODP-tonnes in 1995[2], during a period of economic turmoil.

3. Despite this significant effort, in 1996 Poland was in non-compliance with the Protocol because of its continued consumption of Annex A (Group I, CFCs) and Annex B (Group I, other fully halogenated CFCs) substances. Reported consumption was 549 and 19.5 ODP-tonnes of Annex A and B substances respectively in 1996, instead of zero[2]. Poland also consumed ODS for laboratory and analytical uses without an exemption in 1996, 1997 and 1998. Prior to going into non-compliance, representatives of Poland met with the Protocol's Implementation Committee in 1995 to discuss potential difficulties that Poland foresaw in meeting its obligations under the Montreal Protocol after 1995 "…*because of some doubts concerning the availability of substitutes*[3]". In order to try to remain compliant with the Protocol, Poland in 1995 requested the Parties approve an Essential-Use exemption for 100t of CFCs "… *for technical and economic reasons to prevent thousands of Polish citizens discarding their refrigerators with no immediate prospects for replacing them*."[4] Poland proposed to the Parties that it would not apply for an exemption at any time after 1996, if they were to approve Poland's exemption request for the consumption of CFCs in 1996[4].

4. Poland's request was declined by the Parties as they believed that allowing an exemption for CFCs for refrigerator servicing "…*would set a bad precedent at a time when alternatives were considered to be available*." At their annual meeting one year later, the Parties approved an essential-use exemption for Poland for each year from 1997 to 2003 for 240 to 382 ODP-tonnes[2] of CFC per year, which brought Poland's consumption of CFCs in these years into compliance with the Protocol. The CFCs were used as the propellant in metered-dose inhalers for the treatment of asthma.

5. By the time the GEF Project started in 1997, Poland had already acceded to the Vienna

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1 US State Department. 2009.
2 Ozone Secretariat Data Centre, last updated 13 May 2009.
3 Decision VII/15: Compliance with the Montreal Protocol by Poland
4 Seventh Meeting of the Parties. 1995. Page 55.

Convention, the Montreal Protocol, as well as the London and Copenhagen Amendments in 1996. Poland later ratified the Montreal and Beijing Amendments in 1999 and 2006 respectively.

11.2 INPUTS

6. Three Projects provided financial assistance to Poland to phase out ODS. The first was a GEF/World Bank Project that targeted all ODS for phase out, except methyl bromide and HCFCs. The second was a small Project that aimed to reduce the use of methyl bromide. The third was a larger Regional Project which aimed to phase all uses of methyl bromide, except those used for quarantine and pre-shipment.

11.2.1 GEF/World Bank ODS Phase Out Project

7. The GEF / World Bank Project was approved on 11 March 1997 and completed on 30 April 2001, after three extensions when additional time was necessary to finalise sub-project implementation. The GEF Grant of $5.5 million was matched by $13.5 million from enterprises and a grant of $259,800 from the Polish EcoFund. Poland advised that there were also in-kind funds provided by the government, but the amount was not disclosed.

8. The objectives of the Project were to assist Poland to transition to non-ODS technology by providing financial support:

   1) To assist six enterprises identified in the Country Programme to eliminate their use of CFCs;
   2) To establish a network of refrigerant recovery, reclamation and recycling operations; and
   3) To strengthen the government institutional capacity to manage the phase out of 1,204 ODP-tonnes of ODS. The remaining 712 ODP-tonnes were phased out by the companies without financial assistance from this Project.

9. The GEF Project was prepared by the Ozone Layer Protection Unit (OLPU) from the Industrial Chemistry Research Institute in Warsaw. The Industrial Development Agency (IDA) in the Ministry of Economy (MEC) subsequently became the Project Implementation Unit (PIU) and financial intermediary, with advice from technical consultants. There was strong liaison between MEC and the Ministry of Environment (MoE). MEC/MoE financed the OLPU. The IDA role was further expanded when it became an active investor in one of the companies (see EDA below) that eventually went bankrupt.

11.2.2 UNDP/UNEP Projects on methyl bromide

10. The GEF/UNEP Project "Initiating early phase out of methyl bromide in CEITs through awareness raising, policy development and demonstration/training activities"[5] focused on the development and translation of public awareness materials, demonstration projects, regional training activities, and policy development. The Project commenced in March 2000 and concluded in September 2002. The total budget was $806,195 consisting of $700,000 from GEF, $37,000 in kind from UNEP, and $106,195 from Canada.

11. The larger UNDP/UNEP Regional Project "Total sector methyl bromide phase out in countries with economies in transition"[6] was designed to assist seven CEITs to phase out all uses of methyl bromide except quarantine and pre-shipment by 1 January 2005, in accordance with the Copenhagen Amendment of the Montreal Protocol relevant to developed countries.

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[5] GF/4040-00-10 for CEITs Bulgaria, Estonia, Hungary, Latvia, Lithuania, Poland and Slovakia.

[6] GF/4040-05-05 for CEITS Bulgaria, Estonia, Hungary, Latvia, Lithuania and Poland. Azerbaijan and Uzbekistan were observers.

12. This Regional Project commenced in Poland on 31 March 2005[7] and was completed on 30 June 2008. Actual costs totalled $2,793,318 which consisted of GEF/UNEP $398,834 for capacity building, GEF/UNDP $688,372 for postharvest equipment, GEF/UNDP $499,840 for soil disinfestation equipment, co-finance of $253,164 from commercial partners in cash, and $953,108 in kind. The objective of the Project was to phase out all uses of methyl bromide except quarantine and pre-shipment (QPS) by 1 January 2005, in accordance with the Copenhagen Amendment of the Montreal Protocol relevant to developed countries. In 2003, Poland reported a consumption of 36 tonnes of methyl bromide to the Montreal Protocol.

13. The institutional arrangements in Poland to address the UNDP/UNEP Regional Project were similar to other countries in the Project. The OLPU became the Project Coordination Unit (PCU) that was responsible for project management and administration. The MoE was the Executing Agency. National Experts (one on soil topics, the other on postharvest) provided technical advice to the NOU-PCU/MoE. A National Steering Committee (NSC) provided advice and consisted of representatives from the Ministries and governmental bodies, fumigators, methyl bromide importers and methyl bromide end users.

11.3 IMPACT DRIVER I: GOVERNMENT COMMITMENT

11.3.1 GEF/World Bank ODS Phase Out Project

Institutional and legislative strengthening

14. Legislation implemented in Poland at the time of the Project included a tax on CFCs at $30/kg and other ODS (1992), a ban on new halon equipment (1992), a ban on the use of halon in ships (1992), licences for the import/export of all ODS (1996), and a ban on new equipment on the market containing CFC, HCFCs and halon (1997). The driver for legislation in Poland on ODS after the Project was completed was Regulation (EC) No 2037/2000, which came into force in the EU on 30 June 2000. This regulation came into force in Poland on 1 May 2004 when Poland acceded to the EU.

15. During the Project and since that time, the government of Poland has maintained the same level of institutional strength to address ozone layer protection issues across a range of ministries and departments. Legislation in Poland, which was established by the initiative of the MoE and the NOU, now involves different authorities, services, departments and Ministries who monitor and report on the compliance of companies with ODS legislation. The legislation supplements EC legislation on the control and phase out of ozone-depleting substances.

16. As a result of EU membership from 1 May 2004, the European Commission has required Poland to submit annual reports on emissions control of ODS (minimum qualification requirements), the use of methyl bromide and its alternatives, critical uses of halons, the use of CFCs in medical products that control asthma, the phase out of halon on ships and in aircraft, and the quantity of ODS recovered, reclaimed, recycled and destroyed.

17. The Polish government had shown considerable commitment in undertaking activities that continued to reduce ODS, and that provided information on ODS to the European Commission in compliance with EU regulations and directives. In this regard, the government had contracted the specialised services of the OLPU to undertake defined work on ozone layer protection. Member States including Poland continue to undertake these activities, not only because of the requirement to comply with national

[7] An MOU covered the period 31 March to 31 December 2005, and the Project commenced 1 January 2006. The Project was approved 1 May 2004, endorsed by CEO Nov 2004 and activities in the Project commenced in March 2005.

environmental objectives, but also to avoid infringement action which has been undertaken by the European Commission in the past when a Member State has not complied with the requirements of the EU legislation.

Customs and border security

18. There were three courses undertaken during the project that trained Customs agents all aspects of ODS detection and legislation. Poland wrote a Training Manual for Customs as the first version of the UNEP Manual at the time was not sufficiently comprehensive. The Customs officers received 40 ODS detection units which are currently in use at the border entry points. Any ODS intercepted was sent for validation prior to the commencement of infringement action.

19. The evaluation showed that Poland had put in place legislation, trained customs officers in ODS-detection procedures and equipped them with refrigerant detection equipment. These actions had resulted in the interception of illegal ODS imports. Smugglers had been fined when, for example, HCFCs were illegally imported from Ukraine. Poland has therefore been successful in putting in place legislation and procedures to combat illegal trade.

11.3.2 UNDP/UNEP Projects on methyl bromide

20. The GEF/UNEP Project in Poland focused on the development and translation of public awareness materials, demonstration projects, regional training activities, and policy development. The demonstration project in Poland tested various chemical and non-chemical combinations on several crops in open field (cabbage, celery and tomato) and in glasshouses (strawberries, peppers). The most promising alternative was dazomet combined with *Trichoderma* as a bio-control agent. The demonstration work shortened the time for the UNDP/UNEP Regional Project by allowing equipment selection to proceed as soon as it was approved.

21. The University of Environmental and Life Sciences (Wroclaw) provided monitoring and evaluation (M&E) services in the soil sector, and the Institute of Plant Protection (Poznan) provided M&E services in the post-harvest sector.

22. The UNDP/UNEP Regional Project was divided into pre-harvest and postharvest activities that aimed to phase out methyl bromide. The main pre-harvest use of methyl bromide was for the production of strawberry runners. Poland produces about 17 million strawberry runner plants annually from about 170 ha. They are shipped to Spain and Italy, and exported to Morocco. There are about 15-20 growers that produce most of the runners. They are in demand because they produce two weeks earlier than locally grown runners.

23. Dazomet and metam sodium were selected as the chemicals to replace methyl bromide for the treatment of open fields prior to planting strawberry runners. To apply these chemicals, the UNDP/UNEP Regional Project supplied 4 rotary spader machines and two tractors. The area of strawberry runner cultivation increased from 26 ha in 2005 to 100 ha in 2007. The PCU attributed the 4-fold increase in cultivated area of runners to the rotary spaders financed by the Project. Furthermore, if the spaders had not been financed by the Project, jobs and financial returns to the local area would have both been lost.

24. Steam treatment was used as a replacement for methyl bromide to disinfest nematodes in the soil of glasshouses and plastic tunnels that are used to produced ornamental flower crops. Two steam boilers were financed by the Project. To heat the soil, the boiler passes superheated water at 200°C through pipes buried in the soil. Steaming is only used for ornamental crops, as strawberry and tomato are produced on soilless systems.

25. State Agricultural Extension Service (SAES) trained farmers on the use of alternatives to methyl bromide. Representatives from SAES and the State Plant Protection Inspectorate participated in the training sessions. The government relied on specialised training on the use of equipment delivered by manufacturers of the equipment, such Imants who provided training on the use of the rotary spader technology. There were other companies which received equipment in the Project based on well developed criteria, including Grupa Producentów Owoców i Warzyw Hortus, Gospodarstwo Rolno-Ogrodnicze Wojciech Lechowski, Zamojskie Zakłady Zbożowe, Zarząd Morskich Portów Szczecin-Swinoujscie, PHU Cargofum, Agropest, Agropest Alfa, and Agrochemical Pest. Representatives of many other companies participated in trainings.

26. A range of equipment was used to replace methyl bromide's postharvest uses in fumigation chambers, silos or flour mills. Equipment supplied by the Project included ThermoNox™ mobile heating units & electrical distribution system for heating all or part of a mill to arthropod pests, industrial vacuum cleaners to remove dust that harbours arthropod pests, ventilators and blowers to circulate the phosphine, equipment for measuring phosphine concentrations, pest population monitoring equipment, a generator of phosphine gas, a phosphine recirculation J-system and portable fans for use on silos, and materials and equipment for sealing silos and mills. The companies received equipment in the post-harvest sector based on well-developed criteria. They included Zamojskie Zakłady Zbożowe, Zarząd Morskich Portów Szczecin-Swinoujscie, PHU Cargofum, Agropest, Agropest Alfa, and Agrochemical Pest. Representatives of those and many other companies participated in the training related to the post-harvest use of alternatives.

27. Training was an important component of the Project. In the soil sector, fifteen trainers delivered 13 courses to more than 500 farmers. In post-harvest sector, six technical training workshops focused on specific methyl bromide-free methods and areas of application e.g., heat treatment in mills, IPM/phosphine. Practical demonstrations were provided on the sites of the end users e.g., flour mill. In the postharvest sector, 241 fumigators, end users and plant protection inspectors participated in the training sessions.

28. An M&E survey carried out before and after the training showed that *after* the course the participants became more aware of the range of alternatives, that they found the costs of alternatives were comparable to methyl bromide, and that they appreciated the requirement to install them as soon as possible.

29. Poland valued the study tours by experts to Germany, Italy and The Netherlands that assisted with decisions on equipment selection and procurement. Poland believed that awareness raising activities carried out in schools in rural areas was a supplementary activity that helped to promote environmentally-friendly pest control methods.

30. These actions by Poland indicated to the evaluation team that Poland had coordinated an extensive and ultimately successful programme to replace methyl bromide with alternatives. Further comments on sustainability of this programme are discussed on page 153 in Section 6: Impact Threats.

11.4 IMPACT DRIVER II: RECOVERY AND RECYCLING PROGRAMME

31. This programme in the GEF/World Bank Project aimed to recover, recycle and reclaim as much refrigerant as possible during the transition period between CFCs and CFC-free technology, at a time when imports of CFCs were banned. Therefore, the only available CFC refrigerant to service existing equipment was obtained from the CFCs in the market that were recovered, recycled and reclaimed ('3R'). This programme consisted of two parts:

1) Training of technicians in refrigeration management; and

2) Distribution of equipment for ODS recovery, recycling and reclamation activities.

11.4.1 Training of technicians in refrigerant management

32. Training was carried out in a 6 month period from November 1999, and in two months in late 2000. Not all trainees passed and the failure is about 6% per year. Out of 1,840 trainees, 1,725 trainees passed the course and were issued with Greencards. The Greencard was used as evidence by technicians of qualifications achieved in a number of countries in the EU, after the programme was first pioneered by Hungary.

33. The training and certification system was discarded by the Ministry of Economy after the Project, and therefore since that time no further training has been carried out. However, Poland planned to transpose relatively recent EU legislation on refrigerants into Polish law, which required technicians handling refrigerants to be qualified. As a result, the training programmes were expected to resume in Poland in 2009.

34. Any unqualified workers found to be servicing refrigeration and air conditioning equipment can be fined under Polish legislation. The Prozon Foundation was not aware of any such fines having being imposed.

35. The relatively large number of technicians trained in the Project showed that Poland was committed at that time to reducing emissions of ODS during equipment repair and maintenance, and to maximising the prospects for ODS recovery and recycling which is discussed in the next Section.

11.4.2 Recovery, recycling and reclamation equipment

36. The Prozon Foundation was established in 1996 by two trustee companies now renamed as Air Products and Termo Schiessl. A further trustee Linde Gas joined in 2003.

37. The Project contributed $1,122,640 to procure a reclamation unit, 550 portable ODS recovery equipment, 80 refrigerant identifiers for use by the Customs Authority (40) and by staff at ODS collection depots (40), equipment for the training centre, and 140 small recovery and recycling units and other service equipment (Figure 36). The GEF's overall contribution to the establishment of the ODS recovery network and training was 40% of the actual cost of $1.7 million.

Figure 36: ODS storage tanks (green) and recovery units (orange, yellow, blue); storage cylinders (left) and reclamation unit (right) (Prozon Foundation, Poland)

38. Prozon maintains a database of portable ODS recovery equipment distributed throughout Poland and 90% was reported to be traceable. Poland is establishing a database of equipment supplied in the Project to monitor its use and storage conditions after the termination of the project. The database could result in the re-

allocation of equipment that is under-utilised.

39. A pilot programme implemented early in the Project highlighted deficiencies in the ODS recovery scheme, which were subsequently corrected to make it one of the most successful. The experience of the OLPU was essential in assisting Prozon to re-launch the ODS recovery network into a successful venture (see Prozon Foundation paragraph 20). There were a number of key elements which collectively contributed to its success:

40. The companies that were supplied with units were charged an annual rental fee of about $60/year, which was cancelled if 100 kg of uncontaminated product was delivered to the depot each year. When the units were gratis, the depots received very little ODS.

41. The depots consisted of 21 shops located around Poland that belonged to the three trustee companies. Service companies deposited their ODS which they had collected at these depots which were conveniently located. The ODS was efficiently transferred from these 21 depots to the central Prozon location for reclamation or destruction.

42. Most importantly, ODS was not categorised as hazardous waste by law, which allowed it to be freely transported within Poland to recovery and recycling facilities. In addition, the law that required ODS to be recycled and recovered was implemented at about the same time that Public Awareness Raising Campaign (PARC) was carried out. Poland attributed the success of the programme to these two factors.

43. Poland currently requires owners of ODS to maintain the servicing records showing any leaks in logbooks. Owners that release ODS above a threshold limit are fined, according to State Inspectorate inspections. The combination of these events facilitated the ODS recovery activities of up to 2,500 service companies, of which half received equipment from Prozon and the remainder purchased equipment using their own resources.

44. From the start of the Project to the end Prozon recovered 20t of refrigerants which was well below the target of 140 tonnes. The reduction in the amount recovered per annum compared to the initial estimates was attributed by Prozon to cheap imports of HCFC equipment from Germany. Prozon identified a further 25 tonnes being held at the depots, which were transferred to the Central facility for reclamation or destruction. Prozon estimated in the beginning that 30-60 tonnes of ODS would be recovered between 2001 and 2005. However, in the end about half this amount was recovered as 11 tonnes of ODS were recovered in 2007 and 22 tonnes in 2008.

45. More than 80% of the recovered ODS is recycled. ODS that cannot be recycled is sent to Prozon for initial analysis. Prozon uses a portable detector[8] that can differentiate a wide range of pure refrigerants (CFC-12, HCFC-22, HFC-32, HFC-125, HFC-134a and HFC-143a) and blends (R404A, R407C, R407E, R408A, R410A and R507A). The number of chemicals detected was many more than any other model seen by the review team in 14 countries. As a result of the analysis, Prozon was able to take appropriate extraction and storage decisions on each lot of ODS sent for recovery.

46. Prozon said that it was not eligible for payment from a central government fund under EU Directive 2002/96/EC, and instead must collect fees for each lot of ODS deposited with them from the owner of the ODS. EU Directive 2002/96/EC allowed companies to claim the fee for equipment destruction, which is paid by consumers of electrical goods at the time of purchase. Since Prozon was only collecting the refrigerant and not the equipment, it was not eligible to collect the fee.

[8] Yokogawa TA400A Detector. Sanwa Tsusho Ltd reported in April 2009 that the supply was exhausted and there were no plans to commence manufacture.

47. ODS that could not be recycled or reclaimed used to be sent for destruction in Germany, until recently when this became too expensive. The government thought that some companies probably vented ODS rather than pay for the cost of its destruction. Destruction costs were reduced in 2008 when a Polish company offered destruction services that were less expensive - about $6/kg for ODS received at the reclamation centre, which included about $3/kg for actual destruction. The government thought that a company's access to cheaper destruction costs was only part of the solution. But the second part was to discourage deliberate venting of ODS. The government addressed this by increasing the penalty to $15/kg. The government planned to review the details recorded in the repair-service logbooks as an indicator of whether or not the ODS had been released deliberately. The details of each visit must be recorded in a logbook (unique to a unit of equipment) by a service technician each time the equipment that contained more than 3kg of ODS was serviced or repaired. Inspectors were required to check the logbooks periodically.

48. In the recycling and recovery programme, Poland had gone to great lengths to learn from past mistakes and then to put in place procedures that addressed each step of the programme. The most important step was to ensure that the financial flows encouraged both the collection and the recycling of ODS. Poland has also put in place procedures that both promoted destruction of ODS and that discouraged deliberate venting of ODS. Poland appears to be one of the few CEITs reviewed that has taken a holistic approach to ensure the self-financing of the recovery and recycling of ODS, which has good prospects of being sustainable. The programme is a model for other countries to follow in establishing such programmes.

11.4.3 Halon

49. Halon decommissioning and replacement with alternatives is important in the EU. Halons are only permitted for 'critical uses' as defined in Annex VI of Regulation (EC) 2037/2000, which includes military and civil aviation uses. The Project paid $106,500 only for training activities related to halon recovery and banking, and not for equipment. Sixty-eight trainees participated in two 3-day courses held in 1998, following the HARC "Guide for the Safe Decommissioning of Halons" that was translated into Polish. Six trained technicians were selected from those initially trained to be trainers.

50. There are three companies in Poland that are licensed to recover, reclaim and manage a halon bank. Prozon is one of them, as it does not have the specialised equipment to recover and reclaim halon. The other two companies were equipped with halon reclamation equipment, which they financed themselves. There is no database held by the government that records the quantity of banked halon, so this could not be reported.

11.4.4 Awareness raising

51. The PARC at the end of 1999 and in 2000 was important for promoting action on ODS recovery. The GEF contributed $125,000 towards its cost which included the design, printing and distribution of materials on ozone layer protection; seminars for journalists; contests and concerts for children and teenagers; design, production and distribution of the Green Cards; TV reports, animated films and purchase of the rights to "Hole in the Sky" video cassette; advertisement in 85 cinemas in Poland for 2 weeks; articles in the press; and 100 CD ROMs on the work of Prozon.

52. An Impact Assessment Committee reported that the campaign was successful as it improved ODS recovery, promoted a favourable public response on ODS legislation under development at the time, and it likely to have a sustainable impact on future generations that understand the need for ODS recovery. However, since a base line was not

established, and performance indicators developed to monitor changes relative to the base line, this impact was impossible to verify.

11.5 IMPACT DRIVER III: ENTERPRISE SUSTAINABILITY

11.5.1 GEF/World Bank ODS Phase Out Project

53. There were six companies that received funding to phase out ODS in Poland in the GEF/World Bank ODS Phase Out Project: Polar (later Whirlpool, domestic refrigerators); Zamex (domestic, commercial and medical freezers); Inzynieria (insulation for pipes); Metalplast (sandwich panels); Polfa Tarchomin (pharmaceutical supplies and medical equipment); and EDA (compressors for domestic refrigerators). The World Bank analysed the financial viability of selected enterprises in Poland to try to ensure that funding was only provided to those that were technically viable, competitive on the market and likely to be sustainable in the longer term.

Polar refrigerator manufacturer

54. Polar was retroactively financed by the Project for work completed by the company prior to the start of the project that replaced CFC-12 with HFC-134a in the compressor in two lines, CFC-11 with cyclopentane blown-foam, and CFC recovery and recycling network. There was an overlapping use of the ODS and ODS-free technology over a 10-year period from 1993 until 2003 (Table 14 and Figure 37).

55. Approximately 13% or $529,000 of the total cost of conversion (approximately $4 million) was eligible for GEF retroactive finance. The Project successfully phased out about 200 ODP-tonnes of CFCs.

56. In 2002, Polar was acquired by Whirlpool and the two companies combined employ about 2,500 staff at 3 sites to manufacture refrigeration and other equipment. After the Project was completed, refrigerator and freezer production increased from 362,000 units in 2001 to 913,000 units in 2005. The number of models also increased, in response to market demand. Whirlpool has about 20% share of the Polish market.

Table 14: Use of the ODS and ODS-free technology in refrigerators manufactured by Polar

Insulation foam			Compressor Circuit		
CFC-11	HCFC-141b	Cyclopentane	CFC-12	HFC-134a	Isobutane
1993-1994	1995-1997	From 1996	1993 – 1996	1996 - 2003	From 1996

57. Whirlpool said that the GEF Project enabled the company to join the group of leading European producers, as the market demanded '*ecological refrigerants*'. Other benefits were a wider choice of compressors, avoidance of a fee in Poland for the use of ODS, and improved access to components. Isobutane compressors were expensive initially but reduced in price when isobutane compressor manufacturers became more prevalent. Installation of safety procedures, monitoring for leakage, additional staff training, and re-location of tanks for isobutane and cyclopentane were the major changes in the facility as a result of the transition.

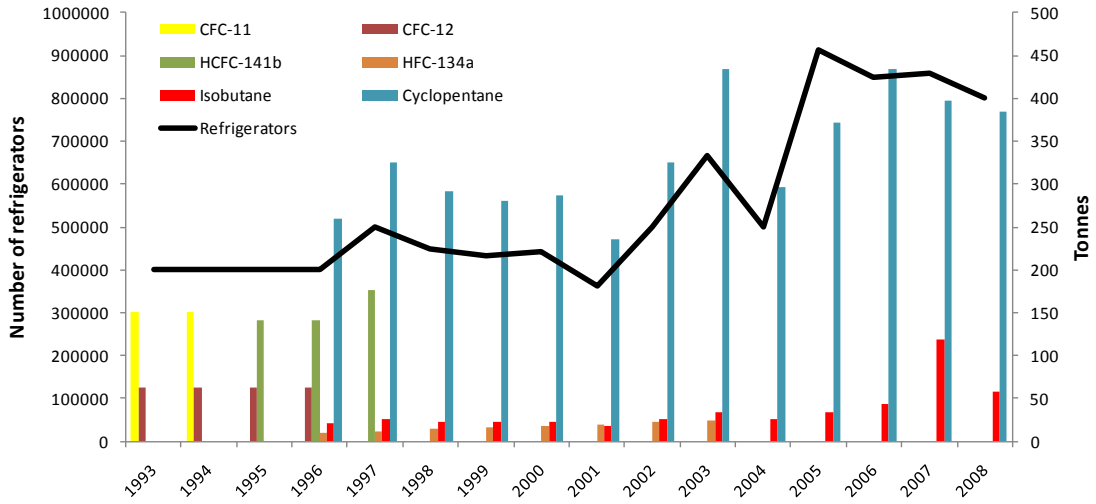

Figure 37: Number of refrigerators produced by Polar/Whirlpool from 1993 to 2008 using ODS and non-ODS in the insulation (CFC-11, HCFC-141b, cyclopentane) and compressor (CFC-12, HFC-134a and isobutane) components

Zamex freezer manufacturer

58. Zamex manufactured domestic, commercial and medical freezers. The Project provided $1,098,650 to replace CFC-11 with 2 injection machines for cyclopentane-blown rigid insulation foam. The Project successfully eliminated the target of 75 ODP-tonnes. Zamex went into receivership and was deleted from the register of companies on 4 September 2006. The receiver was seeking to sell the foam machines but the outcome was not known.

Inzynieria pipe manufacturer

59. Inzynieria manufactures a range of polyurethane foam items, including insulation pipes. The Project paid $149,000 to replace CFC-11 with water/CO_2 technology using a high-pressure blowing machine and modifying moulds. The Project successfully eliminated the target of 19 ODP-tonnes. Inzynieria commented that the Project was very useful as computer systems installed with the equipment allow more accurate production of foam. In addition, the safety and hygienic conditions for the staff operating the machine improved, as hydrochloric acid gas in the air decreased from 1.5 to less than 1.0 mg/m^3 in the air. However, the CO_2 produced foam that was 27% less insulating than with CFCs, which was compensated by using more foam and adding a foil cover. The foam is used for insulating district heating pipes, and therefore compensating for the loss in insulation was very important. In 2009, Poland reported that Inzynieria had been acquired by another company, but it was unable to provide the evaluation team with further details.

Metalplast sandwich panel producer

60. Metalplast was an enterprise that manufactured steel-faced sandwich panels on two continuous laminator plants. The Project retro-financed $481,000 (or 6.2% of total sub-project cost) as by the time the Project commenced Metalplast had already replaced CFC-11 with n-pentane technology in two lines, including the installation of safety equipment. The Project successfully eliminated the target of 300 ODP-tonnes. The GEF finance included DM 50,000 for certification of the insulative value of the foam, safety checks after the equipment was installed, a study on emissions and re-training of personnel.

61. Metalplast said at the end of the Project that the work was pioneering as it was only the second of its type in Europe; the technology was appropriately selected; and they were satisfied with the design, preparation and implementation of the sub-project. Their costs

of production were lower, and the funding improved their ability to access export markets where there was a demand for n-pentane-blown panels. The company valued equipment that was installed for worker safety. Metalplast was a state-owned company that was privatised at the beginning of the Project. Metalplast was probably acquired by Ruukki when it was split into smaller companies due to the economic crisis in 2001. Metalplast was deleted from the register of companies in Poland in June 2006.

Polfa Tarchomin aerosols

62. Polfa Tarchomin (hereinafter "Polfa") is a manufacturer of aerosol and other pharmaceutical supplies and medical equipment. It was privatised on 1 January 1999. The Project paid $446,560 to replace CFC-11 and CFC-12 with isobutane technology, including the installation of safety equipment and product/line certification, which successfully eliminated the target of 320 ODP-tonnes.

63. Polfa said that the funding by the GEF avoided the need to take out a loan and created the opportunity for export expansion. The equipment selection has proved unsatisfactory as there is no longer any local representative for the equipment and parts are difficult to obtain. They were not aware that more expensive and better equipment could have been purchased if they had 'topped up' with their own funds.

64. The safety equipment for isobutane doubled the cost compared to the HFC-134a option. Polfa recalled that the consultant was knowledgeable on HFC aerosols but less so on isobutane, so the Polfa itself undertook most of the evaluation work. At the time, the company management was not convinced of the need to adopt isobutane, and was unwilling to explore the options generally, which delayed implementation. Polfa reported that, had they been aware of the reporting requirements, they would have collected the relevant data in real time. However, they were not told of these until the end of the Project, which then incurred additional time and effort on their part.

EDA compressor manufacturer

65. EDA[9] was a factory producing compressors for domestic refrigerators. At the time of the Project, the company produced 500,000 compressors per year. The Project contributed $1,581,120 to correct an EDA-financed investment that replaced CFC-12 with HFC-134a, but produced unacceptably noisy compressors. It is doubtful that the phase out target of 320 ODP-tonnes was achieved.

66. The company did not pass the World Bank's financial viability analyses at the time. The IDA injected more than $0.9 million into the company during the restructuring phase from state to private company, which then resulted in the World Bank agreeing to fund. The company went bankrupt in 2000 due to poor management that made strategic marketing errors and failed to reduce staff when the profitability was reduced. The company started production again in 2002, using 134a technology. However, sales were insufficient and the company went into receivership in 2005. The majority of the equipment was bought by Cerim that serviced air-conditioning systems. Two machines were transferred to PZL-Hydral SA which is currently producing compressors. Liquidation of EDA was completed in December 2008.

Summary of ODS phase out activities by companies

67. Almost half of the total GEF funds allocated as investment funds to Poland were paid to Zamex and EDA, which went bankrupt shortly after the Project was completed. The evaluation team was able to show that all equipment supplied under the Project to all the

[9] Also known as HCW and Ekapon

other companies apart from Inzynieria was in use. This indicated a satisfactory level of sustainability had been achieved for about 50% of the investment projects in Poland. Further comments on sustainability are provided on page 154 in Section 6: Impact threats.

11.5.2 UNDP/UNEP Projects on methyl bromide

68. There were two companies that received funding to phase out ODS in Poland in the UNDP/UNEP Regional Project on that phase out of methyl bromide: Solfum (chemical and bio-control services); and PNOS (seed-producing and marketing company). One other company (Herbapol) was not funded by the GEF Project, but is shown in this report as an example of catalytic action as it was financially assisted by separate funding.

Solfum agricultural services

69. Solfum has 15 staff and offers a range of chemical and bio-control services pest and disease control services to growers. The company used methyl bromide on soil for the last time in 2008 on 30 ha of strawberry runners. From 2009 onwards, metam sodium has replaced methyl bromide for soil treatments. The Project provided the company with two rotary spaders and a steam treatment unit for soil disinfestation, and an extensive range of equipment for postharvest pest control.

Figure 38: Spader showing nematocide bins (red), and details of spades that are damaged by rocks in soil. Solfum, Poland.

70. Solfum reported that the replacement of methyl bromide in this Project in fact saved both the company and the strawberry runner industry. The area of strawberry runner cultivation had increased from 26 ha in 2005 to 100 ha in 2007, despite constant damage (Figure 38) to the spaders by rocks in the ground (see page 154 Section 11.8: Risks/Threats), and plant losses due to *Verticilium* being 7% more than when methyl bromide was used. The PCU attributed the 4-fold increase to the rotary spaders financed by the Project. The company examined other machinery during the procurement process and remained convinced that the equipment purchased was indeed the best available for the task. Furthermore, if the spaders had not been financed by the Project, jobs and financial returns to not just the company but also the local area would have both been lost.

PNOS seed supply

71. PNOS SA is a state-owned seed-producing and marketing company which has been recently restructured and which employs 300 staff. Seeds are shipped to Europe and exported to Belarus, Russia and Ukraine via 100 companies and 3 distribution centres. PNOS has joint ownership of more than 100 varieties of vegetable seed. Seeds certified as organic are produced and marketed. The Project financed two "GrainPro Cocoons" (Figure 39), each one being an air-tight, two-piece PVC structure joined together with a tongue-&-groove

zipper. A vacuum pump extracts the air. Arthropods in or on the seeds stored in bags die as a result of an increase in carbon dioxide and reduction of oxygen due to the respiration of the seeds.

72. Unfortunately PNOS, local experts and GrainPro have not succeeded in sealing the cocoons due to a fault with the zipper and holes in the PVC, so they remain unused. The PCU attributes this failure to inadequate pre-purchase testing and unsatisfactory performance by GrainPro to rectify a faulty product. Even if the cocoons were to become operational, additional finance will be required to keep them in a constant temperature room above 20°C, as this is the temperature required to kill the pests in a reasonable time. The requirement for a constant temperature room was not foreseen in the Project.

73. Fumigation with phosphine is an alternative treatment to methyl bromide and the GrainPro cocoons. A speedbox for phosphine was provided to PNOS by the Project, but it cannot be used as the registration expired in 2008. Re-registration is expected by July 2009. PNOS plans to test phosphine treatment of seeds using methods already registered in Poland, which is used by 5-7 other seed companies operating in Poland.

Figure 39: Cocoon for creating low oxygen environment to kill pests on seeds (top) with damaged zipper (below). PNOS Seed Company, Poland.

74. A commercial vacuum cleaner to reduce dust and mites in the packing facility was also provided by the Project and is currently the only equipment that is usable and effective.

11.6 IMPLEMENTING AGENCIES

11.6.1 GEF/World Bank ODS Phase Out Project

75. Poland said they were mostly highly satisfied with the outcomes of the sub-projects. They considered the GEF funding as '…inevitable for achieving the phase out of the total quantity of ODS assumed in the Country Programme'.

76. In general, the time allocated for the project was insufficient as it did not take account of the time incurred when companies were suspended pending privatisation arrangements, delays in obtaining and installing equipment in the sub-projects, and additional time required to complete the safety requirements in some sub-projects.

77. The significant volume of data required from companies for the World Bank financial viability screening was seen as overly onerous by many potential enterprises, who decided not to participate in the Project. The OLPU estimated that about 80% of the companies in Poland were not prepared to submit data to ascertain financial viability, mainly because they did not trust the system and the procedures.

78. Poland reported that a study tour to visit companies that had received funding in the past

would have benefited finance staff from enterprises that had been selected for funding, as a means of sharing experiences and reducing the time for compliance with the procurement operations. The OLPU thought that the number of companies in the project and the quantity of ODS to be phased out would have increased if the procedures for companies had been less onerous and more transparent.

79. The Government of Poland listed a number of deficiencies in the Project, which together delayed implementation:

80. The decision to establish IDA as the PIU (rather than the OLPU) slowed activities at the start of the Project as IDA staff required significant familiarisation on technical and other issues associated with the sub-projects.

81. Training of PIU and enterprise staff in the World Bank procurement, reporting and auditing procedures should have been carried out toward the beginning of the Project in order to reduce time for implementation, but instead it was carried out very late (October 2000) during the third and final extension. The adoption of Polish commercial practices rather than World Bank procurement procedures expedited sub-project implementation.

82. The World Bank's Task Manager and Technical Consultant changed during the Project, resulting in a loss of familiarity with the details of the Project and a need to establish connections.

83. The GEF rules[10] for the payment of retroactive financing of the incremental operating costs dissuaded companies from taking immediate action and, moreover, was not seen as fair by companies that had already paid for the ODS conversion prior to 31 December 1995.

84. Approximately 49% of the total GEF funds ($2,679,770) allocated to Poland were paid to Zamex and EDA, which were both companies that went bankrupt shortly after the Project was completed. It would have been useful if the financial viability tests undertaken by the World Bank could have taken into account the macro-economic conditions that prevailed soon after the Project finished. Earlier action on potential foreclosures would have enabled the funds to be directed toward activities that would have eliminated ODS used in other companies in Poland.

85. In the case of Zamex, there was no information available on whether the equipment that was supplied with the project (more than $1 million) was still being used, consistent with the lifetime expectation of the equipment. It would have been useful to have had a clause in the Grant Agreement in Poland that ensured a '*…commitment by the Beneficiary, pending insolvency or discontinuation of activities, to make arrangements with the Implementing Agency to ensure the equipment and materials included in the sub-project and financed wholly or partially from the proceeds of the GEF Trust Fund Grant shall continue to be utilized for purposes consistent with the objectives for the Project*'. This clause was included in the Grant Agreements used by the World Bank in the Czech Republic, Hungary and Slovenia.

11.6.2 UNDP/UNEP Projects on methyl bromide

86. The UNDP/UNEP Regional Project was considered by Poland to have started four years too late. The delay to the start of the Project did not allow it sufficient time to phase out methyl bromide in time for the 1 January 2005 deadline agreed under the Montreal Protocol. Along with some other countries in the Montreal Protocol, Poland was permitted

[10] The new GEF Strategy published in February 1997 allowed payment for costs incurred less than 12 months prior to the approval of the relevant sub-project, and only 15% of the costs could be financed retroactively.

an exemption to use methyl bromide for specific 'critical uses'[11], which extended its use to 31 December 2008. Poland is likely to meet the objectives of the Project by 1 January 2009, as no critical uses have been requested in 2008 for use in 2009.

87. Herbapol, a company that employs several hundred, is a manufacturer of herbal medicines and natural flavourings used in the food industry. Methyl bromide was used to disinfest pests contained in local and imported herbs and edible fungi. Herbapol installed two high-pressure CO_2 chambers to replace methyl bromide which were omitted from consideration by the GEF. The costs of eliminating methyl bromide were financed by Herbapol and Poland's EcoFund. The PCU commented that the EcoFund's contribution to Herbapol was '*absolutely critical*' for completely phasing out the remaining non-QPS uses of methyl bromide in Poland.

11.7 IMPACT THREATS / RISKS

11.7.1 Illegal trade

88. HCFCs were intercepted in the past that had been illegally imported from Ukraine, and the smugglers were fined. The OLPU commented that there is always a risk of illegal trade, no matter how effective the measures are to combat it. However, measures are in place in Poland such as customs officers trained in ODS and equipped with ODS detection machines, and legislation to fine those caught smuggling ODS. There is cooperation between the Customs Department and the MoE, including the regular exchange of information on ODS statistics.

11.7.2 Recovery, recycling, reclamation and destruction

89. The restriction in Regulation (EC) No 2037/2000 that allows only recovered HCFCs to be used to service refrigeration and air conditioning equipment in the EU after 2010 creates a marketing opportunity for Prozon. However, as the new regulation on ODS which is expected to replace the above Regulation in 2009 bans the shipment of recovered HCFCs between Member States, Poland's ability to profit from this marketing opportunity will be limited to sales in Poland rather than in the EU in general.

11.7.3 Methyl bromide

90. From 1 January 2009, methyl bromide has been phased out for all uses in the EU except internationally permitted uses such as QPS, and even this will be banned in the first quarter of 2010. The phase out of methyl bromide may not be sustainable as it has been replaced by another fumigant (metam sodium) which itself may be banned. Even the use of this metam sodium is costly to the company, compared to using methyl bromide, because the fumigation equipment (rotary spaders) that was used to inject the fumigant into the ground was frequently damaged by rocks in the field. Replacement blades needed to be welded onto the unit after every 2-3 ha of spading. The repairs took 2-3 days each time, resulting in significant downtime.

91. Solfum said that deregistration of metam sodium as a result of the ongoing review of fumigants in the EU under Regulation (EC) No 91/414 would be financially disastrous for the company and the farmers, as potential replacements such as 1,3-dicloropicrin and chloropicrin were not registered in Poland. In Poland, metam sodium is the only chemical that can be used in the rotary spaders. The Agricultural Ministry was not fully engaged in the Project, particularly on issues related to the registration of chemicals. The bio-control procedures were considered the most sustainable, but they were not commercially

[11] Critical uses are those uses for which a technically and economically feasible alternative has yet to be implemented in the circumstances of the use of methyl bromide. Decision IX/6 of the Montreal Protocol.

available and had to be developed. Solfum was not aware of any chemical products or non-chemical procedures that were available on the market that could replace metam sodium.

92. There is virtually no prospect of returning to methyl bromide as all uses – including those for quarantine and pre-shipment which are currently exempt under the Montreal Protocol - will be banned in March 2010 under new EC legislation. The prospects for the implementation of any new method in the short term were seen as very remote. There is an additional risk that the operational costs of growing the strawberry runners with metam sodium, given the cost of repairs and lost time during the repair process, will be undercut by runner growers on rock-free land that does not damage the rotary spader.

93. Apart from the production of strawberry runners, Poland also produces ornamental plants in glasshouses and plastic tunnels. In this sector, steam is being used as a methyl bromide replacement. Although farmers in this sector preferred methyl bromide to steam[12], any prospects of the farmers returning to methyl bromide is blocked by EU legislation. The farmers had passed on the cost of production to the consumer. Therefore, the phase out of methyl bromide in this sector seemed to be sustainable, as long as the price of ornamentals on the market is not undercut by cheaper imports.

11.7.4 Government commitment

94. The government for all projects has shown a high level of commitment to ozone layer protection, which was described on page 141 in Section 11.3. The prospect of this level of commitment being maintained appeared to be very likely.

11.8 IMPACT ON THE PHASE OUT OF OZONE-DEPLETING SUBSTANCES

11.8.1 GEF/World Bank ODS Phase Out Project

95. Poland's objective to phase out of 1,204 ODP-tonnes as a result of the Project was fully met. In the CFC component, Poland met the phase out target in the 6 enterprises (assuming EDA is 67% of target), including up to 60 ODP-tonnes of CFCs recovered during the Project. The recovered CFCs would have been available for servicing refrigeration and air conditioning equipment.

96. The success of the GEF Project had the benefit of assisting Poland to comply with the ODS legislative requirements of the EU, prior to accession to the EU on 1 May 2004.

11.8.2 UNDP/UNEP Projects on methyl bromide

97. Poland phased out the consumption of methyl bromide from 1 January 2009 and therefore did not meet the objectives of the Regional Project which aimed to complete the phase out by 1 January 2005. Poland's use of methyl bromide over this 4 year period was in compliance with the requirements of the Montreal Protocol, as the Parties had approved the critical uses of methyl bromide in Poland each year for this period. Poland's ability to engage at a regional level on ways to assess, manage and ultimately to reduce ODS was enhanced by the Project.

[12] Steaming is slow (0.5 ha takes 6 days), expensive (€3.50/m^2 compared to €1.20/m^2 for methyl bromide) and time-consuming for farmers (covering and preparing the soil).

12 SLOVAKIA

12.1 BACKGROUND

1. Slovakia became an independent state on January 1, 1993 after the dissolution of its federation with the Czech Republic (Czechoslovakia). After an initial decline in output in 1993, as a consequence of post-independence economic turbulence, the country's economic performance improved in the mid-1990s and built on the structural transformation and economic liberalization that took place in Czechoslovakia during 1989-1992.

2. The Country Program for Czechoslovakia was undertaken in 1992. The total ODS consumption was determined to be about 3,974 tonnes. The 1991 CFC consumption profile of Czechoslovakia was as follows: 1,600 tonnes in aerosol sector, 1,057 tonnes in the solvent sector, and 279 tonnes in the flexible foam sector. Halon consumption was insignificant less than 10 tonnes. It has been estimated that the Slovak Republic's consumption accounted for about 40% of the total consumption in the former Czech Republic. The largest use of CFC consumption in Slovakia was attributed to the domestic refrigerator manufacturing as a refrigerant and a foam blowing agent in making the insulation.

3. The Slovak Republic ratified the Montreal Protocol in 1994 as a follow-on to ratification by the Czech and Slovak Federal Republic in 1990. The Slovak Republic has been fully committed to phasing out the production and consumption of ODS substances regulated by the Montreal Protocol and subsequently by the London Amendment. Slovakia ratified the London Amendment in 1998. Slovakia was qualified for assistance from the GEF.

12.2 INPUTS

4. The largest single industrial user of CFCs in Slovakia was the domestic refrigerator industry. This sector consumed a total of 248 tonnes of CFC-11 and 120 tonnes of CFC-12. In 1995, the project was formulated to assist Slovakia in complying with the control schedule of the Montreal Protocol by conversion of two domestic refrigerator manufacturers Calex and Novy Calex (Samsung Calex) to non-ODS technology reducing ODS consumption in the country by about 211 ODP tonnes annually. The funding allocated to the project amounted to $2.5 million with the counterpart funding of $2.45 million. The Project was approved by GEF in May 1995 for implementation by the World Bank. In 1997, the equipment was delivered and installed in 1997. Calex started its ODS-free production in 1998. The project ended in May 2002by the submission of the project completion report. .

5. The GEF assistance in conversion of two domestic manufacturing enterprises was a priority for the Government. The phase out of ODS in other sectors was within the commitments of the Government. No financial assistance was provided by the GEF for any other ODS phase out activities in the country.

12.3 IMPACT DRIVER I: GOVERNMENT COMMITMENT

12.3.1 Legislative and institutional strengthening

6. The Ministry of Environment of Slovakia took the lead in the implementation of provisions of

the Montreal Protocol in the country. The staff of the Department the Air Protection and Climate Change was assigned with functions of the National Ozone Office. In 1998, the National Council of the Slovak Republic adopted the Act No. 76/1998 Coll. on the Protection of the Ozone Layer and Regulation No. 283/98 whereby the legal basis was established in relation to London and Copenhagen Amendments. Pursuant to this Act, the Ministry of Economy was entrusted with responsibilities of issuing licences for the import and export of controlled substance.

7. In 2000, the National Council adopted Act No. 408/2000 Coll. that amended Act No. 76/1998 Coll. on the Protection of the Ozone Layer and Act No. 455/1991 Coll. of Laws on Small Businesses (Small Business Act). As amended, the new legislation met the majority of requirements stemming from the EU Regulation No. 2037/2000, and which banned production and consumption of bromochloromethane, creating conditions in the country for ratification of the Beijing Amendment to Montreal Protocol.

8. The Ministry of Environment developed the Action Plan and the timeline for 1996-2000 to eliminate the use of ODS in Slovakia. The new 2001 – 2008 Action Plan was approved by the Government in June 2001. The implementation of the Action Plan has been constantly monitored. The Minister of Environment was responsible to report on the implementation of the Action Plan to the Government every two years and update and amend the Plan as necessary. The adopted legislation and action plans were the major drivers in reducing the CFC imports from 380.9 ODP tonnes in 1995 to zero ODP tonnes in 1996 and stopping imports of Methyl Bromide in 1999 in advance of the Montreal Protocol schedule.

9. Regional environmental protection departments were responsible for implementing and enforcing the legislation, checking the permits for use of ODS and performing inspections of companies. Environmental taxes or subsidies were not introduced. The environmental Inspector can impose a fine in the amount from €6 600 to €99 580 depending on the gravity of the inflicted damage to human health or the environment. The serious amount of the potential fine is working as an effective deterrent.

12.3.2 Awareness raising

10. Slovakia did not undertake a public awareness campaign.

12.3.3 Customs and Border security

11. The custom officers are familiar with the enacted license and import quota system. The Slovakia is a country with a low consumption of ozone depleting substances. Slovakia imported the controlled substances only from EU. Over the past five years, there were 20 recorded cases when fines were imposed by customs officers. However, instances of the illegal trade diminished. Recently only two cases of mislabelling were reported by the customs. Customs are obliged by legislation to provide regularly import/export data by company and by substance to MoE.

12. The customs check points are not equipped with refrigerant identifiers or other gas analysers. The environmental Inspectors take samples of controlled substances in the course of their site inspections and send them to the Technical and Testing Institute (TTI), which has equipment appropriate for detecting all types of refrigerant. Similarly, the Customs Office can send their samples to the TTI when the need might be. In recent years, the meetings of the Ministry of the Environment with the Customs Authorities have not been frequent and happen to be when a specific need arised. In 2008, there were no meetings with the Customs Office.

12.4 IMPACT DRIVER II: RECOVERY AND RECYCLING PROGRAMME

13. Since 1996, the demand for servicing the CFC-based refrigeration equipment has been met

through the imports of reclaimed refrigerants that is allowed under the Montreal Protocol. The Slovak Republic imported 20 tonnes, 40 tonnes, 8.9 tonnes and 1.8 tonnes of reclaimed CFC-12 in 1996, 1997, 1998, and 1999 accordingly.

14. Additionally, the system for recovery and recycling of refrigerant was established in Slovakia to supplement the import of recycled material. No refrigerant reclamation facilities were installed in the country. The enacted legislation requires the recovery and recycling operators to send the information on recovered and reused refrigerant to the Department of the Air Protection and Climate Change every six months. The data on quantities of recovered and reused refrigerant was not made available to the evaluation team. It appears that the capacity of the established 3R system was not sufficient to meet the total demand for CFC refrigerants in the refrigeration servicing sector.

12.4.1 Destruction of ODS

15. There is an active destruction facility FECUPRAL Ltd in Slovakia. This company is authorized by the Government to collect and manage waste from electric and electronic industry, and scrapped equipment containing CFC, HCFC, and HFC. This destruction facility apply a two-step high temperature continuing incineration process with direct oxidation for treatment of solid, paste and liquid wastes. The incineration is carried out in two combustion stages, first in the rotating oven at a temperature over 500 °C, the second one in an after-burning chamber/reactor at a temperature exceeding 900 °C, as required by our legislation. The web site provides a detailed description of the technological process that meets EU requirements. The price of incineration of ODS is not in the price list and needs to be requested directly from FECURPAL.

12.4.2 Training of technicians in refrigerant management

16. The training programs “Expert Qualification for ODS Handling” was established in [year] by the Ministry of Environment in co-operation with the Refrigeration Association. The ODS legislation stipulates that only certified personnel can obtain a license for working with ODS and ODS containing equipment. The certificate can be awarded to those who has undertaken theoretical and practical training on good servicing practices and passed the test. The “Expert Qualification” certificates are issued by the Slovak Association for Refrigeration and Air-conditioning Technology which is commissioned by the Ministry of the Environment to be a responsible agency. The Ministry approves the training syllabus and test questions. The Ministry staff has been involved in the training delivering lectures on the ODS legislation. The cost of the training is covered by trainees. Overall, 1,760 persons have been trained since [year].

12.4.3 Halon Management Bank

17. In the Slovak Republic, halon is used only for critical uses in accordance with EU Regulation No 2037/2000 on substances that deplete ozone layer (Annex VII) in the following applications: aircrafts, military and petrochemical sector. In total, about 1,280 kg of halon is contained in existing installed fire fighting systems. The halon will be gradually replaced by the acceptable and available alternatives and then stored in the Halon bank.

12.4.4 Metered Dose Inhalers

18. Slovakia managed to make a transition to non-CFC MDIs without external assistance.

12.5 IMPACT DRIVER III: ENTERPRISE SUSTAINABILITY

19. The project had two sub-projects to assist two companies Calex and Novy Calex (Samsung Calex) manufacturing domestic refrigerators and freezers. Both sub-projects had encouraged the use of CFC substitute technology widely accepted and used in Europe. One sub-project proposed conversion of the refrigerant from CFC-12 to HFC-134a, and both

sub-projects proposed conversion of polyurethane insulation lines to using cyclopentane as the blowing agent instead of CFC-11. By the time of the project, both companies possessed considerable technical expertise and were fully conversant with the technical issues of conversions.

12.5.1 Novy Calex (Samsung-Calex) domestic refrigerator and freezer manufacturer

20. Samsung Calex was a joint venture formed in 1993 between Calex owned by Slovak Government and Samsung Corporation (South Korea). Production share of the new company in 1993 was about 254,000 units. This production consisted entirely of Calex models. In late 1994, four new Samsung models were introduced. The replacement of CFC-11 by cyclopentane as the foaming agent in the cabinet foaming line and partial conversion of the refrigeration systems to HFC-134a has been already implemented by Samsung Calex. The project covered conversion to cyclopentane for the door foaming line and consolidation of HFC-134a use. The GEF funding for this component amounted to $1.1 million that was disbursed in 1994. The counterpart funding was $2.4 million. The company started ODS-free production in 1995.

12.5.2 Calex domestic refrigerator and freezer manufacturer

21. The original production capacity of the single company was 600,000 units per year. After the formation of the joint venture , production capacity of Calex was 350,000 units. The remaining production facilities have been acquired by the joint venture company. Conversion to HFC-134a in the refrigeration circuit was implemented by the company. The project covered modification of existing production equipment and provision of new equipment to adopt the new foaming agent- cyclopentane. The new equipment was delivered in 1996-1997. The ODS-free production started in 1998. The total grant for Calex was estimated to be $2.4 million. Only $1.49 million was disbursed.

22. Prior to the start of the project, Calex had made a very large investment in an HFC-134a compressor production facility provided by the S. Korean Samsung company[1]. Production from this plant was intended to replace compressor production at Calex's ageing CFC-12 compressor plant. Conceived under the former Czech Communist administration, the loan repayments for this project proved too much for Calex and were a major cause of its subsequent financial failure. This failure resulted in Calex effectively being taken over by Novy Calex (the former Samsung Calex).

23. Once part of the same Calex refrigerator company, Samsung Calex was a joint venture formed when part of the old Calex plant was acquired by the Korean Samsung company. In 1997 Samsung suddenly pulled out of this joint venture and that company was re-named Novy Calex. By the time Calex requested the final disbursement of its grant in 1997, Novy Calex had acquired most of Calex' assets in payment of Calex' debt to it. After careful thought and legal consultation over whether IFC/World Bank would be fulfilling its fiduciary duty by disbursing to Calex in its then state, it was decided in 1998 that this was both legal and desirable since the production facilities would be used for Slovak owned non-ODS refrigerator production and thus be fulfilling the objectives of the GEF funding. In August 2001, however, Novy Calex was itself declared bankrupt and as a result the final disbursement was not made. Production never reached the levels required to fund the heavy loan repayments with which Calex was saddled.

24. In 2002 the Snaige refrigeration company, Lithuania, came to the Slovakian market and bought assets of bankrupt company Novy Calex. Later on, the acquired equipment was

[1] Samsung was not a partner in this. The compressor plant was fully funded by Calex, and all subsequent liabilities were theirs.

used in Kaliningrad, Russia where the new factory had been built. For further information, refer to Lithuania and the Snaige refrigerator producer.

25. The enterprises chosen and investment made by the World Bank proved to be unsustainable. Persistent delays in implementation of the project have been experienced by Calex. The company was always short of cash because of losses incurred in the commissioning and running of the new compressor plant referred to in Paragraph 24. Calex tried to overcome this problem by entering into a barter deal with the foam equipment supplier Cannon, exchanging refrigerators for the first delivery of equipment. Shortage of funds delayed the start of production of ODS-free refrigerators. These signals of financial instability of the company and withdrawal of Samsung from the joint venture compelled the World Bank and IFC to stop the disbursement of funds. The remaining funds ($US 838,032) were returned to the GEF in December 2000.

12.6 IMPLEMENTING AGENCIES

26. The project formulated by the World Bank solely addressed the conversion of two enterprises in the domestic refrigeration sector that did not prove to be financially viable. GEF resources were not used effectively, as other sensitive areas such as recovery recycling system, institutional strengthening and customs left unaddressed resulting in imports of about 70 ODP tonnes of reclaimed CFCs refrigerant needed for servicing existing refrigeration equipment and 275 ODP tonnes of carbon tetrachloride in the solvent sector. The project design and quality of financial viability evaluation undertaken by the World Bank did not take into account the macro-economic conditions that prevailed at the time of the project resulting in loss of $2.6 million. Earlier action on potential foreclosures would have enabled the funds to be directed toward activities that would have eliminated ODS used in the refrigeration servicing and in the halon sectors.

27. The country programme for Slovakia was not prepared by the World Bank. The national consumption was roughly estimated on the basis of the country program prepared for the former Czechoslovakia. This seems to be the factor contributed to ill-designed project.

12.7 IMPACT THREATS / RISKS

12.7.1 Illegal trade

28. Slovakia considered that its trade was predominantly with EU countries and that it had sufficient internal controls in place to intercept ODS. Furthermore, Slovakia believed that actions against companies that violated the law are deterrent enough. The Inspectors are responsible for regulating companies which includes checking ODS stockpiles, storage, and import documentation. The Inspectors cooperate with the MoE and Customs in combating illegal trade by reporting any irregularities to both organisations. The risk of illegal trade with adjacent EU counties is negligible.

29. However, the border with Ukraine is not specifically secure since there is ODS still available on its market Customs check points are not equipped with gas identifiers that creates risk of illegal trade through potential mislabelling of ODS shipments. There were several cases of mislabelling recorded by the customs in the past. Therefore, the risk of illegal trade on this border still exists. Slovakia needs to equip customs check points on the border with Ukraine to reduce the risk of ODS being smuggled via Slovakia to the other member states in the EU.

30. The dependency on halon in several sectors and the lack of well articulated halon management plan poses risk to the environment given high ODP of halon.

12.8 IMPACT ON THE PHASE OUT OF OZONE DEPLETING SUBSTANCES

31. Slovakia technically fulfilled its obligation as Article 2 country of the Montreal Protocol.

However, significant quantities of reclaimed controlled substances were imported i.e., about 70 ODP tonnes of CFC-12 during 1996 to 1999 and 275 ODP of tetrachloride in 1996. The capacity of the national 3R system proved to be insufficient to meet the demand in the servicing refrigeration sector. Slovakia consumed 275 ODP-tonnes of carbon tetrachloride in 1997 without an exemption for this use from the Parties.

32. Slovakia continued imports of CFCs that were exempted by the Parties for laboratory and analytical uses in 1997 to 2003 in quantities of 0.8 to 1.7 ODP tonnes. The import of 1.2 ODP tonnes in 1997 was not exempted by the Parties to the Montreal Protocol.

13 SLOVENIA

13.1 BACKGROUND

1. Slovenia introduced economic reforms after independence from the Former Yugoslavia in 1991, which resulted in steady but cautious progress toward a market economy and healthy economic growth. Slovenia today has the highest per capita income of all the transition economies of central Europe[1].

2. About three-quarters of Slovenia's overall trade is with the European Union (EU) and the vast majority of this is with Germany, Italy, Austria, and France. While the service sector is the largest part of the economy as a percentage of GDP, manufacturing accounts for most employment, with machinery and other manufactured products comprising the major exports. Slovenia acceded to the EU on 1 May 2004. Services contributed the most to the national output in 2007, accounting for 63.5% of GDP. Industry and construction comprised 34.4% of GDP; and, agriculture, forestry, and fishing accounted for 2% of GDP.

3. In the early 1990's, Slovenia imported ODS from the European Union. Due to Slovenia's export-orientated economy in 1993, about 38% of the ODS used in Slovenia at that time was exported in equipment such as domestic refrigerators and aerosols. About 89% of the ODS was CFCs, 10% 111-trichloroethane (industrial solvent) and the remaining 1% HCFCs. The focus of the programme to phase out ODS was therefore on CFCs in enterprises that had a strong export market.

4. Slovenia succeeded to the Vienna Convention and the Montreal Protocol in 1992; accepted the London and Copenhagen Amendments in 1992 and 1998 respectively; and has ratified the Montreal and Beijing Amendments in 1999 and 2003 respectively.

5. In the Montreal Protocol, Slovenia reported consumption of more than 2,300 ODP-t of CFCs in 1989, but by 1995 this had been reduced by 85% to 353.8 ODP-t. This significant reduction in tonnage resulted in Slovenia being classified as a developing country (operating under Article 5 of the Protocol) since its Consumption had reduced to less than 0.3 kg per capita. As Slovenia was officially classified as a developing country by the Montreal Protocol, Slovenia was not mandated by Protocol to phase out CFCs in that year. Low level Consumption of 0.1 to 1.2 ODP-t of CFCs continued from 1996 until 1999, which was in compliance with the Montreal Protocol. In 2000, the Parties agreed to Slovenia's request for reclassification as a developed country in the Montreal Protocol[2]. From 2000 to 2003 Slovenia remained compliant with the Montreal Protocol based on an exemption from the Parties which permitted CFC and CTC Consumption of 0.1 to 2.6 ODP-t for essential uses.

6. Unlike many of the other CEITs, Slovenia did not have any recourse to the Implementation Committee and remained compliant with all aspects of the Montreal Protocol's

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1 Slovenia. 2009. Countries and other areas. US Department of State.

2 Decision XII/12. 2000. Request by Slovenia to be removed from the list of developing counties under the Montreal Protocol.

requirements. The Implementation Committee reported in 1998 that Slovenia's ODS phase out was in compliance with the Protocol's Consumption reduction schedule and was fully successful.

13.2 INPUTS

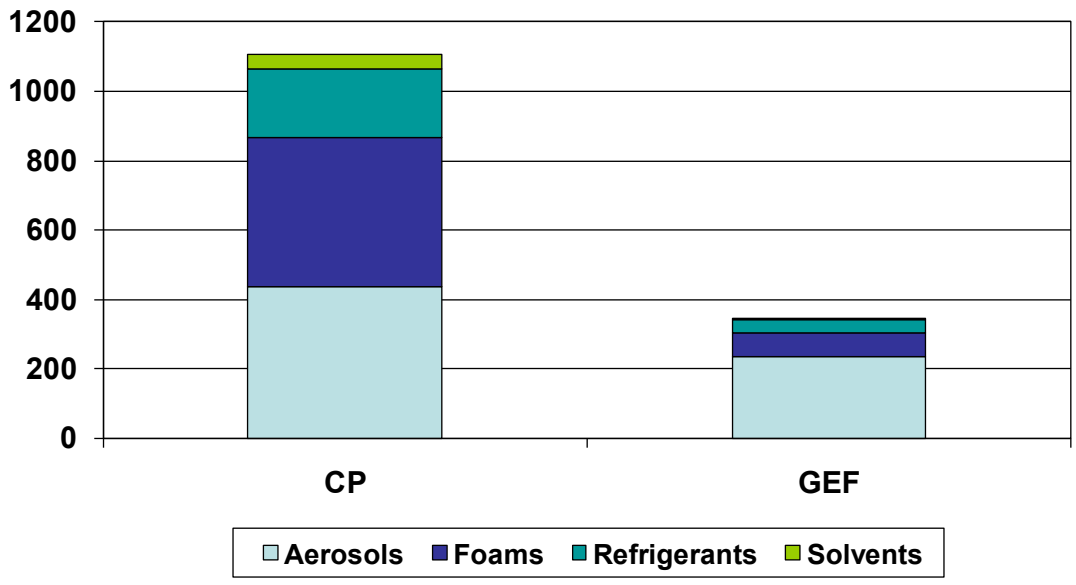
7. As Slovenia in 1995 was not considered a developing country by the GEF and the Bank but rather a non-Article 5 / CEIT, the GEF was able to proceed with a Project to provide financial assistance to six Slovenian companies to assist them to phase out their Consumption of ODS, and to the government for institutional strengthening. The Project was approved in 1995 and concluded on 30 June 1998, after a 6 month extension. The total budget was $8,711,335 which consisted of $6,173,434 from the GEF and $2,537,901 from enterprises. The Project in Slovenia was the second successfully completed ODS phase out project worldwide, after the ODS phase out project in the Czech Republic.

8. By focusing on key sectors and enterprises, the Project in Slovenia aimed to phase out 345 ODP-t per year in the following sectors:

    1) Institutional Strengthening ($220,000)
    2) Refrigerator production ($4,031,954)
    3) Servicing sector ($459,989)
    4) Two aerosols companies ($2,860,292)
    5) Foam ($960,000)
    6) Solvent ($179,100)

Figure 40 shows the GEF funded a relatively small but important quantity of the phase out of ODS in relation to the country programme.

Figure 40: Tonnes of ODS in the Country Programme (CP, 20 users) by sector, and targeted for phase out in the GEF Project (6 investment projects).



Source: Ms **Janja Leban, Chamber of Commerce and Industry of Slovenia**

9. The Project was managed on a daily basis by the Slovenia Eco-Fund (SEF) which served as both the Project Implementation Unit (PIU) and the Financial Intermediary. The Ministry of Environment and Physical Planning (MEPP) was the overall coordinator for the Project, with responsibility for liaising with other ministries and industrial policy issues. The SEF was assisted by the Chamber of Economy (COE) as it had been the PIU before the Project and had gained some experience in this role, and assistance in the selection of technology

by a Technical Advisory Group (TAG). Apart from project coordination, the SEF also determined when technical assistance and consultancy advice were necessary.

10. The World Bank provided a Project Implementation Manual (PIM) to guide stakeholders on procurement and disbursement procedures, the use of consultants, financial reporting, auditing, and other relevant materials. The Bank also provided a week of training in mid-January 1995 in Budapest on Project implementation and management that was attended by staff from SEF and COE. The Bank determined the financial viability of each enterprise that was under consideration for funding.

11. Toward the end of the Project in Slovenia, the Bank ran a series of workshops that were designed to capture and build on the experiences and good practices of the countries involved in the phase out of ODS. They were held in:

    1) Budapest (May 1997): The Czech Republic, Slovenia and Hungary;
    2) Ribno and Ljubljana (October 1997): The Czech Republic, Poland, Slovenia and Hungary;
    3) Prague (March 1998): The Czech Republic, Poland, Slovenia, Hungary, Belarus, Slovakia and the Russian Federation;
    4) Warsaw (October 1998):
    5) Budapest (August – September 1999): The Czech Republic, Poland, Slovenia, Hungary, Belarus, Slovakia and the Russian Federation.

12. Enterprises were responsible for providing an Environmental Impact Assessment to determine the potential impact of the replacement of ODS technologies or substitutes with other chemicals that has an environmental risk. The MEPP also requested information on the international safety standards and procedures from chemical and equipment suppliers, and ensured that they were applied by the enterprises.

13.3 IMPACT DRIVER I: GOVERNMENT COMMITMENT

13.3.1 Legislative and institutional strengthening

13. The MEPP developed the Country Programme in June 1994. It was officially adopted by the government in 1995, in consultation with a broad spectrum of stakeholders, including ministries, enterprises, NGOs, industry associations and others. The Country Programme was used to define ODS phase out targets by sector, to identify where policies and measures where needed to assist in the reduction and phase out of ODS. The policies and measures were intended to support the ODS phase out, with minimal disruption to the industrial sectors.

14. The government held a series of workshops to identify, design and prepare potential sub-projects. One of the first workshops in June 1997 was held in Ljubljana with stakeholders to discuss the implementation of regulatory measures on ODS phase out and control. A second workshop followed in October 1997 in Ribno to discuss alternatives for ODS in the solvent sector.

15. The government introduced policies and measures in parallel with the work on the phase out of ODS by enterprises, in order to promote the long term sustainability of the phase out of ODS in companies financed by the Project. These policies and measures included a prohibition on the import of CFCs, and obligatory ODS reporting and monitoring requirements. The government recognized the importance of installing technology in Slovenia that would produce equipment that was environmentally acceptable in its export markets, which were mainly in the EU. MEPP required each enterprise to provide a combined Environmental and Safety statement as a condition of grant disbursement. A permit to operate the equipment was also issued when the local health and fire protection

inspectorates were satisfied.

16. Prior to 1998, Slovenia followed the requirements of the Montreal Protocol, Regulation (EC) No 594/91 on Substances that Deplete the Ozone Layer, and Regulation (EC) No 3093/94 by the same name. In effect, Slovenia was transposing "several successive generations" of EU legislation on ODS into its national legislation well before Slovenia joined the EC in 2004. Legislation on ODS implemented at about the time of the GEF projects by Slovenia included:

    1) An ODS import/export licensing system in 1997[3];
    2) A ban on the import, placing on the market and use of CFCs in 1998[4];
    3) A ban on the import of CFC-containing equipment in 1998[4];
    4) A ban on the deliberate venting of ODS in 2003, including the requirements for the use, maintenance, decommissioning, and disposal of equipment in relation to the recovery, recycling, use, reclamation, or disposal of ODS and equipment containing ODS[5];
    5) A requirement that refrigeration technicians to be licensed, which was important for the effective operation of the ODS recovery, recycling and reclamation (3R) scheme (probably in 2003)[5].

17. Because best-international equipment was installed in each of the sub-projects (see Section 13.5), no additional investment was needed in the enterprises in the Project when Slovenian legislation in 1999 was harmonised with legislation on ODS in the EU.

18. Since the completion of the Project, Slovenia has implemented legislation that merges ODS and fluorinated gases[6]. The decree with respect to ODS prohibits the release of ODS, mandates recovery, registration of all equipment that contains more than 3 kg of ODS, mandatory leak checks and record keeping, recovery of ODS and record keeping, annual reporting on the amounts charged, qualifications requirements for technicians handling ODS, permits for reclamation and disposal of ODS, inspection provisions, penalties for infringement of the regulation from €300 to €50,000 depending on the category of the offence and whether or not the offender is a private citizen or a company

19. The scheme to control collect unwanted refrigerators was funded by the MEPP as part of the waste management campaign, which is an indicator of the government's commitment to reducing emissions of ODS. The scheme was accompanied by a public awareness raising campaign (PARC) that was initiated and financed by Gorenje Servis (50,000 brochures). PARC was later expanded and financed by MEPP to target a wider audience including refrigeration and fire associations. The MEPP contacted local media (TV, radio and newspapers) to highlight the need to replace ODS with alternatives.

20. In 1998, the EU provided funding for the development of an implementation programme for a Slovenian Waste Management Strategy, which included the legislative framework for the disposal, dismantling and recycling scheme for unwanted refrigerators. As a result of this work, legislation on waste management was drafted at the end of 1998.

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[3] OJ RS 80/97. 18 Dec 1997. Order on Handling of Ozone-Depleting Substances (Legislation that included permits for the import and export of ODS.). In force until 11 July 2003.

[4] OJ RS No 41/01. 25 Jan 2001 . Update of Order on Handling.

[5] OJ RS No 42/03. 9 May 2003. Rules on the Management of Waste Substances that Deplete the Ozone Layer. Article 3 and others.

[6] OJ RS No 78/2008. 30 July 2008. Decree on the use of products and equipment containing ozone-depleting substances or fluorinated greenhouse gases. In force from 14 August 2008.

13.3.2 Customs and Border security

21. One of the aims of the 3R scheme was to reduce the demand for CFC-12 which, according the World Bank report (1999), might be imported illegally from Russia, China and India. The same report also mentioned the prospects of illegal trade from Ukraine and Croatia.

22. As part of the Project in 1997, nine Customs officers and 6 environmental inspectors were trained on the implementation of the new regulations on ODS phase out and control. Also present were other inspectors for Market and Work, and representatives for the Environment Ministry. There was no use of refrigerant identification equipment by Customs officers and inspectors in Slovenia.

23. After the Project was completed and in 2007, Slovenia reported that there were "indications" of illegal trade in ODS from a supplier in Singapore by one of the Slovenian companies. However, legislation in Slovenia did not allow the government to fully investigate this case in regions outside of Slovenia. Illegal imports were intercepted at the Port of Koper in 2007 and the ODS intercepted was returned to the country of origin.

24. Since the completion of the Project, the MEPP met with other Slovenian agencies to reinforce the requirement to combat illegal trade in ODS. The Environment Ministry has worked closely with the Inspectorate and Customs agencies. The Customs and Inspectorate are legally required to report to the MESP every 12 months on interceptions of illegal trade, including those on ODS. Penalties for illegal trade were introduced which consisted of fines that vary from €4,000 to €50,000 for companies, depending on the circumstances[7]. There are also fines for individuals that vary from €300 to €1200, again depending on the circumstances.

25. Training of Customs officers was undertaken again in 2005 for 52 participants, which included a description of the ODS legislation and films by the Environmental Investigation Agency that showed the methods used by smugglers to conceal illegal trade in ODS.

13.4 IMPACT DRIVER II: RECOVERY AND RECYCLING PROGRAMME

26. Unlike in the other CEITs that involved a network of different servicing enterprises, the MEPP decided to implement the recovery, recycling and reclamation component of the programme by working with just one enterprise called Gorenje Servis. This was because Gorenje Servis was at the time the largest servicing organization in Slovenia with about 30% of the Slovenian market for servicing refrigerators and heat pumps using a network of 10 servicing stations and 29 technicians. In 1993, this company carried out more than 25,000 repairs on refrigeration appliances. At the time, the Bank considered the population of 2 million in Slovenia to be too small for a full-scale 3R scheme, and supported the initiative of the MEPP to work with just one company.

13.4.1 Recovery and recycling programme

27. The GEF contributed $118,680 toward the total cost of the sub-project that aimed to phase out annually 10.2 ODP-t of CFC-12 in refrigeration and 1.2 ODP-t annually of CFC-12 in heat pumps. As a result of the funding, Gorenje Servis obtained Ekotez and Refco mobile recovery units[8]. The list of equipment was kept in a database managed by the MEPP. Gorenje and LTH were both important organisations that create a 3R scheme in Slovenia.

28. Gorenje Servis financed and launched its own PARC on the damage caused by CFCs to the ozone layer, and that encouraged the general public to employ qualified technicians to

[7] Article 30 of Decree 78/2008 contains more than 4 pages of circumstances. There was also earlier legislation on the implementation of Customs regulations contained in OJ RS No 25/2004, 28/2006 and 111/2007.

[8] Information on the quantity of each unit was no longer available.

recovery ODS. This resulted in a 20% increase in servicing work for the Gorenje Servis, compared with a same period in the previous year. This is the only report from the 18 CEITs where the impact of the PARC could be evaluated, relative to a base line.

29. In order to recover and recycling of ODS, technicians were required to obtain a certificate from MEPP confirming their fulfilment of all conditions described in Articles 13, 14 and 15 of the "Rules on the Management of Waste Substances that Deplete Ozone Layer" which included:

1) Registration as physical or legal entity for their business activities;
2) Ownership of approved technical equipment; and
3) Successful completion of a training course.

13.4.2 Training of technicians in refrigerant management

30. The COE completed a Manual on Good Practices in Refrigeration and Air Conditioning in March 1997, which was used in eight training courses for service technicians in 1997 and three in 1998. These courses took place in Ljubljana and other cities in Slovenia, and in total 211 service technicians were trained. Technicians that passed the course received a certificate. There was no 'Greencard' or similar identification system for qualified personnel, as in some other CEITs. The GEF paid 50% of the cost of the courses from 1997 – 1998, and the technicians paid the remainder (about $115). The qualifications were valid for a period of 4 years.

31. From 1997 until 2003 there were 211 technicians trained, and a further 300 technicians from 2004 to 2008. The continuation of the training after the projects were completed was evidence of the Government's commitment to ozone layer protection. The Chamber of Commerce and Industry and the Institute for Business Education assisted in the organisation and delivery of the training courses, and was the equivalent of the Refrigeration Association found in other CEITs.

32. The training for a total of 40 hours (26 hours of theoretical knowledge, 14 hours for practical application) was divided into three modules:

Module I:	Refrigeration, air conditioning and heat pumps
Module II:	Fire extinguishers and fire protection systems
Module III:	Products containing solvents

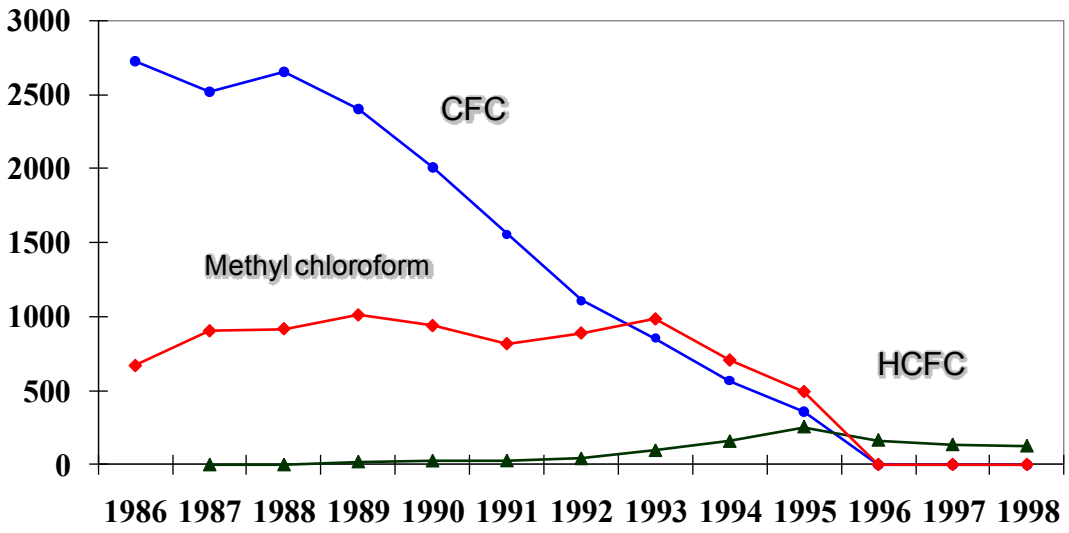
It covered heat pump and cooling equipment, and included training on the use and containment of F-Gases, as prescribed by (EC) Regulation No 842/2006. The costs are now about €600 per course. The pass rate for the examination and course is about 98%.

33. To be eligible for a current training programme, personnel must have either obtained a vocational qualification (Level IV) in electrical or mechanical engineering and have three years of work experience in the assembly, servicing and maintenance of the recovery and recycling equipment, or they must have obtained a secondary professional or technical qualification (Level V), usually in electrical or mechanical engineering and irrespective of work experience.

13.4.3 Results of the recovery and recycling programme

34. From 1986 until 1998 there was a significant decline in ODS, as shown in Figure 41.

Figure 41: Changes in ODS (tonnes) in Slovenia from 1986 until 1998



Source: Ms **Janja Leban, Chamber of Commerce and Industry of Slovenia**

35. The quantities of ODS recovered and reclaimed were reported annually to the European Commission (see Table 15).

Table 15: Quantities (kg) of ODS recovered, recycled, reclaimed and destroyed in Slovenia from 2003 until 2008

OZONE DEPLETING SUBSTANCE	RECOVERED (kg)			RECYCLED (kg)			RECLAIMED (kg)			DESTROYED (kg)		
	2003	2004	2005	2003	2004	2005	2003	2004	2005	2003	2004	2005*
CFC -12	15	2	286	0	0	0	0	0	0	0	0	0
HCFC-22 (1)	300	301	4,599	270	180	3,379	2,652	2,679	487	0	0	0
Halon 1301 (2)	0	0	1,957	0	0	0	0	0	0	0	0	0
1,1,1-trichloroethane (3)	0	0	446	0	0	0	0	0	0	0	0	446
HCFC-22 + R407 (4)	0	0	50	0	0	0	0	0	0	0	0	0
HCFC-22 (5)	0	0	31	0	0	0	0	0	0	0	0	0
HCFC-142b (5)	0	0	5	0	0	0	0	0	0	0	0	0
TOTAL	315	303	7,374	270	180	3,379	2,652	2,679	487	0	0	446

1) From the recovered quantity of HCFC-22 512 kg are stored at collector; 2) From the recovered quantity 837 kg Halon 1301 was transferred to military storage facility , other 1120 kg are waiting for destruction at Kemis d.o.o.; 3) 446 kg of solvent (mainly 1,1,1-trichloroethane with some small amounts of other halogenated solvents) was destroyed at a plant (Fernwärme Wien GmbH) in Austria; 4) 50 kg of mixture (HCFC-22 and R407) is waiting for destruction at LTH d.d. storehouse; 5) HCFC-22 as a part of refrigerants R409A and R402A; HCFC-142b as a part of R409A.

OZONE DEPLETING SUBSTANCE	Recovered [metric-kg]			Recycled [metric-kg]			Reclaimed [metric-kg]			Destroyed [metric-kg]		
	2006	2007	2008	2006	2007	2008	2006	2007	2008	2006	2007	2008
CFC -11	0	0	18	0	0	0	0	0	0	0	0	0
CFC -12	56	190	195	0	0	0	0	0	0	0	0	0
CFC- 13	3	0	0	0	0	0	0	0	0	0	0	0
HCFC-22	6820	867	2587	6600	554	1705	210	40	876	0	0	0
HCFC-124 (1)	9	0	13	0	0	11	0	0	0	0	0	0
Halon 1301	0	57	866	0	0	0	0	0	0	0	0	0
HCFC-22 (2)	0	31	35	0	0	35	0	0	0	0	0	0
HCFC-142b (3)	0	6	7	0	0	7	0	0	0	0	0	0
Mixture of ODS's	0	0	871	0	0	0	0	0	0	0	0	0
Total	6888	1151	4592	6600	554	1758	210	40	876	0	0	0

HCFC 124 from R409a; 2) HCFC-22 as a part of refrigerants R402A, R403B and R409A; 3) HCFC-142b as a part of R409A.

36. The results show that CFCs were a small proportion of the amount recovered, relative to HCFCs and halon. As there are no ODS destruction facilities in Slovenia, ODS for destruction was sent to Fernwärme Wien GmbH in Austria.

13.4.4 Halon recovery and destruction

37. In 1993, the World Bank reported no Consumption of halon in Slovenia, even though Slovenia officially reported a Consumption of 19 ODP-t the previous year. In 1994, Slovenia reported minus 9 ODP-t of halon, which indicated that this amount had been destroyed. It was probably for this reason that a sub-project was not formulated by the Bank for halon. Slovenia reported zero Consumption of halon from 1995 to 2003. There was no obligation for Slovenia to submit a report to the Montreal Protocol after 2003 as this was submitted by the European Community on behalf of all the Member States.

38. Recently, halon was supplied to the Slovenian army for use in combat equipment, which is a critical use recognised under (EC) Regulation No 2037/2000. In 2008, 2000 kg of halon was shipped from Slovenia to the UK for military uses.

13.5 IMPACT DRIVER III: ENTERPRISE SUSTAINABILITY

39. The GEF funded the phase out of ODS in five companies that used ODS for a range of commercial production activities: Commercial refrigeration equipment (LTH); aerosols (Krka and Lek); sandwich panels (Trimo); and dry cleaning clothes (Labod).

40. Acquisition of modern technology by these companies as a result of the GEF funding gave them a much needed boost to help them ride out the difficulties caused by the disintegration of the Former Yugoslavia. When part of Yugoslavia, these industries were configured to supply 24 million people in the Yugoslav Federation, but after the war and independence for Slovenia the national market was reduced to just 2 million. This required significant adjustments to each business to ensure production targeted export markets, particularly those in Western Europe.

13.5.1 LTH commercial refrigerator producer

41. In 1995, LTH was the largest commercial refrigerator manufacturer in Slovenia, producing chest freezers, cabinets for ice cream and frozen food, and refrigerators for catering industry and shops.

42. The GEF provided $1,492,724 of financial assistance toward the replacement of 26 ODP-t of CFC-12 and R-502 in the cooling circuit with HFC-134a, and the replacement of about 41.4 ODP-t of CFC-11 with cyclopentane for blowing the foam insulation. In some parts of the operation, HCFCs continued to be used as refrigerants, but this was permitted in Slovenia and under EC law until 1 January 2015 (and also the Montreal Protocol as the EU was more stringent).

43. The Bank considered the use of cyclopentane for foam blowing as essential for LTH to maintain its market share of the W. European market. The company sold 20% of its products on the local market, and exported 50% to Europe, 20% to the states of the former Yugoslavia, and 10% to other countries. With the loss of the Yugoslav market LTH's financial situation deteriorated to the extent that the start of the sub-project was delayed because LTH could not obtain a bank guarantee as a requirement by the World Bank for the grant disbursement. Restructuring of the LTH delayed the start of the sub-project by about one year.

44. The company also financed the purchase of its own 3R equipment and developed refrigerator servicing capacity. This equipment was used to collect and store recovered refrigerants, to identify recovered refrigerants, and for refrigerant reclamation. LTH funded experts to give lectures on 3R, and ran refrigeration training courses for service

companies in other parts of the former Yugoslavia. It also provided servicing advice to similar servicing companies in Croatia, Bosnia, Bulgaria and Macedonia.

45. After the completion of the LTH sub-project, the Bank reported in 1999 that LTH had been restructured financially and the new ODS-free technology had strengthened its market position. However, despite being in production for more than 70 years, LTH ran into severe financial difficulties in 2008 as it could not pay its suppliers due to decreasing sales.

46. The internal restructuring plans announced in October 2008 were not successful. Consequently, in June 2009 the beginning of the bankruptcy procedure was announced, and all of the 300 employees recently received termination notices. The future of the company was uncertain.

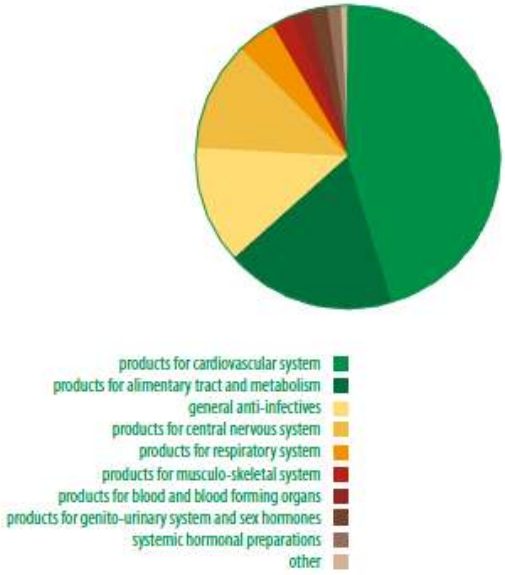
13.5.2 Krka Kozmetika aerosols

47. In 1995, Krka produced aerosols for cosmetic and technical applications, producing on average about 6 million units per year, of which about one third were perfumes. The GEF provided $675,312 of financial assistance toward the replacement of 79 ODP-t of CFCs with dimethyl ether (in perfumes and colognes) and hydrocarbons (as propane-butane in the other products).

48. The filling line that was installed can operate on Di-methyl Ether (DME) or hydrocarbons. This filling line was one of the first to be installed in Europe that had the flexibility of operations.

49. In 2009, Krka is a major generic medicine producer on the strategic markets of East, Central, Western Europe and Central Asia. The sales of prescription pharmaceutical, self-medication (such as vitamins), cosmetic, and animal health products are shown in Figure 42.

Figure 42: Proportion of sales of prescription pharmaceuticals and self medication products by grouping



50. Krka employs more than 7,000 workers and ships products to more than 70 countries worldwide from its production and distribution centres located in Slovenia and Germany; and in the Russian Federation, Poland, Croatia from 2001 to 2005.

51. The company reported that in 1995 it used 17.9 tonnes of CFCs and 141.95 tonnes of dimethyl ether and hydrocarbons to produce 1.992 million aerosols. From 1998 onwards, there was no use of CFCs. Most of the equipment was purchased by Krka prior to 1995, and therefore the consultants were not involved in the selection of the equipment. There have been no difficulties in obtaining spare parts since installation. Prior to the economic crisis in 2008, aerosols were manufactured 8h and sometimes 16h per day, occasionally 6 days per week, depending on the market demand.

13.5.3 Lek pharmaceutical aerosols

52. Lek is one of the largest manufacturers of drug and cosmetic aerosols in Slovenia. The GEF provided $1,992,600 of financial assistance toward the replacement of 157 ODP-t of CFC-11 and CFC-12 with hydrocarbons (as propane-butane) used in the production of Byvacin.

Byvacin is an antibiotic spray applied to the skin.

53. Lek did not respond in 2009 to any questions related to their activities during the period of the project. However, in the past Lek reported that without the GEF funding Byvacin funding would have stopped, and the employment of 20 employees terminated. Indeed, the spectacular sales of Byvacin on the export markets were so successful that they restored the Lek business to its pre-1989 levels and employed an additional 20 staff in one of the highest unemployment areas in Slovenia. The filling process was simplified by eliminating the need for beeswax as a result of the conversion, resulting in less production cost.

54. Subsequent to the completion of the sub-project in 1998, Lek acquired other pharmaceutical companies in Poland and Romania in 2001. The Lek company itself was acquired by Novartis in 2002. In 2003, Lek/Novartis becomes part of the Sandoz group of companies producing generic drugs. Lek Kozmetika ceased to become part of the Sandoz Group in 2006.

13.5.4 Trimo sandwich panels

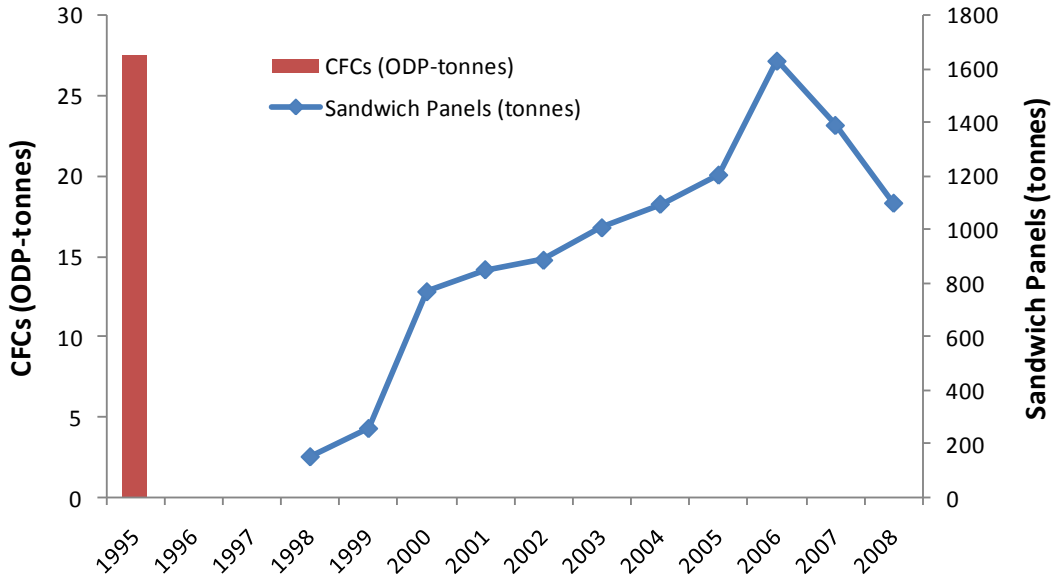
55. Trimo is one of Europe's largest manufacturers of fire resistant sandwich panels, producing more than 600,000 m^2 per year in 1995 prior to the start of the sub-project. The panels are used for building insulation. PU foam is used as an adhesive to bond mineral wool fibres to the metal walls of the panels. At that time, about 40-60% of the production was exported, mainly to Europe and the Russian Federation.

56. The GEF provided $784,800 of financial assistance to replace 27.7 ODP-t of CFC-11 with CO_2-based foaming agent. The GEF also partly funded an extension to the factory for curing the panels as the CO_2 system required more curing time and storage space than the CFC-based system.

57. Today, Trimo reported that they were the largest manufacturer of foam sandwich panels in Slovenia with about 60% market share. The GEF project yielded technical benefits which assisted Trimo to significantly increase production (Figure 43) of fire resistance panels, and to expand their production capacity. Trimo was able to provide information only for 1995 on the quantities of CFCs used in that year. The sub-project became a catalyst for in-house technical developments that drew visits from other technical experts from Japan, Russia and Saudi Arabia, with a view to replicating the technology in other countries.

58. After the project, Trimo added Russia and the Czech Republic to their list of exporting countries. Access to the German market was in part due to compliance with the latest German fire standards, for which the sub-project paid for the costs of certification. Daughter companies were established in other countries such as Dubai, Serbia, the Russian Federation. Trimo reported that spare parts were readily available. The supplier companies in Slovenia and other countries also increased their supplies to Trimo as a result of the GEF project, so the GEF project had a catalytic action on supply companies. The number of employees at the parent company in Slovenia has increased by 36% from 418 in 1999 to 567 in 2007.

Figure 43: Production of sandwich panels by Trimo (Slovenia) after conversion to non-ODS technology in 1998



13.5.5 Labod dry cleaning company

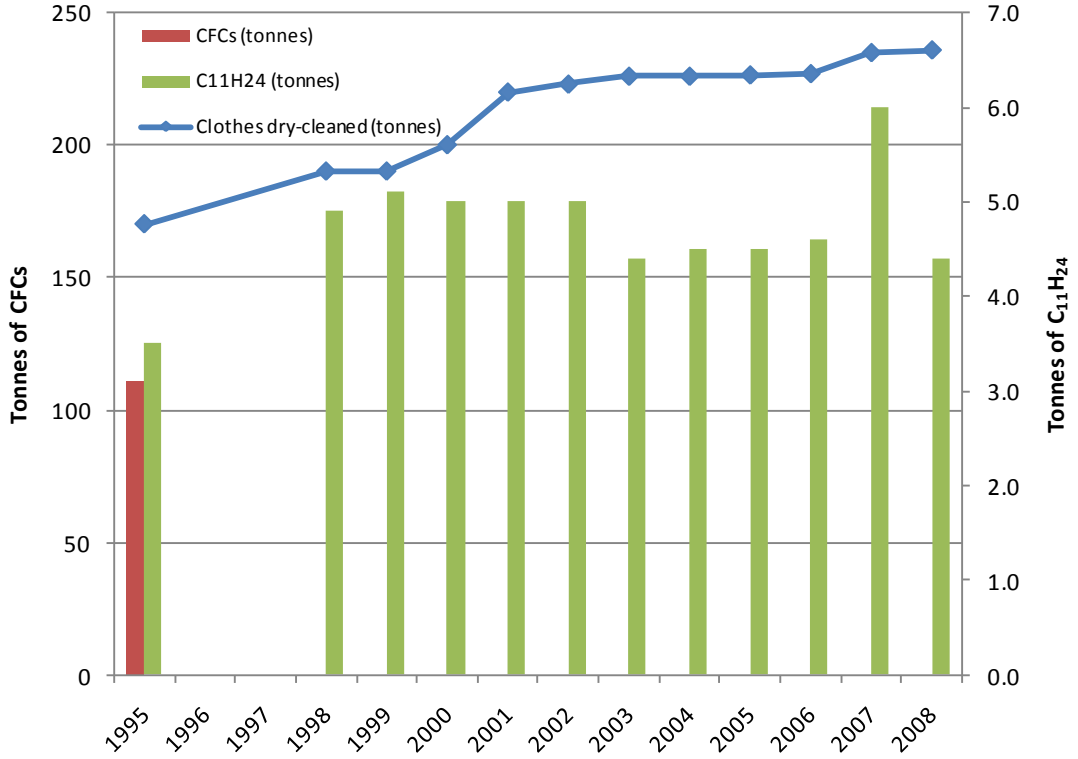
59. Labod is the largest drying cleaning company in Slovenia which in the early 1990s used CFCs to clean leather, silk and similar materials each year. The GEF provided $179,100 of financial assistance toward the replacement of 2.8 ODP-t of CFC-113 with $C_{11}H_{24}$ (an aliphatic hydrocarbon). About 72% of the CFCs used for dry cleaning in Slovenia were used by Labod.

60. Labod reported that the replacement of CFCs was relatively simple. Additional safety features were installed that shut down the machine automatically if air concentrations contained explosive levels of $C_{11}H_{24.}$

61. Labod ran workshops to show to other dry cleaning operations that hydrocarbons were easy to implement and resulted in cost-effective cleaning operations. There were about 300 other dry cleaners in Slovenia in 1995. Since that time, all of them have replaced CFCs with perchloroethylene (PER) and not with the hydrocarbon used by Labod. PER was also used to replace CFCs in Hungarian dry cleaning operations (see Hungary Country Chapter), but it is not a good replacement as it has carcinogenic properties and it contributes to low level ozone.

62. Labod's income has increased in proportion to the quantity of clothes dry cleaned (Figure 44), which the company attributes to the environmentally-friendly method for dry cleaning. In 2009, Labod reported that it had 6-8% market share of the dry cleaning business in Slovenia. Labod attributed the international tendering process as responsible for making it aware of environmentally-superior dry cleaning technology. Labod considered that the sub-project took too long to complete and the administrative requirements were too burdensome.

Figure 44: Replacement of CFCs by the aliphatic hydrocarbon ($C_{11}H_{24}$) at Labod Dry Cleaning Company, Slovenia



13.5.6 Summary

63. The overall objectives of the Project were achieved. The consumption of CFCs were replaced by the introduction of long term alternative technologies. The Project helped the industry to maintain their existing markets and in some cases to obtain new ones, and to increase their sales of ODS-free products. Appropriate safety measures were implemented where alternatives were potentially flammable or explosive.

64. The ban on the import of CFCs ensured that all enterprises that used ODS were encouraged to adopt ODS-free technologies. In many cases, the technologies that were implemented were innovative, state-of-the-art and environmentally superior to the ODS technology that was replaced. Employment increased in some cases as a result of the Project.

13.6 IMPLEMENTING AGENCIES

65. The World Bank reported that, in the course so sub-project formulation, the companies did not list all the equipment that was required to fully transition from ODS to ODS-free technology. In all cases, the additional equipment that was needed came within the budget initially agreed. This indicated that sub-project formulation was not prepared with full diligence, and that the Bank did not alert the companies in the beginning to provide a comprehensive list of equipment.

66. Some companies involved in the transition reported that the procedures for sub-project formulation, tendering and financially reporting were too long and, moreover, administratively burdensome. This indicated that the Bank needed to provide further information on the time frame for the sub-project, and further training and templates on the administrative requirements.

13.7 IMPACT THREATS / RISKS

13.7.1 Government commitment

67. Slovenia has a strong commitment to ozone layer protection. The Environment Agency within the Ministry of Environment and Spatial Planning finances from the central budget 1.2 FTE to address both ODS and F-gases. Along with representatives from the other Member States and the European Commission, Slovenia regularly attends meetings of the Management Committee established under (EC) Regulation 2037/2000 that seeks to improve ozone layer protection through better implementation. There is therefore a strong likelihood that the government commitment to ozone layer protection will continue, driven to a large extent for Slovenia to continue to comply with EU requirements.

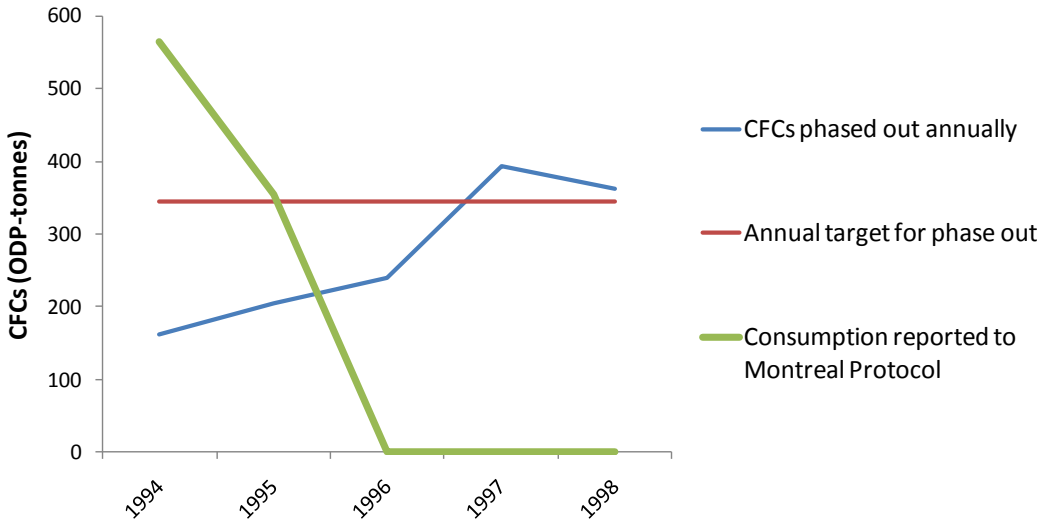
13.7.2 Illegal trade

68. The risk from illegal trade was assessed as being minimal, as the Slovenia had trained Customs officers trained in all aspects relating to the import of ODS, there were inspections of companies in Slovenia that dealt with ODS by the Inspectorate, the companies were required to report to the government on their import/export or use of ODS, and legislation was in place that supported penalties for import/export violators. Moreover, the demand for ODS has reduced in the EC because of the widespread adoption of non-ODS technology, which has reduced the incentive for illegal trade in ODS. The risk of illegal was therefore assessed as minimal.

13.8 IMPACT ON THE PHASE OUT OF OZONE-DEPLETING SUBSTANCES

69. The GEF funding targeted about 31% of the ODS Consumption in Slovenia in 1994. The quantity of ODS phased out annually (Figure 45, blue line) was very close to the targeted phase out of 345 ODP-t per year, which resulted in almost zero Consumption reported within 2 years of the start of the Project. Compared to other CEITs, the rapid phase out of ODS was the result of good project coordination, exchange of experiences and information between the World Bank, the government (the PIU, MEPP, COE and SEF) and enterprises.

Figure 45: Phase out of ozone-depleting substances in Slovenia during the GEF intervention from 1995-1998



70. The overall reduction in ODS Consumption in Slovenia suggested that the GEF finance had a catalytic impact not only on the financed enterprises but also on those that were not directly financed. Workshops held by the government and industry assisted in this country phase out, together with legislation that reduced and phased out ODS.

71. The GEF finance provided to the Slovenia probably helped to sustain policies and measures, and to instil confidence in further legislation that would lock in the gains achieved in the programme. For example, Slovenia reported that the ODS import-export licensing system that was established in 1997 allowed it to ratify the Montreal Amendment in 1999, since this Amendment required that a Party put in place a licensing system.

72. It was a significant environmental achievement that the Slovenia eliminated the use of ODS as this country was one of those whose industry suffered significantly from dislocated markets due to the war shortly before independence.

14 TAJIKISTAN

14.1 BACKGROUND

1. Tajikistan is a landlocked low-income country in Central Asia with a population of 7.3 million and a per capita income of $550[1]. Tajikistan continues to face difficult challenges arising from its geography, history, institutional weaknesses and the global economic crisis. Tajikistan suffered a civil war immediately after independence during 1992 to 1997, which inflicted widespread physical damage and loss of up to 50,000 lives. Peace and stability were achieved twelve years ago in 1997. The country experienced strong economic growth between 2000 and 2007, averaging about 9% per year. But for the last two years, Tajikistan's economic development was frustrated by deficiencies in macroeconomic management and severe winter energy shortages. Although the poverty rate declined recently, it still remains very high.

2. Tajikistan ratified the Montreal Protocol and the London Amendment on 7 January 1998. In 1998, the total consumption of all ODS in Tajikistan was about 60 ODP-tonnes. At that time, the Refrigeration Sector consumption was 96.7% of all ODS consumption in Tajikistan. It covered the repair of domestic (38.7% of ODS consumption) and commercial and industrial refrigeration appliances (41.1%). Also at that time, there was a local manufacturer of domestic refrigerators. The industrial refrigeration applications use ammonia as the refrigerant. The use of halon and ODS in aerosols have been discontinued. The ODS consumption in Tajikistan decreased by about 82%, from about 213 ODP-tonnes in 1986 to 38 ODP-tonnes in 1996, due to structural changes in the country's economy.

3. As a developed country that was formerly a part of the Soviet Union, Tajikistan was required to, *inter alia*, phase out the consumption of halon on 1 January 1994; and to phase out CFCs by 1 January 1996. In October 2001, the thirteenth Meeting of Parties to the Montreal Protocol noted that Tajikistan was in non-compliance with its control obligations[2]. Tajikistan believed that this situation would continue through at least to 2004. In its country program, Tajikistan committed to reduce CFC consumption to 14.08 ODP-tonnes for the calendar year 2002, to 4.69 ODP tonnes for 2003 and to phase out CFC consumption by 1 January 2004. The Government committed to establish in 2002 a licensing system for ODS imports and exports, and to reduce methyl bromide consumption to 0.56 ODP-tonnes for 2002, to 0.28 ODP-tonnes for 2003, and to phase out methyl bromide consumption by 1 January 2005.

4. The Parties in 2001 urged Tajikistan to work with the relevant implementing agencies to promote the adoption of alternatives to ODS. Tajikistan requested the GEF to assist it to achieve compliance with the provisions of the Montreal Protocol.

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1 World Bank country profile.

2 Decision XIII/20: Compliance with the Montreal Protocol by Tajikistan.

14.2 INPUTS

5. With the assistance from the GEF, the Country Programme and the Refrigerant Management Plan were prepared in accordance with the guidelines of the MLF. The project components reflected the strategies formulated in the Country Programme and the Refrigerant Management Plan. The GEF Council and the GEF GEO approved the Country Programme for Tajikistan in July 2000, and the grant agreement was signed in the same year.

6. The GEF approved the ODS Phase out Project for Tajikistan with the budget of $817,221. Additionally, it was anticipated that $194,956 would be contributed by enterprises and the Government. The main objective of this project was to assist Tajikistan in the rapid phase-out of ODS consistent with Decision XIII/20 of the Parties. The project targeted priority ODS phase-out activities in the refrigeration sector that would enable the transition to non-ODS alternatives in this important sector before supplies of ODS were discontinued. The project was approved by GEF in December 1999 and started in December 2000 after the first disbursement by UNEP. The project was completed in December 2006.

7. The objectives of the Project were to assist Tajikistan to eliminate approximately 50.7 ODP-tonnes of mainly CFCs per year by providing financial support:

    1) To assist Tajikistan to prepare the country programme, and to identify technical assistance & investment actions that would enable ODS phase out;
    2) To establish a network of refrigerant recovery, reclamation & recycling operations, as well as training in the best practices of refrigerant management;
    3) To assist a refrigerator manufacturer to eliminate their uses of ODS; and
    4) To strengthen the government institutional capacity to coordinate and manage the phase out of ODS.

8. UNDP/UNOPS were the implementing agency for the investment sub-projects, UNEP/DTIE was implementing the institutional strengthening and training components.

9. GEF funding of $259,011, including government co-finance of $21,000, was provided to Ministry of Nature Resources Protection (MNRP) for *Institutional Strengthening* over a 3 year period. Funding of $306,405 was allocated to the *Recovery and Recycling of Refrigerants in the Refrigeration and Air-conditioning Sector* as part of a national Refrigerant Management Plan. Funding of $122,673 was provided for *Training the Trainers in Refrigeration* to train trainers in servicing, maintenance and repair in the refrigeration sector. Funding of $122,673 (with in-kind co-finance of $173,956) was provided to *Eliminate CFC-12 in the Manufacture of Domestic Refrigerators in "Pamir"*.

10. Tajikistan participated in the GEF regional project: Promoting Compliance with the Trade and Licensing Provisions of the Montreal Protocol in CEIT's implemented by UNEP. Four regional training workshops for representatives from 21 CEITs aimed to train officers in ODS monitoring and control; and in the establishment, operation and enforcement of licensing systems to enable compliance with the Montreal Protocol trade and licensing provisions.

14.3 IMPACT DRIVER I: GOVERNMENT COMMITMENT

14.3.1 Institutional and legislative strengthening

11. In August 1998 by Decree of the President of Tajikistan, the working group on preparation of the National Program on Ozone Protection was established and the Deputy Ministry of Environment Protection was designated as a coordinator. The National Programme served as a basis of the Country Programme prepared with assistance of GEF and later approved

by the GEF Council.

12. The National Ozone Unit (NOU) was established in the MNRP as non-profit organization in January 2001. It was staffed by four employees, including the former Deputy Minister of MNRP as the head of NOU. The head of NOU continued to discharge his responsibilities as Deputy Minister. The activities of the NOU had a well-defined place in the national administration and access to the key decision-makers, including enforcement agencies.

13. The major objectives and responsibilities of the NOU were to:

1) Develop a legislative process;
2) Coordinate activities described in the Country Programme and in the Refrigeration Management Plan (RMP);
3) Raise public awareness of the need to protect the ozone layer;
4) Promote ODS-free technologies to local industrial and technical institutions;
5) Put in place procedures that would reduce and phase out ODS by 2004, to meet Tajikistan's commitments to the Montreal Protocol;

14. The NOU prepared legislative drafts and promoted them through the approval process, including "About implementation of Vienna Convention on ozone layer protection and Montreal Protocol on ozone depleting substances", "About import of ozone depleting substances to Republic Tajikistan", and "State licensing of activities, connected with use of ozone depleting substances and ODS-containing production". This legislation contained a range of restrictions on ODS including:

1) In 2002, legislation was adopted that proposed to halt the consumption of ODS; regulated the imports of ODS through a license; an import quota system was put in place; and one-time permits for ODS imports[3] were established[4].

2) In 2005, the production, imports and re-export of ODS and products containing ODS were banned[5];

3) In 2006, existing legislation was amended to require activities related to the purchase, sale, use and destruction of ODS and ODS-containing products to be licensed, as well as activities related to the installation, maintenance and repair of equipment containing ODS[6];

4) In 2007, additional legislation was approved including directives on the licensing of ODS-related activities and activities related to the installation, maintenance and repair of equipment containing ODS.

15. The NOU prepared and approved the working plans for 2002, 2003 and 2004. However, due to the delay in financing, some activities in the working plans were rescheduled. These delays were caused by UNDP/UNEP's complex reporting and accounting requirements, which the NOU was not trained to complete. Despite these difficulties, reports on a limited number of activities that could be implemented at that time were submitted to UNEP.

16. The Committee on the Environment Protection of the Cabinet of Ministers monitored the implementation of the National Programme on Ozone Protection. The implementation of its Action Plan was part of two important National Plans: the Plan of the National

[3] The CFC-12 imports quotas were established as 28.97 ODP-tonnes in 2001; 14.08 in 2002; 4.69 in 2003; and none in 2004.

[4] Decree No 477. 3 December 2002. Measures for the Implementation of Provisions of the Vienna Convention and the Montreal Protocol

[5] Decree No 517. 30 December 2005. The list of products was established in the annex to the decree.

[6] 30 June 2006. Law of Republic Tajikistan on the licensing of specific activities.

Development of the Republic of Tajikistan until 2015, and the Plan of the Poverty Alleviation. The implementation of requirements of the Montreal Protocol was also one of indicators determining the ecological sustainability in the country, so it had a very high profile politically.

17. The financial support to the NOU was extended for another two years in 2004 and 2005, with finance from the original funds. This support included provision of computing and communications equipment, operating costs including telecommunications and office supplies, staff support for a national project coordinator, funding to raise the awareness of the need for ozone layer protection, and project support services.

18. The continuation of the GEF funding for the institutional strengthening component was reported by the NOU to have been crucially important for resourcing the following activities outlined in the IS renewal project: i) Putting the licensing system fully into force; ii) Continuation of the implementation of the training seminars on best practices in refrigeration equipment servicing; iii) monitoring of on-going and new ODS phase-out activities; iv) ratification of Montreal, Copenhagen and Beijing Amendments. The NOU staff were trained on how to manage donor projects. The funding for these activities is especially important at the time when Tajikistan in economic crisis.

19. Despite the high political profile of the programme and the objectives achieved on ozone layer protection, it seemed that the government was not prepared to support the staff financially when the Project funding finished. The staff were reduced to two people in 2006 and their salaries were halved, as the Ministry integrated the NOU budget into its own limited budget. The head of the NOU was re-assigned as a head of division formed within the State Agency on Hydrometeorology. The NOU therefore its political profile and most of its staff. The lack of government commitment has severely curtailed any meaningful activities on ozone layer protection.

14.3.2 Customs and border security

20. The NOU established good relationship with the State Customs Committee (SCC) that was initially incorporated into the Ministry on State Income and Taxes. The SCC was involved in the development of ODS related legislation. The NOU officer and officials from the State Customs Committee and the Environment Inspectorate from Tajikistan participated in the workshops held in Baku, Azerbaijan (June 2000) and in Budapest, Hungary (May 2004). This GEF Project financed the training of customs officials and it provided the Customs Department with ODS detection equipment to enable identification of ODS imported in bulk quantities and in equipment.

21. The NOU organized Phase I of the Train-the-Trainer for 18 custom officials in 2002. Representatives also attended from the Ministry of Economy and Trade, Ministry of State Income and Taxes, Ministry of Justice, Ministry of Finance and State Inspection of Plants Quarantine. The customs operations manuals for the customs officers training were distributed. The instructors and speakers for the workshop were two UNEP international consultants. They were assisted by the NOU staff and several concerned Government departments. The certificates were provided after the verification test at the end of the course.

22. Phase II of training was conducted in 2006 for 87 officers representing 22 entry points in four regions. The training curriculum covered issues on ozone layer depletion and the Montreal Protocol provisions, national regulations concerning ODS, methods of identification of ODS, and illegal trade in ODS. A practical session on identification of ODS using refrigerant identifiers was also part of the agenda. At the end of the workshop, each participant that passed test received a certificate. In total, 22 ODS identifiers were

distributed among regional entry points.

23. The SCC informs regional ecological inspectors when they intercept ODS at the border. The reports on ODS by the customs were provided to the NOU annually. There were not many cases of interception of ODS (mainly CFC-12). Illegal trade in ODS was associated with smugglers carrying small quantities of ODS without licenses. Ecological inspectors identified significant quantities of CFC-11 and CFC-12 mixture (2,300 kg) at former aluminium plant and the inventory of 6,000 kg of CFC-11 in the closed refrigerator manufacturing plant. All these quantities are sealed and checked for leakage.

24. The rotation of customs personnel at entry checkpoints is very frequent, which has the disadvantage of leaving only a few from the 87 ODS-trained officers available for duty. The NOU recognized the value of regular training of customs officers, as the nomenclature of substances and equipment changes frequently, and to have the detection equipment calibrated. The customs are using six digit harmonized code system that is not able to handle emerging refrigerant blends. A common computer system interconnected locally with the NOU and internationally with neighbouring countries (Russia, Kazakhstan, Kyrgyzstan and Belarus) would be an advantage.

14.3.3 Awareness raising

25. The NOU realized the importance of raising the public awareness about the ozone depletion problem and relating it to the Government strategy on the implementation of the National Programme on ODS phase out. Altogether, 22 booklets on the implementation of the National Programmed were published and disseminated among Regional Offices of the MEP for further distribution locally. There are several examples of these booklets: "*Problems with the depletion of the ozone layer*", "*Status of the ozone layer*", "*Main facts, scientific data and policies related to the ozone layer protection*", "*Montreal and Kyoto Protocols: Two Protocols – One World*", "*Reduction of ozone layer depletion and global warming*", "*Measures undertaken by Republic of Tajikistan on the ozone layer protection*", "*Projects on ozone layer protection, implemented in Republic of Tajikistan*", "*Recovery and recycling of refrigerants in Tajikistan*", "*Problems of transition to alternative refrigerants*", "*New refrigerants: pluses and minuses*", "*What is the ozone hole*", and others. During the period from October 2000 until October 2005 eight seminars on ozone layer protection were conducted for regional inspectors and Governmental official in four regions. The State TV and radio stations covered regularly ozone related workshops and other events. The public awareness and media coverage were the factors that facilitated promotion of ozone related legislation in the Parliament.

26. As in many other countries, Tajikistan had undertaken activities on Awareness Raising to shore up support from the public, government and business stakeholders for legislation and activities that would restrict and eventually phase out ODS. As in other countries, a baseline and performance indicators to measure the benefits of ODS reduction were never developed. These could have been, for example, before and after data on the number of ODS-free refrigerators bought by the general public, an increase in ODS refrigerators being sent for recycling, demand for information on the website (as number of hits) on ODS-free alternatives. It was therefore impossible to evaluate the impact of the awareness programme.

14.4 IMPACT DRIVER II: RECOVERY AND RECYCLING PROGRAMME

14.4.1 Recovery, recycling and reclamation equipment

27. The national programme for Recovery and Recycling of refrigerants was implemented as a part of a national Refrigerant Management Plan. There is a Refrigeration Association that was formed in November 2004. This Association assists in the information transfer and

delivery of results related to the recovery and recycling programme, collection of data, and in the training of personnel associated with this programme. Under the project, 117 recovery machines and 50 manual recovery pumps and recovery bags were distributed to servicing companies and technicians. The target established by UNDP for the sub-project was 15.5 tonnes of CFCs recovered and reused annually.

28. Technicians that recovered more than 10 kg of refrigerant a month received a recovery machine; those with less received a manual pump and recovery bags. The project also provided 5 sets of reclamation equipment strategically distributed around the country. Four technical recycling centres were created in largest refrigeration servicing facilities: two in Dushanbe and two in Khudzhand.

Rembyttechnica refrigeration servicing facility

29. The evaluation team visited "Rembyttechnica" in Dushanbe, which is one of four centres in Tajikistan used for the repair and servicing of domestic refrigerators. Currently, the enterprise is staffed with 40 technicians dealing with servicing in the commercial and domestic sectors. There are about 20 repairs per technician in the busiest period from March to November. The enterprise received 8 recovery machines from the project. Typically, one recovery machine is designated to a team consisting of 3 technicians. Each team fills the log book every day with data on recovered refrigerant.

30. The quantity of refrigerant that requires reclamation is registered separately. The unclean CFC-12 refrigerant that requires reclamation was delivered to the centre both by its staff and independent technicians. The bulk of CFC-12 that is required for servicing the existing refrigeration equipment was supplied from recovered and recycled refrigerant collected in the centre. The deficit related to losses is about 10% of the total required quantities and has been usually replenished by purchasing the reclaimed CFC-12 from individual servicemen in Dushanbe and regions for about US $5.00/kg. The additional cost of reclamation is about US $1.00/kg.

31. CFC-12 refrigerant is still available on the market at about 10.0 to 12.0 US $/kg. Given the relatively cheap labour in Tajikistan, it appears that recovery and recycling operations are economically viable. The cost of labour related to the processing of 1kg of CFC-12 has been confirmed through more accurate calculations during the visit to the training centre.

32. The monitoring of the efficiency of the recovery and recycling program has been carried out since 2001. Data on the recovered and recycled CFC-12 and HCFC-22 were reported by recovery/recycling centres using the format developed by the NOU. Lack of data submissions from certain regions to the centre were correlated with disruptions in funding in 2003. The full account of recovered and recycled refrigerant is presented in Table 16.

Table 16: Kilograms of recovered and recycled refrigerants in Tajikistan in 2001 to 2008

Refrigerant	2001	2002	2003	2004	2005	2006	2007	2008	Total
CFC-12	1,459	6,637	6,366	8,720	10,025	11,259	11,331	11,718	67,515
HCFC-22	571	2,105	1,934	3,174	3,893	5,519	14,621	15,676	47,493
Total	2,030	8,742	8,300	11,894	13,918	16,778	25,952	27,394	115,008

33. According to "Rembyttechnica", there was a noticeable progress in the replacement of old CFC-12-based equipment in the commercial refrigeration sector with new equipment using R-404, R-22 and R-134a. There are still about 150,000- 200,000 domestic refrigeration appliances working with CFC-12 refrigerant in the country. The trend in quantities of recovered and reused CFC-12 demonstrated, however, that the demand for CFC-12 is strong and even growing. Imports of CFC-12 stopped in 2004 as 2003 was the last year for legal imports of CFC-12 in Tajikistan (reported as 4.7 ODP-tonnes). In 2003, the total

demand representing imported and recovered CFC-12 was about 11 ODP-tonnes which remains at about the same level for the next five years. In the presence of such a stable demand there is always a threat of illegal trade.

Training of technicians in refrigeration management

34. The training of refrigeration technicians is an important element of the Refrigerant Management Plan and is a good driver for reduction of CFC-12 refrigerant in servicing operations. The director of Refrigeration Center Ltd. (Dushanbe) was very actively involved in the implementation of the training programme. He acted as a deputy of the head of the NOU at the initial stage and as a consultant in refrigeration.

35. The NOU staff and a refrigeration expert prepared a training module for the training program. The Russian version of the UNEP manual "*Good Practices in Refrigeration*" was received from Uzbekistan and further adapted. Notwithstanding that the delivery of equipment for the training centre was delayed till October 2002, the Phase I "*The Train the Trainers*" workshop was held in June 2002 in Dushanbe in a temporary training centre where 19 refrigeration technicians were trained and were certified as trainers for the Phase II training. A refrigeration expert from the Uzbekistan was invited as an instructor for the workshop, and he was assisted by staff of the NOU. The training curriculum covered issues related to the Montreal Protocol and practical aspects of good servicing operations including recovery and recycling.

36. By the end of 2005, the scheduled Phase II training was carried out using the trainers from Phase 1 to train technicians in different parts of the country. This training project was crucial for the successful implementation of the Refrigerant Management Plan due to the significant contribution of the refrigeration sector to the overall ODS consumption in the country. Altogether, 15 training seminars for refrigeration servicing technicians resulted in 334 trained technicians. All participants received official certification, as well as service kits. The technicians were pleased with the tools in the kit and they demonstrated proficiency in the evacuation and recovery of refrigerants.

37. Two permanent training centres have been established following the precedent set by the Refrigeration Centre Ltd: one in Dushanbe and one in Khundzhand. The next phase of the training programme is supposed to be supported from the extension of the GEF grant for the Institutional Strengthening. The funding has been recently transferred to the UNDP office in Dushanbe. The trainees will be provided with the certificate that will be later used as a basis for application for the license. The procedure of issuing the licences has been debated in the Government and will be established in the near future.

14.5 IMPACT DRIVER III: ENTERPRISE SUSTAINABILITY

14.5.1 Pamir domestic refrigerator manufacturer

38. "Pamir" was established in 1964 as a domestic refrigerator manufacturing company. The project financed the replacement of 8.61 ODP-tonnes per year of CFC-12 with HFC-134a refrigerant. "Pamir" used CFC-11 as the foaming blowing agent in 1991 and 1992, but had to discontinue the use of polyurethane insulation after the civil war in 1993 due to equipment damage and lack of funds to purchase the foam components. Since then, the mineral wool was used as the insulation material that intrinsically has much inferior insulation performance.

39. By the time of the formulation and approval of the conversion project in 2000, CFC-11 was not used for a number of years, and therefore, the foam component was not included by UNDP into the GEF funding package. The funds were used to change the existing production lines, and for technology transfer, technical assistance, re-design, testing, pre-

production trials and training. Incremental operational costs were not requested by the enterprise.

40. "Pamir" has a production capacity of 176,000 units per year. For the period 1964 to 1998, the total output was about 3.6 million domestic refrigerators that was sold internally and partially exported. In 1995 production was virtually stopped because of the civil war and since then, production was about 1,500 units a year due to economic hardship of the population of Tajikistan (Figure 46).

41. The conversion of the refrigerant line to HFC-134a alternative was accomplished by UNDP in 2001. In the same year, the new evacuation and charging line based on isobutane refrigerant was installed with assistance from the Government of Switzerland. UNDP did not conduct the verification of the financial and economic viability of company.

42. It was anticipated that the management of the enterprise and the Government would take the necessary steps for further modernization of production lines in "Pamir", including the installation of cyclopentane-based foaming equipment using external sources of capital. These expectations did not materialize. "Pamir" products could not compete with imported refrigerators available at the market in Tajikistan because of high energy consumption and outdated design. The production and energy costs were also very high because of old and worn out equipment. The production was stopped in 2006. The enterprise went bankrupt. Most of the equipment was dismantled and sold as scrap. Some of the equipment provided under the project is in the warehouse. The evaluation team was allowed access to the warehouse to take photographs of the equipment.

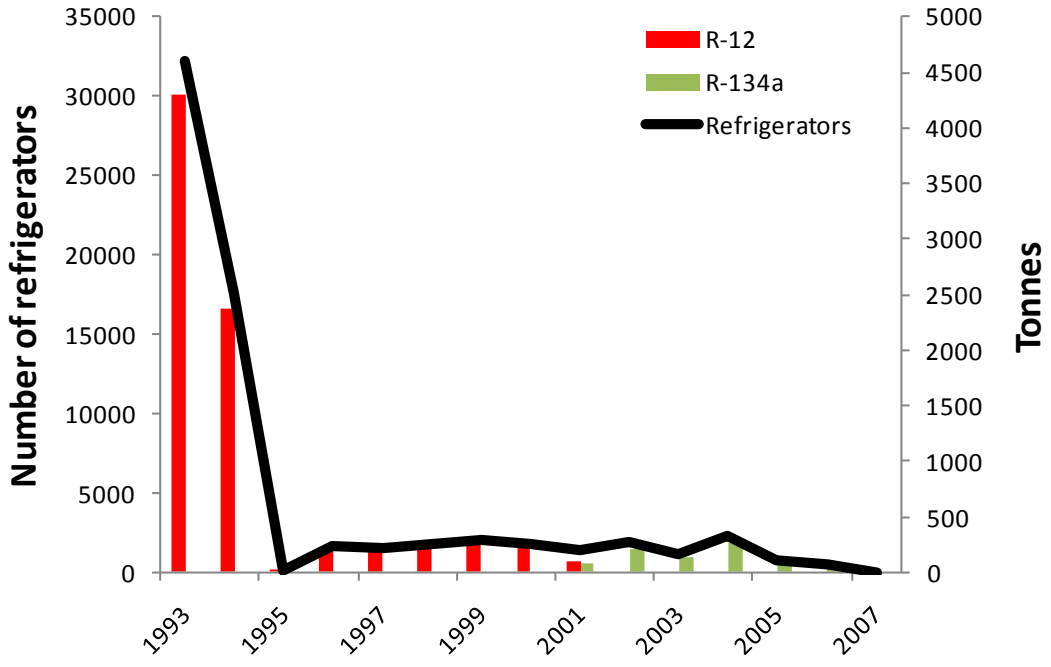


Figure 46: Production of domestic refrigerators at Pamir, with the replacement of CFC-12 by HFC-134a in the compressor

14.6 IMPLEMENTING AGENCIES

43. The GEF approved the project Continued Institutional Strengthening Support (CISS) for CEITs to meet the obligations of the Montreal Protocol for four CEIT, including Tajikistan with expected date of the commencement of the project to be June 2007. In March 2009, discussions were on-going between the NOU and the UNDP office in Dushanbe regarding the exchange rate to be applied to the first funding tranche. In May 2009 and after 2 years

of delay, the project has yet to commence.

44. The interaction of the NOU with UNDP/UNEP during the implementation of the Project was not perfect. Delays in funds transactions happened impeding the progress. There were complaints on behalf of UNEP and GEF financial management officer regarding NOU deficiencies in reporting and book keeping. The communication problems, including language barriers were identified among others. UNDP was the first implementing agency to establish an East-European Regional office in Bratislava (Slovakia) that is staffed with Russian speaking officers.

45. The implementation of CISS project will require more extensive coordination between lead agencies and NOUs in handling the projects for various countries in the region, so that there is coherency to regional efforts within the context of trans-boundary issues. These issues include the prevention of illegal trade; destruction of ODS; strengthening of ODS licensing systems; and the import, export and re-export HCFCs. The NOU appreciated the opportunity to be invited and to participate in the NOU network meetings organized by UNEP DTIE under the MLF umbrella. These forums can be used for the further strengthening of co-operation in the region.

14.7 IMPACT THREATS / RISKS

14.7.1 Illegal trade

46. The risk of the illegal trade still remains very high because of continuously high demand for CFC-12 for servicing old refrigeration equipment. Despite more modern equipment having been imported, the state of the economy is insufficient to stimulate the early replacement of existing CFC-12-based equipment.

47. The recovered quantity of CFC-12 that reflects the demand remained steady at about 11 ODP tonnes and even growing for the last four years. Losses during recovery operations reported to be about 10% or about 1.1 ODP tonnes. The source of the replenished ODS was not made clear. The NOU, the State Customs Committee and the Inspectorate in the MNRP continue to remain vigilant.

14.7.2 Government commitment

48. Further work by the NOU on a range of activities including the licensing system, training seminars on best practices in refrigeration equipment servicing, and monitoring of the ODS phase-out are unlikely to proceed if the government does not increase the funding for ozone layer protection. A lack of funding threatens to undermine the gains made by the NOU in this area.

14.7.3 Collection, disposal and destruction of ODS

49. About 8.3 ODP tonnes of unusable CFC-11 and CFC-12 were identified by ecological inspectors on closed enterprises in Tajikistan. The containers with ODS are old and rusty. There is a high risk of leaks and emissions from them into the atmosphere. The NOU also receives periodically queries from end-users that want to get dispose of collected unusable ODS. There are two cement kilns near the centre of Dushanbe. The NOU approached the management of these two plants with the proposal to consider the use of the kilns for ODS destruction. The reaction was negative because of the chlorine and fluorine contained in the ODS. There are no other potential destruction facilities in Tajikistan. In the absence of actions from the international community, there is a risk of emissions from the collected ODS.

50. There is no legislation in place to support the collection and environmentally-sound disposal of old refrigerators and freezers. The charge of CFC-12 happened to be recovered only if the appliance is disposed through the servicing facility equipped with refrigerant recovery

equipment.

14.8 IMPACT ON THE PHASE OUT OF OZONE-DEPLETING SUBSTANCES

51. Tajikistan's objective to phase out its 1999 consumption of 50.7 ODP-tonnes of ODS was fully met, largely as a result of the GEF financial assistance. Tajikistan returned to compliance with the requirements of the Montreal Protocol, in accordance with Decision XIII/20 of the Parties.

52. Tajikistan successfully phased out approximately 0.2 ODP-tonnes in one investment project in "Pamir", which eliminated the demand to import this quantity of CFCs. From socio-economic prospective, the project was not successful since the enterprise ceased to exist shortly after the project was completed.

53. In agreement with Tajikistan's commitment in Decision XIII/20, Tajikistan successfully ended the use of methyl bromide for soil fumigation in 1999. In 2006, consumption of methyl bromide for quarantine and pre-shipment, which is a permitted use under the Montreal Protocol, was 3.84 ODP-tonnes mainly for cotton and grain exports to Iran.

15 THE RUSSIAN FEDERATION

15.1 BACKGROUND

1. The Russian economy underwent significant changes in the 1990s as it moved from a centrally-planned economy to a free market system. A serious financial crisis in 1998 resulted due to difficulties in implementing fiscal reforms aimed at raising government revenues and a dependence on short-term borrowing to finance budget deficits. Lower prices for Russia's major export earners (oil and minerals) and a loss of investor confidence due to the Asian financial crisis exacerbated financial problems. The result was a rapid and steep decline (60%) in the value of the rouble, flight of foreign investment, delayed payments on sovereign and private debts, a breakdown of commercial transactions through the banking system and high inflation which declined from 85% in late 1998 to 9% by end-2006. The Russian economy recovered from the 1998 crisis and was followed by over nine years of sustained growth averaging about 7% due to a devalued rouble, implementation of key economic reforms (tax, banking, labour and land codes), tight fiscal policy, and favourable commodity prices.

2. As in all other countries, the use of ODS in the Russian Federation was important to key sectors of the economy. In 1992, the Russian Federation used ODS in aerosols (46%), refrigeration (27%), fire suppression (14%), foam production (11%) and solvents (2%). Russia's estimated Consumption of ODS in 1992 was about 49,000 ODP-tonnes, equivalent to about 7% of global Consumption. Similarly, 1992 production was estimated to be 74,000 ODP-tonnes (including 25,000 ODP-tonnes exported), equivalent to about 10% of global production. Russia was major exporter of ODS to other CEITs in the region. The Consumption of Annex A Group I and II substances was reported to be 17,682 ODP tonnes at the time of the Project appraisal in 1996.

3. In relation to controls on ODS, the Russian Federation accepted the Vienna Convention in 1986 and the Montreal Protocol in 1988; the London Amendment in 1992; and the Copenhagen, Montreal and Beijing Amendments in 2005. Historically, the Russian Federation actively promoted the development and adoption of the Vienna Convention and the Montreal Protocol. Representatives of the Russian Federation were elected and worked for several consecutive years in the Executive Committee of the Multilateral Fund.

4. In 1995, after a meeting with the Protocol's Implementation Committee, the Parties to the Protocol understood that there was a possibility of the Russian Federation being in non-compliance with the Protocol's control measures on ODS in 1996[1]. The Committee recommended international assistance to enable compliance of the Russian Federation with the Montreal Protocol. The Russian Federation promised to provide information to the Parties on its political commitment to the phase out of ODS.

[1] Decision VII/18. 1995. Compliance with the Montreal Protocol by the Russian Federation. See also Decisions VIII/25, IX/31, X/26, XIII/17 and XIV/35.

5. The Committee was also interested in the linkages between the Russian Federation's sectoral approach for ODS phase out and the financial/institutional arrangements for implementation; the timeframe for reducing and phasing out ODS; and the measures for enforcement of the trade regulations in particular. The Committee took into account the difficult economic and social problems in CEITs by allowing the Russian Federation to continue to export ODS to Commonwealth Independent States, provided the levels of production permitted for Basic Domestic Needs were not exceeded and there was no re-export of ODS from these countries.

6. Representatives of the Russian Federation met again with the Implementation Committee in 1996, 1997, 1998 and 2001[2]. At these meetings, the Committee noted each year that the Russian Federation was in non-compliance with the Montreal Protocol because its Consumption had not been reduced to zero. The Russian Federation stated that non-compliance with the Protocol's control measures was likely to extend past 2000. The Committee emphasised the need for the Russian Federation to maximise the use of its ODS recycling facilities to diminish production of new CFCs, and to submit information to the Committee annually on its progress in phasing out ODS. The Committee noted that agreement had been reached in late 1998 to phase out the production of ODS as a Special Initiative[3], and that as a result production had ceased on 20 December 2000. In 1998, the Russian Federation committed to:

    1) To reduce the Consumption of CFCs to no more than 6,280 ODP-tonnes in 1999;
    2) To reduce the Consumption of halon to no more than 960 ODP-tonnes in 1999;
    3) To reduce the Consumption of other CFCs to no more than 18 ODP-tonnes in 1999;
    4) To phase out the production of CFCs and halon by 1 June 2000; and
    5) To phase out the Consumption of Annex A and B substances by 1 June 2000

7. The Committee recommended international assistance, in particular from the GEF, to the Russian Federation for projects that would phase out the production and Consumption of ODS.

8. The GEF aimed to assist Russia to phase out ODS Consumption, in a manner consistent with its international obligations, while ensuring that this was accomplished with the minimum economic disruption. However, unlike GEF initiatives in other CEITs, this Project was not intended to be a comprehensive country phase out. Due to inadequate resources, it was initially limited to phase out investments within the first funding tranche in the only two high ODS-consuming sectors (aerosol and refrigeration). Other ODS-consuming sectors and ODS production were left to national initiatives under the Country Programme. Importantly, the production phase out was not part of the Project but instead was developed as a separate *Special Initiative*.

9. The GEF Project, implemented by The World Bank aimed to provide the necessary technical assistance and institutional strengthening to develop policies and regulatory actions required to sustain the ODS phase out. In addition, during the implementation of the Project, the objectives were re-assessed and the sub-projects re-adjusted (within the resources available) to take into account a more complex interrelation between ODS phase out in the industrial sectors and restructuring that was occurring in the industry and the Government.

15.2 INPUTS

10. The GEF formally opened an Ozone Focal Area in 1995 for CEITs who had a Country

[2] Decision VIII/25 (1996); Decision IX/31 (1997); Decision X/26 (1998); Decision XIII/17 (2001).
[3] Special Initiative for ODS Production Closure in the Russian Federation. October 1998.

Programme (CP) endorsed by the Parties to the MP, and who had ratified the London Amendment. The Russian Federation prepared a CP with bi-lateral assistance from Denmark in 1994. At that time, the Russian Federation's CP aimed to phase out ODS in 1999, on the assumption that external funding would be provided. The GEF funding level allocated to each CEIT including the Russian Federation was determined on the basis of specific priorities identified in their CPs, government commitments, co-financing and other factors.

11. The original appraisal capital cost of the ODS project in Russia was $104 million, made up of $60 million GEF grant financing of which $57 million was for investment sub-projects in ODS Consumption phase out, and $44 million in enterprise and government financing. Actual investment in sub-projects was $72.4 million, of which $48.1 million was financed by GEF and $24.3 million was financed by enterprises. GEF financing of technical assistance increased from $1.7 million to $8.6 million. No co-financing was provided by the Government (see Table 17). The GEF Council approved the Project in May 1996 and concluded it in June 2004.

Table 17: The Russian Federation sub-project cost and financing summary

Enterprise/ Sub-Project	Estimate at Appraisal ($)			Actual ($)		
	Cost	Financing		Cost	Financing	
		Enterprise	GEF		Enterprise	GEF
Aerosol Sector						
Arnest	14,468,060	8,818,080	5,650,000	16,654,562	11,016,737	5,637,825
Sibar	17,570,994 9,227,805*	4,429,724 1,362,510*	13,141,270 7,865,295*	7,827,811	2,319,462	5,508,349
Chimprom	7,795,002	2,703,002	5,092,000	5,690,871	957,483	4,733,388
Harmonia	8,106,385	1,854,385	6,252,000	8,471,222	2,285,855	6,185,367
Til	844,000	120,000	724,000	880,218	82,816	797,402
Altaivitaminy	936,400	305,000	631,400	955,422	134,000	821,422
Commercial Refrigeration Sector						
Mariholodmash	4,634,311	3,753,311	881,000	3,400,691	2,614,374	786,317
Holodmash	2,514,625	259,625	2,255,000	2,689,073	341,753	2,347,320
Domestic Refrigeration Sector						
Iceberg	746,900	56,100	690,800	785,225	156,166	629,059
Non-Insulating Foam Sector						
Plastik	3,646,488	906,388	2,740,100	5,796,877	2,853,139	2,943,738
Stroidetal	1,103,100	20,750	1,082,350	1,485,555	403,555	1,082,000
Nelidovo	1,160,500	22,000	1,138,500	1,776,015	856,152	919,863
Refrigeration Servicing Sector						
Combine TT	2,277,628	38,628	2,239,000	2,199,596	106,739	2,092,857
Pyatigorsk TT	1,175,025	30,625	1,144,400	935,350	28,331	907,019
Kemerovo TT	1,746,230	42,230	1,704,000	1,652,582	57,579	1,595,003
Samara TT	238,707	7,550	231,157	189,209	7,550	181,659
Rostov TT	259,329	14,900	231,157	162,117	14,900	147,217
Yartorgtechnika	288,294	7,635	280,639	234,357	7,635	226,702
Orenburg	240,870	5,450	235,420	175,855	5,450	170,405
Orel TT	304,858	7,550	297,308	214,295	7,550	206,745
Volgograd TT	117,664	8,390	109,274	85,773	8,390	77,383
Perm TT	337,810	10,700	327,110	255,725	10,700	245,025
Bryansk TT	210,564	5,765	204,799	166,767	5,765	161,002
Tvertorgtechnika	244,186	5,450	238,736	197,312	5,450	191,862
Cherepovets TT/Vologda TT	259,004	5,240	253,764	173,325	5,240	168,085
Irkutsk TT/Ulan-	457,072	7,550	449,522	357,805	7,550	350,255

Enterprise/ Sub-Project	Estimate at Appraisal ($)			Actual ($)		
	Cost	Financing		Cost	Financing	
		Enterprise	GEF		Enterprise	GEF
Ude TT						
Primtorgtechnika / Kamchat TT	503,068	6,185	496,883	467,357	6,185	461,172
Astrakhan TT	133,299	2,510	130,789	104,148	2,510	101.638
Podolsk TT	224,619	6,185	218,434	196,422	6,185	190,237
Chelyabinsk TT	270,348	10,700	259,648	257,603	10,700	246,903
Kaliningrad TT	73,894	2,405	71,489	71,063	2,405	68,658
PskovTT / Novgorod TT	146,609	4,925	141,684	126,184	4,925	121,259
Consumption Total	**73,035,863**	**23,478,958**	**49,556,905**	**63,721,769**	**24,227,494**	**39,494,275**
Production Closure						
	8,500,000	-	8,500,000	7,786,146	-	7,786,146
PROJECT TOTAL	**81,535,863**	**23,478,958**	**58,056,905**	**72,422,533**	**24,332,251**	**48,089,282**

*After restructuring and re-appraisal;

12. There was no threshold determining the level of co-financing in GEF investment projects. The co-financing negotiated between the World Bank and an enterprise on an individual basis and was the subject of the financial health of the company. The level of co-financing varied from-enterprise-to enterprise ranging from 1.3% to about 330% of the value of the grant. In total, enterprises in 33 investment projects contributed $24.3 million to match $39.5 million in grants.

13. The Project was designed to provide: 1) Support to enterprises to phase out ODS, 2) Support for technical assistance to strengthen institutional capacity to undertake initiatives in support of the phase out; and 3) Support to a Project Implementation Unit (PIU) to manage/implement the phase out. The technical assistance comprised support for initiatives to develop regulatory measures, monitor ODS demand, prepare projects and determine subsequent tranches, identify the phase out requirements in other sectors including production, and to develop a public awareness campaign. The PIU support included funds for staff to supervise the sub-projects, to financially manage them, to procure equipment and to help prepare sub-projects.

14. A Project Implementation Unit (PIU) was established in April 1995, and closed in June 2004. It functioned on the basis of the following legal entities: Autonomous Non-commercial Organization “Centre for Preparation and Implementation of International Projects on Technical Assistance” (CPPI), Investment Centre of Ozone Depleting Substances Production and Consumption Phase-out Projects (ICP “Ozone”), State Enterprise “Federal Centre of Geo-ecological Systems” (FCGS “Ecologia”). In total, it comprised 4 staff (Project management, coordination, accounting, sub-projects preparation) and 3 consultants (procurement, financing, institutional strengthening).

15. In the course of the implementation of the second and the third tranches, the original GEF funding allocation was expanded to include more than the original aerosol and refrigeration sectors. It was expanded to cover the sectors of refrigeration servicing, medical aerosols, non-insulating foam, solvents and fire protection.

16. Funds available from the second tranche of $8.5 million also contributed to the Special Initiative of $27.0 million. The Russian Federation paid $25.4 million from this Initiative in compensation to seven ODS production companies for phasing out 105,296 ODP-tonnes per year of ODS production. Most of the funding for the Special Initiative came from donor countries. The Special Initiative commenced in May 2000 and was completed in December

2005.

17. The investment projects benefited from the advice received from national experts mainly from the State Institute of Applied Chemistry in St Petersburg, which was the principal institution responsible in the Russian Federation in regard to policy and technology on ODS. This Institute was involved in project formulation of the investment projects, and especially in the aerosol sector. National experts were also a part of the international team that prepared the Special Initiative Project. International technical assistance was limited in general, but did include US experts for the identification of sub-projects in the third tranche and Danish experts for assistance with the formulation of the refrigeration servicing investments.

18. Experts on the staff of several companies, such as "Stroydetal" foam operations, "Harmonia" aerosols and "Iceberg" domestic refrigerator manufacturing, reported that the consultants involved them in the design of the sub-projects and in the selection and procurement of equipment. These companies reported that a cooperative effort in the selection of ODS-free technology was beneficial to their operations as the equipment choice was compatible with their plans for strategic development of their operations.

19. However, enterprises in the refrigeration servicing sector reported that they were not consulted on the range and quality of the tools available for the efficient recovery and recycling of ODS. Instead, the equipment was selected, procured in bulk and distributed to the servicing centres. The companies reported that, as a result, more costly equipment of inferior quality was delivered than could be obtained locally.

20. In some cases, important contributions from key organisations were not funded. As an example, the Russian Federal Customs Service was not included in the Project for funding, despite their services being essential for enforcing the legislation that banned the import and export of ODS and ODS-containing products that came into force in 1995 and 1996. In contrast, other CEIT countries received funding for training Customs officers and for equipping them with refrigerant identifiers in projects implemented UNDP/UNEP.

21. The GEF Project was part of a broader World Bank Environment Management Project (EMP) in Russia ($110 million) providing additional institutional capacity and expertise to the Ministry of Environment Protection and Natural Resources (MEPNR) and a $50 million financing component of EMP offering an additional source of capital for investment in ODS phase-out sub-projects implemented with GEF funding.

15.3 IMPACT DRIVER I: GOVERNMENT COMMITMENT

15.3.1 Institutional and legislative strengthening

22. The management of the project implementation relied at great extent on the PIU supported by the Moscow World Bank office and dedicated personnel in the World Bank Headquarters. The role of MEPNR (from 1996 – the State Committee on Environment Protection (SCEP) and from 2000 – the Ministry of Natural Resources (MNR)) were important at the initial stage when adoption basic legislation was absolutely necessary. The management had to constantly adjust itself to the rapidly evolving restructuring occurring in both the Russian industrial sector and in the country's institutional structure.

23. The decision of the World Bank to distribute the whole amount allocated by GEF into three funding tranches seemed appropriate as it allowed the Bank flexibility in re-allocating resources to the most relevant area.

24. The Government role was especially important in the implementation of the Special Initiative Project (SIP). In contrast with other investment projects executed by recipients, the SIP was Bank executed with money in cash to be paid to ODS producing enterprises to

compensate them for closure of production. It was the responsibility of the Government to organize payments in an accountable and transparent way in accordance with detailed procurement plans and agreements reached with each enterprise.

25. In general, the financial assistance provided under the technical assistance component helped the Government, in interaction with PIU and the enterprises, to implement national programmes, to undertake technology development and transfer initiatives, to prepare and appraise required investments, to disseminate results, to enhance public awareness, and to undertake procurement and financial requirements of the Project. Another important task was the monitoring of the implementation of agreements under Special Initiative Project in the way to satisfy strict requirements of international inspectors. According to the World Bank, these tasks were performed by the Government in a highly satisfactory manner.

26. An "Inter-Agency Commission for the Ozone Layer Protection" (IAC) was established by a Government resolution in July 1992 and was active in the preparation of ozone related regulations, the development of ODS phase-out national plans and programmes and its budgets, including R&D. The IAC was attached to MEPRN. The IAC held meetings several times per year, but these meetings ended in 2004 when this commission with another inter-agency commission were both closed by the Decree of the President of the Russian Federation.

27. Subsequently, between May 1995 and June 2001, nine legislative instruments in the field of ozone layer protection were drafted by MEPNR, SCEP and MNR and adopted by the Government of the Russian Federation (Table 18). These instruments:

1) Banned the import of ODS and ODS-containing products in 1995 and 1996 (1995)
2) Approved procedures of import and export of ODS and ODS-containing products (1996)
3) Approved quotas for production from 1 August 1999 (1999)
4) Banned new production facilities from 1 July 2000 (1999)
5) Approved priority measures for reductions in ODS production and Consumption (1999)
6) Approved import and export of ODS as feedstock, special applications envisaged by the Montreal Protocol, and ODS in transition to/from other countries (1999)
7) Approved the Special Initiative to phase out of ODS production (2000)
8) Approved ODS production only for feedstock and special applications envisaged by the Montreal Protocol (2000)
9) Approved the national strategy for CFC management (2001)
10) Approved ODS Consumption for Essential Uses and management of distribution

Table 18: Legislation in the Russian Federation regulating the production, Consumption, export and import of ozone-depleting substances

Date	Number	Description
3 Jul 1992	Decree No 378	It was decided to develop the state program on the production of ODS -free alternatives and to estimate the volume of financing needed to cover the associated R&D.
30 August 1993	Decree N0 875	Inter-departmental commission on the ozone layer protection (hereinafter MVK) was created and attached to Ministry of Natural Resources in order to coordinate the activity of Russian Ministries, authorities, administrative bodies, organizations, etc., on fulfilling the Russian Federation international obligations on the ozone layer protection.
18 May 1994	Decree No 496	MEPNR was requested to submit the Federal Program on Production of ODS-free Substitutes to the Cabinet of Ministers by August 1994.
24 May 1995	Decree No	The decree approved the priority measures on fulfilling by the Russian

Date	Number	Description
	526	Federation the international obligations concerning the ozone layer protection in 1995--1996. Import and export of ODS and ODS-containing products to/from the non-Parties of the Montreal Protocol, was prohibited. Obligatory licensing was introduced for ODS and ODS-containing products import and export to/from the Parties of the Montreal Protocol.
8 May 1996	Decree No 563	Approved the Regulations ODS and ODS-containing products import and export to/from the Russian Federation.
5 May 1999	Decree No 290	After 1 August 1999 ODS production had to be carried out in line with the quotas approved by the State Committee on Environment Protection, in cooperation with the Ministry of Economy and on the assumption of the calculated levels, rates, terms and other requirements of the Montreal Protocol. The decree banned new ODS production facilities in the Russian Federation after 1 July 2000.
26 Nov 1999	Decree No 1980-p	Approved the "*List of the priority measures intended to step-by-step reduction of ODS production and Consumption in the Russian Federation*"
9 Dec 1999	Decree No 1368	The decree stated that commencing on 1 March 2000 ODS import/export to/from the Russian Federation is permitted only in cases as follows: - For usage as feedstock in other chemicals production; - For special applications envisaged by the Montreal Protocol; - For the transition to/from Parties of the Montreal Protocol.
26 Sep 2000	Decree No 728	The decree approved the Grant agreement between the Russian Federation and the World Bank aimed to provide financing of the project "*Special Initiative on ODS production phase out in the Russian Federation*"
19 Dec 2000	Decree No 1000	The decree stated that commencing from 20 December 2000, ODS production in the Russian Federation was permitted only if to be used as feedstock in other chemicals production or in special applications envisaged by the Montreal Protocol.
20 Dec 2001	Act No 7-Ö3	"*On environment protection*". The Act forms the basis for the Russian national strategy for CFC management. In Chapter VII. "*Requirements on environment protection when realizing economical activity*". Article 54. "*Protection the ozone layer of the atmosphere*", it is stated: "*Protection of the ozone layer of atmosphere from environmentally hazardous changes is provided by means of regulation of production and usage of the substances that deplete the ozone layer of the atmosphere, in line with the international agreements by the Russian Federation, universally recognized principles and norms of international legislation and the legislation of the Russian Federation*".
28 June 2001	Order No 523 of MNR	Approved the ODS Consumption quotas for essential uses provided from the ODS banks (reserves). The Department of Environment Protection and Safety (hereinafter: DEPS), that is one of the departments of the Ministry of Natural Resources) was entrusted to carry out the ODS reserve management and distribution, and to control the usage of ODS in essential applications.
27 August 2005	Decree N0 539	The Russian Federation adopted Copenhagen, Montreal and Beijing Amendments to the Montreal Protocol.

28. The technical assistance component helped to strengthen country institutional capacity related to ODS phase-out regulatory measures. In the period 1995 to 2004 twelve Governmental resolutions were adopted that supported the management of ODS phase-out activities consistent with international practice. This included establishment and updating of the Country Program, international reporting as required under the Montreal Protocol, establishment of regulatory controls on ODS Consumption, import and export, and licensing of residual ODS Consumption.

29. MEPNR has been in the state of permanent transformation in the last decade. In 2000, the

SCEP was dissolved and its responsibilities were absorbed by the Ministry of Natural Resources (MNR) thus resulting to a major downsizing of Federation-level environmental function. Moreover, the environmentally-oriented management in SCEP was replaced by geologists who outnumbered the environmental staff in the MEPNR. Financial benefit from the exploitation of mineral resources is now a major objective of the MEPNR[4]. Prior to these reforms in 2000, the SEC included a central office with more than 80 regional arms representing Federation policy. Now, under the reorganization, 90 percent of the federal staff and equipment have been transferred to regional administrations and most of the responsibility has been devolved to the regional governments.

30. In March 2004, compliance and enforcement responsibilities were transferred from the MNR (which retained policy making functions) to a Federal Service for Oversight in Ecology (FSOE) and Natural Resources and the Federal Service for Ecological, Technological and Nuclear Oversight (FSETNO). In 2008, after the last reorganization, both FSOE and FSETNO (now Rostechnadzor) were incorporated into the ministerial structure (From 2008 – the Ministry of Natural Resources and Ecology (MNRE)). The relationship of Rostechnadzor to other institutions in the Russian Federation is shown in Figure 47.

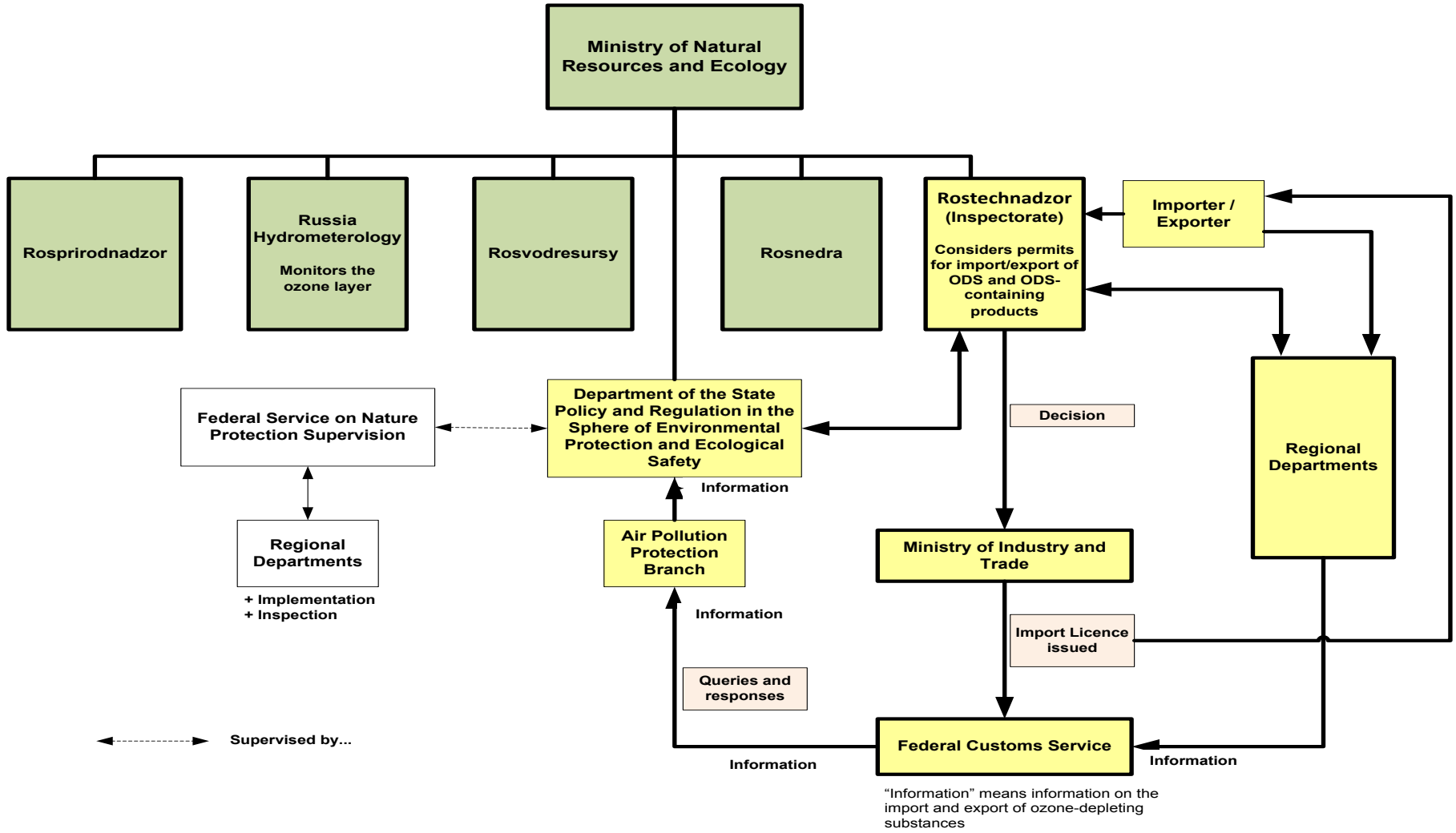
31. Currently, MNRE's ODS responsibilities are limited to the implementation of an ODS import quota and licensing system. This results in MNRE working with the Ministry of Industry and Trade, and the Federal Customs Service.

32. ODS emissions are not regulated by the existing legal and regulatory framework. Environmental inspectors have no administrative and judicial means to push compliance of end-users of ODS and ODS contained equipment. The relationship between MNRE and the Federal Customs Service was not particularly cooperative as there was no procedure for sharing information in real time. Moreover, the focus of MNRE's work is now on climate change, rather than ozone layer protection *per se*, as climate change has been set as a government priority. MNRE was aware of the dual benefit of phasing out ODS because of its ODP and GWP values. However, there is no dedicated staff in the MNRE dealing with the Montreal Protocol and ODS related issues.

33. With the Project's support, the Russian Federation developed a regulatory framework for the management of ODS issues that helped the country to return to compliance with the Montreal Protocol. However, the momentum was lost in the post-GEF intervention period in the absence of the Government commitments to assume full responsibility for further development and implementation of regulatory mechanisms.

[4] Environmental Management in Russia: Status, Directions and Policy Needs, the World Bank, July 28 2004

Figure 47: Government structure in the Russian Federation related to the licensing of the import and export of ozone depleting substances (in February 2009), shown in yellow



Customs and border security

34. In the Russian Federation, there was no training of Customs officers to familiarise them with the quota and licensing system, national regulations concerning ODS, harmonized code system for ODS, methods of identification of ODS, illegal trade methods in ODS, and practical hands-on session on identification of ODS using refrigerant identifiers. ODS detection equipment was not supplied to the Customs Service to enable them to differentiate legal from illegal ODS that could be imported in bulk or in equipment.

35. Despite the lack of funding, training and equipment for Customs Officers, the Federal Customs Service (FCS), the Rostekhnadzor, the Ministry of Industry and Trade (MIT) and the MNRE were involved in the implementation and enforcement of the ban on the import and export of ODS and ODS-containing products. Government Resolution # 563 (of 8th of May 1995) was amended in February of 2009 to give MIT the responsibility for issuing of ODS import/export licenses. Before the amendment, the Ministry of Economic Development and Trade had this responsibility. In general, the Rostekhnadzor is responsible for the preparation of decisions for the ODS import/export and the FCS – for the control measures on the border, and the MNRE – for the preparation of the reports to the Montreal Protocol Secretariat. It was not possible to determine how effective their activities were in combating illegal trade.

36. There were indications that illegal imports of CFCs were still taking place in the Russian Federation today. Both servicing centres that we visited reported that they continued to service CFC-based systems, although the volume of this service is constantly diminishing. One of the companies demonstrated the relative ease of obtaining virgin CFCs by calling a supplier to arrange delivery of ODS. The market price of CFC-12 was about $10 per kg in Moscow and about $8 per kg outside of Moscow. There were indications that the ODS did not originate from Russian stock of CFCs accumulated in 2000-2001, but was imported into the Russian Federation illegally from China and other countries. This indicated that the border of the Russian Federation was not effective in controlling imports of CFCs.

37. Although CFCs are cheap and available in the Russian Federation, there was some evidence of ODS interceptions at the border. In August 2004, the Russian media reported the interception of a shipment of 60 tonnes of ODS en route from China to Vladivostok. It had been declared as HCFC-22. However, after further examination of the consignment, the officers discovered that about 30 tonnes of the shipment was CFC-12. The perpetrator was taken to court, but the result was unknown.

Awareness of ozone depletion

38. A number of publications and media coverage were organized by PIU[1]. There was no special program in MEPRN/SCEP/MNR/MNRE on public awareness on ozone related issues. All enterprises were informed of the need to phase out ODS from different sources.

[1] Kopylov N.P., Nikolayev V.M., Zhevlakov A.F., Pivovarov V.V., Tselikov V.N. Russian National Strategy for Halon Management. St. Petersburg: CHIMIZDAT. - 2003. - p. 40; Barabanov V.G., Blinova O.V., Rusanov V.B., Tselikov V.N., Zoticov V.S. Russian National Strategy for CFC Management. St. Petersburg: CHIMIZDAT. - 2003. - p. 56;Barabanov V.G., Blinova O.V., Zoticov V.S., etc. Ozone-Safe Alternatives and Substitutes. St. Petersburg: CHIMIZDAT. - 2003. - p. 304; Tselikov V.N. Overview on Ozone Depleting Substances Situation // Polyurethane. - 2002. No. 7; Tselikov V.N. On the Necessity of Joining of the Russian Federation to the Copenhagen, Montreal and Beijing Amendments to the Montreal Protocol on Substances That Deplete the Ozone Layer // Kholodilnaya Tekhnika (Refrigeration Engineering). - 2004. - No 1; Tselikov V.N. Direct and Indirect Influence of the Montreal and Kyoto Protocols on Production of Refrigerating Equipment // Kholodilnaya Tekhnika (Refrigeration Engineering). - 2005. - No 9, 10.; Tselikov V.N. Forecast HCFC Use in the Refrigerating Equipment in Medium-Term and Long-Term Prospects // Imperia Kholoda (Empire of Cold). Branch-Wise Analytical Journal. - 2008. - No. 4.5.

15.4 IMPACT DRIVER II: RECOVERY AND RECYCLING PROGRAMME

39. A national Refrigerant Management Plan (RMP) is an internationally recognized tool for reducing ODS Consumption in the servicing sector. The decision to address the refrigeration servicing sector in Russia was taken as part of the third tranche when it was clear that funds became available when fewer enterprises passed the financial viability test than originally anticipated. As a result, 20 sub-projects on servicing in the commercial refrigeration sector were funded and implemented over 24 regional servicing centres across the Russian Federation.

15.4.1 Recovery, recycling and reclamation equipment

40. Under the Small Grant Programme of the GEF 24 refrigeration servicing enterprises were equipped by recovery and recycling machines and reclamation facilities for processing CFC-12. In total, the servicing companies received 822 portable refrigerant recovery units with limited cleaning capabilities, 117 stationary recycling units for cleaning recovered refrigerant and equipment for 5 refrigerant reclamation facilities for deep cleaning of recovered refrigerants in bulk quantities, including analytical capacity (Table 19). In addition, 449 flushing and drying machines were supplied to promote retrofits of existing appliances to HFC refrigerants and synthetic oil. The equipment was received in 2002-2003.

Table 19: Recovery, recycling, reclamation and flushing-drying units provided to the Russian Federation

Supplier	Recovery units	Recycling units	Reclamation units*	Flushing and drying units
ITE N.V. Belgium	536	59	3	307
Ecotez, Honeywell Ecoflush	286	58	2	142
Total	822	117	5	449

*Including analytical capacity

41. The companies that received the equipment were selected on the basis of a survey that determined the extent of their servicing activities for reducing the demand for Consumption of new ODS.

42. Every refrigeration regional servicing centre in an approved sub-project received recovery machines as part of their equipment package, depending on the size and volume of servicing operation. Recycling machines were provided proportionally approximately at the rate one recycling machine for every servicing outlet.

43. The enterprises that received the equipment reported that the relatively light and portable recovery machines were valuable as they avoided the need to buy refrigerant, which was increasing in price. The company in Volgograd purchased additional recovery machines on their own, which indicated that their value to the companies was still present even when they had to buy the machines themselves.

44. The recovered refrigerant was recharged after repair. The share of recovered HCFC-22 refrigerant was reported to be increasing, while the volume of recovered CFC-12 had diminished. Recycling machines have not been practically used for handling CFC-12 refrigerant due to transportation problems and diminishing demand. One enterprise used the recovery system for packaging refrigerant into smaller containers for retail sales.

45. The ODSs are not included in the list of controlled emissions in the Federal Law on Environmental Protection. Therefore, there are no regulations making the recovery and

recycling of ODS mandatory for ODS end-users.

46. In Russia, there are several professional associations related to refrigeration technology and equipment. A professional association of refrigeration manufacturers and large contractors and end-users of refrigeration equipment in food industry was established in 2003. It is well organized and connected with Federal and Regional Governmental institutions. The association of refrigeration servicing enterprises is loosely organized and less formal. It has no connection with the Government. This association has little impact on the control and monitoring of ODS emissions in servicing operations across the country.

15.4.2 Training of technicians in refrigerant management

47. The Train-the-Trainer workshop was organized in St Petersburg in 2002 with participation of representatives from all 24 regional centres. Subsequently, the training of technicians was organized by enterprises and delivered by trainers using material obtained at the workshop. The training continued as part of the team work during servicing operations. Altogether more than 600 technicians were trained between 2002 and 2004. Currently, several colleges and training centres across the country provide training of refrigeration technicians on the commercial basis.

48. The system of certification of refrigeration servicing technicians was not in place. This opens the avenue for not adequately trained individual entrepreneurs to be in the servicing business handling CFCs in uncontrolled manner. The introduction of the certification system should be a priority of the Government since it would greatly facilitate the complete phase-out of use of CFC refrigerants, particularly when a servicing network already exists in the Russian Federation.

49. In addition to the training programme, personnel in each sub-project were trained by the equipment supplier as part of the installation and commissioning contract. Special training was undertaken in enterprises that installed flammable ODS substitutes, and in these cases the training was supervised by the local safety authorities and international safety inspectors.

15.4.3 Results of recovery and recycling operations

50. Data on the quantity of recovered and recycled refrigerants were collected regularly and reported to the PIU from 1998 to 2004.

51. Since 2004, these data have been collected by some of the Project beneficiaries, but they have not been reported as the MNR and MNRE has not provided the resources to collect and analyse these data. In July 2009, the MNRE requested 24 servicing companies to provide information on the amount of ODS recovered and recycled (Table 20). Five companies responded which permitted the average ODS recycled per machine to be calculated. The average amount was then used to calculate the total recycled for the other 19 companies that did not respond to the request from MNRE for information on the quantity of ODS recovered and recycled.

52. The results showed that on average about 122 kg of ODS (CFCs and HCFCs) was recovered in total by each recovery and recycling centre over a period over about 9 years. Compared with other countries, the amount recovered and recycled was relative small. The reasons for the smaller quantity recovered and recycled were not provided.

Table 20: Quantity of CFCs and HCFCs recovered and recycled over a 9 year period in the Russian Federation.

No	Recovery and Recycling centre	Number of machines	CFC-12 recovered kg	CFC-12 recycled kg	HCFC-22 recovered kg	HCFC-22 recycled kg	Reused per machine kg	Total ODS recycled kg
1	Ekaterinoburg TT	246						30,055
2	Pyatigorsk TT	168						20,525
3	Kemerovo TT	167						20,403
4	Samara TT	14						1,710
5	Rostov TT	8						977
6	Yartorgtechnika	26	0	0	0	0		0
7	Orenburg	14						1,710
8	Orel TT	23	183		46		9.96	229
9	Volgograd TT	6						733
10	Perm TT	25						3,054
11	Bryansk TT	27	915	2448			124.56	3,363
12	Tvertorgtechnika	23	832	1,394	530	704	150.43	3,460
13	Cherepovets TT	6						733
14	TT/Vologda TT	14						1,710
15	Irkutsk TT	19						2,321
16	Ulan-Ude TT	3						367
17	Primtorgtechnika	49						5,987
18	Kamchat TT	8	790	680	95	65	203.75	1,630
19	Astrakhan TT	16						1,955
20	Podolsk TT	28						3,421
21	Chelyabinsk TT	22	1,162	525			76.68	1,687
22	Kaliningrad TT	5						611
23	PskovTT	3						367
24	Novgorod TT	5						611
	Average per machine						122.17	
	Total							107,620

15.4.4 Recovery and reclamation of halon

53. The production of Halon 1211 and Halon 1301 was stopped in the Russian Federation in 1994.

54. Halon 2402 was commonly used for civilian applications nuclear power stations, oil platforms, compressing and pumping gas stations, civil aviation, main computer centres in banking and telecommunication facilities, and dominated all halon fire protection use in the military. The production of Halon 2402 ceased in December 2000.

55. In 2002, the bank of Halon 2402, Halon 1301 and Halon 1211 was 2,903 tonnes; 333 tonnes and 107 tonnes respectively[2]. The stock of Halon 2402 accumulated during the last years of production proved to be excessive and a sizeable part of it was used as feedstock by the chemical industry in Russia. This reduced the stock to about 960 tonnes and brough the price of Halon 2402 up to about $25.00 per kg.

56. The production of alternative fire fighting agents such as HFC-227, HFC-23, HFC-125 and other non-HFC-based substitutes commenced. However, these substitutes could not be used in existing systems specifically designed for the use of halons. These systems cannot be replaced with available alternatives in some applications such as military and aviation or the replacement was prohibitively expensive.

57. The need to recover, reclaim and recycle halon became apparent in Russia. Given the high price of halons, several companies emerged that recovered halons using their own recovery and recycling equipment on a commercial basis. Four Russian companies offered recycling and banking services, with at least 20 companies operating as collecting agencies. In addition, the military sector and Gasprom have banking facilities to support their own needs. Maximum recycling capacity is estimated to be about 800 tonnes per year. The quantities of halon reclaimed by the three largest companies are shown in Table 21.

Table 21: Tonnes of halon recovered and reclaimed by three major halon recycling companies in the Russian Federation

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total	% of Total
Halon 1211	0	0	1.3	4.2	2.3	1.6	2.1	1.8	4.8	18.1	5%
Halon 1301	2.8	9.7	13.3	16.8	25.3	24.9	18.3	13.0	10.8	134.9	32%
Halon 2402	55.9	28.2	23.6	31.0	26.4	41.9	20.0	16.0	20.7	263.7	63%
Total	58.7	37.9	38.2	52.0	54.0	68.4	40.4	30.8	36.3	416.7	100%

58. The data on halon 1211 quantity indicate that demand for Halon 1211 is relatively small. Halon 1211 is used in hand-held fire extinguishers and in fixed fire extinguishing equipment, for engines for use on board aircraft for the protection of crew compartments, engine nacelles, cargo bays and dry bays. The aviation industry has a long term need for Halon 1211. Although alternatives are available, the practicalities of using them on the existing fleet of aircraft are very challenging and expensive. ICAO set 2014 as the timeframe for the replacement of halon in hand-held extinguishers for new production aircraft.[3] Halon 1301 is still used in fire fighting systems in buildings, civil vessels, civil aircraft and military. The need for recycled Halon 1301 has reduced due to the implementation of halon-free alternatives.

59. Unlike Halon 1301, the UNEP Halon Technical Option Committee predicts that the total demand in recycled Halon 2402 in Russia is growing by up to 160 tonnes annually in the next several years before it will start decreasing[3]. It appears therefore that Halon 2402 will continue to remain important for the uses described above in Russian Federation in the future.

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[2] Russian national strategy for halon management, CHIMIZDAT, 2003

[3] UNEP Halon Technical Options Committee Report, February 2009.

15.5 IMPACT DRIVER III: ENTERPRISE SUSTAINABILITY

60. The sites that were visited included those that serviced refrigerators, two aerosol producers, one facility that produced non-insulating foam, one domestic refrigeration plant, two ODS production facilities, and a chemical research centre. One meeting was held with the management of a halon recycling company. The most salient information is provided on the status and achievements of the enterprises.

15.5.1 Refrigeration service

Podolsktorgtechnika servicing company

61. Podolsktorgtechnika is one of the 24 regional refrigeration servicing centres that received equipment. Located in Podolsk in the southern part of the Moscow Region, the company repaired and assembled domestic and commercial refrigeration equipment and compressors. In the former Soviet Union, this enterprise would have been part of a state-owned service and repair network. The company also sold new refrigerators and freezers, compressors and other parts, and equipment for restaurants. Podolsktorgtechnika received from the Project 57 sets of servicing tools (see example in Figure 49) as well as recovery equipment (Figure 48), and one retrofit machine (total value $190,237).

Figure 48: Set of servicing tools supplied for technical work on refrigeration and air conditioning equipment in the Russian Federation. Podolsktorgtechnika, Moscow.

Figure 49: Equipment for recovering ozone-depleting substances. Podolsktorgtechnika, Moscow.

62. About 1,605 kg of CFC-12 were used in their operations in 2008. The amount recovered could be underestimated as each technician was given recovery target of 10% of overall turnover of CFC refrigerant. In reality this amount the recovered and reused refrigerant might slightly higher, but 10% was believed to be a practical target. Data on recovered and reused CFCs were collected but not reported as there was no government NOU or other institution willing to receive the information after the Project was completed. The location of most of the recovery kits was known to Podolsktorgtechnika, according to a database that was used to keep track of them. However, some had gone missing and could not be traced.

63. Podolsktorgtechnika reported that it benefited from the Project by improved productivity due to better tools (even though they had to be optimised), improved profitability, lower servicing costs (which it passed on to its clients) and opportunities to participate in international tenders. The retrofitting machine, which replaced CFCs with non-CFC refrigerant, was not beneficial as the cost to the client was too high. The volume of recovered refrigerant reached its peak in 2004 of 609 kg and then gradually diminished to 160 kg in 2008.

Volgogradtorgtechnica servicing company

64. Volgogradtorgtechnica was a similar but smaller establishment located in Volgograd. It was affiliated with several companies in several towns of Volgograd Region. Volgogradtorgtechnica received 50 sets of servicing tools, 10 recovery and one recycling machines. Later they bought even bigger capacity units that reduced the time to pump and store the ODS.

65. The CFC-12 is still easily available on the local market at the price of about $8.5/kg if it s purchased in a cylinder of 13.6 kg. CFC-12 refrigerant is also available in bulk at a much cheaper price. The labelling and the cylinder design indicate to the Chinese origin of the product. It is assumed that similar situation exists in other regions in Russia.

15.5.2 Aerosols

Chimprom Aerosols

66. "Chimprom Aerosols"[4] used to be a fully integrated aerosol producer complete with formulation, filling, can and valve manufacturing, and packaging capability. The aerosol company produced mainly insecticide aerosols (85%, mainly Dichlophos), and 15% lubricants. The GEF paid $4.7 million to replace 1,212 ODP-tonnes of CFC-11/CFC-12 (1996 Consumption) with hydrocarbon aerosol propellant (HAP), with the conversion of some product lines to CO_2 propellant. The enterprise co-financing was $0.95 million. In 1996, production was 4,305,000 aerosol cans per year and projected to be 3,000,000 in 1997, both well below the installed-estimated capacity of 20m aerosols.

Figure 50: Aerosol filling line stored in plastic.

Figure 51: Connection to exterior for hydrocarbons (left) and valve filling equipment (right), both in storage under plastic. Chimprom Aerosols, Volgograd.

67. A detailed financial viability evaluation was conducted on Chimprom in March 1997. Financial projections based on a range of sales forecast and operating cost assumptions indicated that the enterprise would remain viable in the medium term under reasonable circumstances and would have the capacity to maintain its projected sub-project contribution obligations. Free cash flow was projected at $ million: 12.6; 17.0; 15.8; 16.5; in 1997, 1998, 1999 and 2000 respectively.

68. In regard to conversion to CFC-free operations, the aluminium cans produced with the existing manufacturing facilities were considered adequate for HAP and they were kept. Valves suitable for HAP would no longer be able to be produced, and instead a third party supplier of valves was proposed. The appraisal mission decided that Chimprom Aerosols

[4] Part of JSC Chimprom, a large chemical company in Volgograd. Called "Chimprom Aerosols" in this report to distinguish it from Chimprom's chemical production operations.

was eligible for funding for the maximum capacity of 20m aerosols per year. While this was in excess of current utilization, the seasonal nature of the enterprise's product sales required more than single line capacity in its primary filling operation to maintain an efficient operation.

69. In 2009, Chimprom Aerosols production was 100,000 to 200,000 aerosols per year, produced by a single round of campaign production that supplied sales for several years in advance. Three campaigns have been completed since the Project finished in 2004, and the largest one was only 300,000 cans. Chimprom Aerosols explained that when they changed to hydrocarbons they could no longer use aluminium cans and they could not afford to install machinery to produce the upper and lower part of the steel cans. They had little choice but to purchase cans from their competitor Arnest, another aerosol company which had also received GEF grant for conversion. Arnest sold the cans to Chimprom Aerosols at an unfavourable price, as it did not want to encourage competitors. This made it difficult for Chimprom to market aerosols competitively, and the low volume of their current production was not considered to be not economically viable. The facility is in storage for most of its life (Figure 50 and Figure 51), and occasionally produces a small run which is sold over several years.

70. Chimprom Aerosols had no complaints regarding the technology and equipment supplied, except that the hydrocarbon storage had to be upgraded. The number of aerosols that could be produced was over estimated, even in a buoyant market. Chimprom Aerosols appeared to be lacking strategic direction, and could have benefited from strategic marketing advice being included in the assistance package provided by the World Bank. In the risk appraisal, the World Bank indicated that the primary financial risk associated with the project related to the enterprise's long term viability. However, the Bank did not propose practical solutions to remedy the risk.

71. In the long-term, commercial viability of the Chimprom Aerosols is most likely to be in the hands of JSC Chimprom Volgograd, which faces increasing costs of production of its main products such as calcium chloride and caustic soda due to escalating energy prices.

JSC Chimprom Volgograd

72. JSC Chimprom Volgograd employs more than 2800 people and is one of the largest enterprises of the national chemical industry in the Russian Federation. It produces a wide range of inorganic and organic compounds, polymers, plasticizers, solvents and refrigerants. Funds of $6.28 million from the Special Initiative were used to phase out 5,974 tonnes of CFC-11/CFC-12 (1998 production) with the elimination of the nominal annual capacity of 24,000 tonnes and 150 tonnes of CFC-113 (1998 production) with elimination of the nominal annual capacity of 18,000 tonnes. The disused facility and sealed pipes are

Figure 52: Disused CFC production plant (left) and sealed CFC production pipe (right).

Figure 53: Exterior of Chimprom facility. Chimprom, Volgograd.

shown in Figure 52 and Figure 53.

73. JSC Chimprom Volgograd agreed that the payments from the GEF were appropriate for shutting down production. However, the discussion with stakeholders has demonstrated that in several instances the ownership of the Government was problematic. JSC Chimprom Volgograd complained that the project was not carefully considered from engineering perspective and did not take into account the mass balance existed in the technological chain, increase in waste treatment and manpower problems. Indicating that the Government concluded the deal without appropriate consultations with stakeholders involved. The imbalance in production has come as an additional operating cost to the company which has yet to be corrected.

Harmonia aerosols

74. JSC Harmonia located in Moscow, is one of the largest Russian aerosol manufacturer that develops and produces more than 100 household aerosol products (some examples shown in Figure 54). The GEF grant financed $6,185,367 and the enterprise co-financed $2,285,855 to replace 1,105 ODP-tonnes of CFCs (in 1996) with hydrocarbon propellant. Harmonia's products were generally in the middle to upper range of product quality in the domestic market.

75. At the beginning of the Project, the general trend was to replace the ODS, as to not do so would risk the replacement of national production with lower quality Russian products (Arnest, Sibar) and imports from Turkey and Italy. Harmonia had two production lines (Figure 55) and two pilot lines, a tin plate can making operation, valve manufacturing, can detail and packaging capability, and CFC propellant handling and storage infrastructure.

76. In 1996, Harmonia had a production capacity of approximately 30m cans per year using two product lines, but actual production was only 6m cans. Projected 1997 aerosol production was estimated to be 4.31m cans using 670 ODP-tonnes of CFCs. In March 1997, Harmonia was assessed as economically viable through to 2000, and would maintain a reasonable operating margin of around 14% during this period. The appraisal mission concluded that replacement of 20m cans per year of capacity was eligible for grant funding consideration, which was half of the maximum capacity and 4-5 times

Figure 54: Aerosol products. Harmonia, Moscow.

Figure 55: Production line. Harmonia, Moscow.

Figure 56: Railway wagons for delivery of hydrocarbons. Harmonia, Moscow.

annual production at that time.

77. The Project paid for extensive technological and infrastructural upgrades to the site. It replaced two filling lines with new ones, constructed new buildings so there was no production downtime, paved the road, connected water and power to the site, and purchased four railway wagons (example in Figure 56). The cans and valves produced with the existing manufacturing facilities were considered adequate for hydrocarbon propellant and were retained. The switch over to the flammable propellant requires approval of fire fighting authorities. As the site was large and in and region zoned industrial, Harmonia obtained local permission to store and work with hydrocarbons. The factory is the subject of regular scrutiny by local safety inspectors. Therefore, the safety requirements in the factory were very stringent. The necessary safety retraining of personnel was part of the routine operations.

78. Consumption of CFC propellants in 2000 was 1,120 tonnes in the last year that CFCs were used. Since 2001 the Consumption of hydrocarbon propellant increased from 211 tonnes to 732 tonnes in 2005. The decline in 2007 and 2008 was due to the competition in the marketplace. The production of CFC-based product was in the range of 8-10 m cans per year, but production with hydrocarbon propellant was about 7-9m cans per year. The decline in production was not associated with conversion to the hydrocarbon propellant but to the decline in marketing opportunities. The conversion to hydrocarbons typically result in both increases in quality control and maintenance costs, and in savings associated with use of lower quantities of less expensive propellant. The resulting overall net annual operating cost savings were estimated at $504,881.

79. Harmonia reported that the current trend is to make high-value products using new ingredients such as dimethyl ester and oxygen, but these could not be produced with the equipment provided by the Project. Therefore, Harmonia was forced to continue with the same line of products, so the product range had not been expanded as a result of the project. In 2004-2005, Harmonia felt the equipment made them competitive, but now the equipment was seen as a barrier to high-value products. Legislation in Russia under international cooperation does not allow the sale of such equipment unless all benefits are assessed and reimbursed, and taxes are imposed and paid. Harmonia wanted to sell or rent the equipment to free up funds for more modern equipment, but it could not afford to reimburse the costs and pay taxes, despite the annual operating savings gained with the GEF equipment.

15.5.3 Refrigerator production

80. In 1990s, the domestic refrigeration sector in Russia experienced tremendous transformation and rationalization. In 1993, twelve manufacturers were reported to produce 3.5m refrigerators per year. The sector's overall nominal capacity was approximately 4m per year with an estimated ODS Consumption potential of 3,780 tonnes. In 1996, was estimated that less than 1,187,000 refrigerators were manufactured, of which 834,700 were made by a JSC Stinol. By 1998, total sectoral Consumption had dropped to 457 ODP-tonnes, of which 286 ODP-tonnes of which were used by JSC Stinol. Consumption of CFCs declined, largely as a result of increasing use of non-ODS substitutes and transitional substances, and closure of a number of refrigerator producers.

81. Based on sector screening of 12 refrigerator manufacturers undertaken by the World Bank during third tranche preparation, only one manufacturer (JSC Iceberg) appeared to be potentially viable and who was interested in participating in the Project. Iceberg advised recently that the remaining enterprises were assessed as economically unviable. Some of these enterprises tried to undergo the transition to HCFC-22 as refrigerant and HCFC-141b as blowing agent without any international assistance. Currently, at least half of these

manufacturers marketed domestic refrigerators in the Russian Federation with a competitive product. Some of them exported their refrigerators to the former Soviet Union countries and to Europe.

82. Conversion of domestic refrigerator compressor manufacturers was not part of the GEF Project in Russia. By excluding compressor manufacturing plants the refrigerator manufacturing industry was put at risk, because they were forced to purchase compressors from a new network that was outside of their current suppliers. This exposed the refrigerator manufacturing companies to undue financial risk. It seemed that World Bank consultants were not aware that this category of sub-project was eligible for funding, according to the rules used by the MLF. Iceberg was fortunate in establishing links with Belarus compressor manufacturing plant that could supply ODS-free compressors at a price affordable to Iceberg.

Iceberg refrigerator production

83. JSC Iceberg, located in Smolensk, produces refrigerators (Figure 57) for the low end market to meet a renewed demand for Iceberg products because of expensive imports. The GEF paid $629,059 and Iceberg co-financed $156,166 to phase out in total 115 ODP tonnes of CFC-12 and CFC-11 replacing it with HFC-134a in the compressor and with HCFC-141b in foam blowing operations.

84. In 1998, 52,300 refrigerators were produced and production was increasing toward its nominal capacity of 213,000 refrigerators per year. The Project purchased equipment for the refrigerant that involved charging units (Figure 58), leak detectors, vacuum pumps and recovery and recycling equipment for both production and service facilities. Foam blowing equipment included two foaming dispensers along with transfer and positioning equipment and moulds. The enterprise paid for equipment installation, plant modifications, environmental approvals and engineering costs. Iceberg maintained production during conversion.

Figure 57: Refrigerator production line. Iceberg, Smolensk.

Figure 58: Gas charging equipment. Iceberg, Smolensk.

85. The interaction with the Government was limited to tax waiving on the equipment. Despite the waiver, Customs clearance took about six months causing the delay in implementation of the project. There was a customs code problem that their procurement officer could not resolve.

86. Iceberg established relations with Atlant in Belarus that also received assistance from GEF. This co-operation allowed Iceberg to increase the number of models from 3 to 12 using Atlant brand for several of them. This business opportunity was made possible exclusively because of GEF project. This increase in number of models improved the profile of the company and its financial security. The company has already expanded its production capacity to 500,000 refrigerators per year. The business plan envisages conversion to isobutane refrigerant and cyclopentane-blown foam in 2010. The management of the

company visited Germany and Italy with the next phase of modernisation in mind. The current economic crisis could affect their plans.

15.5.4 Foam

Storydetal foam producer

87. JSC TrN, located in Moscow, is a manufacturer of extruded polyethylene foam used for building insulation (Figure 59). The GEF paid $1,082,000 and Stroydetal co-financed $403,555 to replace 39 ODP-tonnes of CFC-12 with CO_2/butane as the blowing agent for the foam. In 2000, CFC-12 was in short supply, so Stroydetal used temporarily HCFC-142b and HCFC-22 mixture.

Figure 59: Extruded polyethylene foam (top left), gas detector for safety (top right) and rolls of insulating foam (bottom). Stroydetal, Moscow.

88. The World Bank assessed Stroydetal's financial viability as relatively stable, but this was determined prior to the August 1998 financial crisis in Russia. Stroydetal was dependent on the domestic construction sector, particularly state housing which had been adversely affected by the crisis. At that time, Stroydetal had a limited product range. Production capacity was low as the curing time took 20 days. The old lines had to be manually operated. Variation in temperature varied the pressure in the extruder, which then required more maintenance.

89. The Project converted two existing extrusion lines to CO_2/butane. The handling and distribution systems were upgraded, the extrusion dies replaced, and gas detection and fire protection equipment were installed. The introduction of butane necessitated a significant increase in incremental costs associated with safety-related equipment and plant modifications. The transition to the new technology was not easy. There were no training materials. The new operators relied on experienced staff to be trained.

90. The interaction with the Government was positive. In general, the company was well-received by local environmental authorities. The quality and the safety features were sufficient.

91. The equipment that came with the project gave them the confidence to buy more of the same to increase their production and to expand their product range, which added to the company value. The curing time was reduced to just 5 days, so the time for placing on the market is reduced by 75%. Suppliers supplied more raw ingredients for the foam production. Spare parts were readily available. The transition to isobutane saved operating costs as CFC-12 cost 4-times more than butane in those days. Today, butane is even cheaper at $1.50 per kg *versus* CFC-12 at $8.00 per kg. The company added more staff and the prefecture gave strong support to the Project knowing that it benefited the global environment and employment.

92. The Project created new marketing opportunities for Storydetal as the product had

improved with better process control during production. To keep up with marketing demand, the company installed another line using their own funds. The new machine was very similar but with slightly lower production capacity than the one installed in the Project. The German team installed the new equipment, and trained their staff. The downtime was quite manageable as the line installed by the Project kept going while the new line was installed.

15.6 IMPLEMENTING AGENCIES

93. In total, 36 enterprises received GEF funding, including 24 in the refrigeration servicing sector. All the companies participated in industrial conversions have discussed the choice of technology and only to certain extent business implications. Business related issues have been discussed also as part of economic viability study undertaken by the World Bank as part of its project appraisal process.

94. The role and performance of the World Bank as an implementing agency can be assessed in terms of achievement of objectives outlined in the Project. The first and paramount objective was achieved: The Russian Federation met its ODS phase out obligations under the Montreal Protocol. Unfortunately, this was not in time to prevent the Russian Federation going into non-compliance with the requirements of the Montreal Protocol. The Russian Federation reported a Consumption of 25,000 ODP-tonnes of Annex A and B substances, instead of zero by 1 June 2000 which was required in Decision X/26. With the benefit of exemptions for ODS from 2003 to 2007, the Russian Federation remained in compliance except in 2005 when Consumption of CFCs exceeded the authorised exemption.

95. Initially, the World Bank put its focus on addressing two major ODS consuming sectors in the Russian Federation: aerosol and refrigeration. Other ODS Consumption sector assumed were left to the Government responsibility. This was a deficiency in the project design that had been corrected later through broadening the scope of the Project. The creation of the PIU was appropriate since the World Bank itself is not an executing agency and strong Government institutions did exist to take the full responsibility for the implementation of the Project.

96. There was evidence that experts from “Stroydetal”, “Harmonia” and “Iceberg” were actively involved in the design of the sub-projects, as well as the selection and procurement of equipment together with international consultants. However, enterprises in the refrigeration servicing sector were not consulted in regard to the specifications and range of equipment included in standard set of servicing tools. Such an approach resulted in some instances in delivery of more expensive equipment than could be obtained locally, and with inferior quality.

97. In the refrigeration manufacturing sector, from 12 identified enterprises only one enterprise (Iceberg) appeared to pass the World Bank’s financial viability test. Eleven did not pass because of actual or perceived poor financial situation, or they failed to meet the stringent quality requirements of the financial documentation requested by the auditors. Some companies reportedly were not interested in participating in the Project. At least six of these 12 manufacturers were reported to be still manufacturing and selling domestic refrigerators in the Russian Federation suggested that the screening process was too stringent. This indicated that neither the objective of mitigating potential negative economic and social impact of the ODS phase out in the Russian Federation, nor striving to finance the most ODS to be phased out, had been fully achieved.

98. The channeling of available resources to the refrigeration servicing sector was seen by the Bank as having significant social and economic implications for the country’s food security

and to public safety, and allowed the original objective of minimizing social and economic disruption to be met. The implementation of the refrigeration servicing component, however, was not systematic and had not been accompanied by the development of a Refrigerant Management Plan. Therefore, this objective was not fully achieved.

99. The technical assistance component that provided institutional strengthening for technical support and technology transfer to participating beneficiaries assisted the Russian Federation to develop a modern regulatory framework for ODS management and control. Uncertainty still exists regarding commitment within the responsible government agencies to assume responsibility for sustainability and continuation of ODS phase-out activities in halon, MDI and refrigeration servicing sectors and transitional substances, and or even more broadly in being part of global chemical management agenda where Russia should be a major participant. The World Bank's objective in providing institutional strengthening to the Russian Federation has been only partially achieved.

15.7 IMPACT THREATS / RISKS

15.7.1 Government commitment

100. The capacity building component of the Project did not result in the creation of a sustainable Ozone Unit within MNRE. The PIU established under the project not only implemented specific investment sub-project, but also acted as the NOU providing support to the MNRE in policy development. With the closure of the Project and disbandment of PIU the continuity was lost. The MNRE has been re-organised into different configurations with various bodies at least three times in the past 15 years, but no structure dedicated to ODS issues was ever set up. Now, only one department in the MNRE is responsible for policy on environmental protection. As ODS is not listed as hazardous substance, there is no requirement to develop and implement policies and measures to control emissions. Legislation applicable to emissions control is the cornerstone of the ODS recovery and recycling programme. The lack of legislation means that environmental inspectors also have no legal basis to prevent enterprises releasing ODS. Ozone layer protection was assessed as a low environmental priority in the Russian Federation.

101. The semi-independent "Federal Environmental, Technological and Atomic Supervision Service" ("Rostekhnadzor", see Figure 47 on page 194) was established to carry out inspectorate functions. Recently, this body was fully merged with MNRE, which may impede Rostekhnadzor's ability to raise environmental transgressions. There are weak linkages between MNRE and the Russian Federal Customs Service as, for example, training on ODS detection is not carried out and there is a limited information exchange. Data on ODS imports and exports reported by FCS to MNRE are not consistent. Unless there is a concerted effort from all organisations involved in developing a comprehensive and effective border control policies and actions, there is a risk illegal trade will increase.

15.7.2 Servicing

102. The refrigeration servicing sector is another area where the Government ownership was lacking. The servicing and recovery and recycling equipment funded by GEF could not be utilized effectively without regulatory support from the Government. The stakeholders listed the following areas where urgent actions from the Government were needed:

1) Adoption of legislation banning venting of ODS refrigerants during servicing and maintenance of equipment;
2) Establishment ODS recovery and recycling centres in addition to the 24 that currently exist, in order to promote a effective network for the ODS collection;

3) Establishment of facilities to destroy ODS that can no longer be recycled;
4) Involvement of regional environmental inspectors in monitoring recovery and recycling operations;
5) Manuals on the best refrigeration servicing practice, developed centrally and distributed to training centres;
6) Training and certification programme for delivering best-practice requirements to servicing technicians;
7) Introduction of economic incentive/disincentive measures discouraging use of ODS and promoting use of non-ODS refrigerants and equipment;
8) Establishing working relationships with professional associations;
9) Disseminations of manuals on good refrigeration servicing practices;
10) Targeted awareness campaign.

103. The financing and implementation of these actions, in cooperation with other organisations and government departments, would require a political and financial commitment from MNRE to fund experts familiar with ozone-related issues in refrigeration and other sectors (see halon below). After abolishing the PIU in 2004, there were no new legislative initiatives undertaken by MNRE on ozone layer protection.

104. The Country Programme is currently out of date and does not account for unresolved issues in the halon sector, the transition to CFC-free medicines, the phase-out of CFC-113 solvent in space applications and the HCFC phase-out in the light of the 2007 adjustment. The actions proposed by the stakeholders in the refrigeration sectors require well coordinated efforts of Governmental institutions in their respective area of responsibilities.

105. Small refrigeration servicing workshops may be overtaken by larger companies that have an integrated approach toward sales, delivery, installation, warranty and after-warranty servicing of new modern refrigeration and air-conditioning equipment. There is a risk that the useful network of small servicing facilities will not survive unless high capacity recovery, recycling, and reclamation units become more widespread; ODS quantities are logged and tracked electronically to facilitate the follow up by technicians and inspectors; and customised cars and computer-based diagnostic tools are employed more widely during servicing operations.

106. The representatives of the Russian Federation are not particular active in the Montreal Protocol meetings of the Parties. There is a risk that, unless MNRE takes steps to coordinate, fund and staff the various activities on ozone layer protection, the gains so far achieved in the Russian Federation will be undermined by illegal trade, higher emissions of ODS and a reduction in the rate of transition to ODS-free technology.

107. The Special Initiative Project was not completed when the PIU was disbanded in 2004. There remains $3m in the account. The World Bank advised that this amount could be spent on urgent needs in ozone layer protection and related areas in the Russian Federation, if well established proposals were to be submitted by MNRE.

15.7.3 Halon

108. The establishment of the Halon management bank was part of the third tranche activities. The implementation of this sub-project experienced serious delays due to poor project design and eventually the sub-project failed since enterprises involved could not fulfil the World Bank's procurement criteria.

109. National experts and HTOC estimated that about 1000 tonnes of halon 2402, 1301 and 1211 were still installed in fire-fighting equipment in the Russian Federation. This installed base

created a strong demand for halon, which was met by recovered halons available locally and being imported. Russia does allow new halon installations only in critical applications and has extensive military systems that will need maintenance. There are several companies performing halon recycling, reclamation, and banking activities on a commercial basis. In addition, the military sector, Gazprom, and some other large companies have banking facilities for supporting their own needs. The HTOC reports that the bank of Halon 2402 in Russia will continue to be maintained at the level of about 880 tonnes (5,280 ODP tonnes) until 2015. The predicted losses between now and 2015 are estimated to be about 50 tonnes (300 ODP tonnes)[5].

110. There was no emphasis on halon in the Project which, in the light of action taken in all the other countries by the GEF and the high ozone-depleting nature of halon, remains an omission. It appeared that the government had not taken any significant action to put in place policies and legislation that would mandate halon that has an alternative to be decommissioned and banked. There is a risk of ozone layer damage due to emissions of halon unless there is government commitment to the development and implementation of a national Halon Management Plan (HMP). The following elements are part of a Plan: 1) Choose appropriate replacements or alternatives; 2) Identify remaining mission critical uses and quantity requirements; 3) Identify halon sources (recoverable and available for reclaiming) from non-critical use or acquisitions; 4) Survey installed capacities & establish database of halon users: 5) Identify and involve stakeholders; 5) Establish National Halon Steering Committee: 6) Open discussions with the Military, Civil Aviation, Shipping, & Airlines; 7) Plan for decommissioning of halon systems.

15.7.4 Metered-dose inhalers

111. Asthma sufferers that once used metered-dose inhalers (MDIs, also called 'puffers') with CFCs as the propellant for their lung medication have today CFC-free formulations available globally.

112. JSC "Alatyvitaminy" is a pharmaceutical company producing a range of medicines, including MDIs and medical aerosols. The GEF funded the conversion of production skin treatment aerosols from using CFC-12/CFC-11 to hydrocarbon propellant. The medical aerosol sub-project undertaken at JSC "Altaivitaminy" had experienced delays but eventually the enterprise accepted and installed modern GEF financed equipment and the sub-project was completed in 2005. This company is still producing ODS-based MDIs together with another pharmaceutical company "Moschimpharmpreparaty". The HFC-134a-based formulation was developed by these two companies and is undergoing a certification process in the Ministry of Health of the Russian Federation. The Russian Federation and the United States were the only countries in 2009 that have requested approval from the Parties to use CFCs for MDIs in 2010[6]. There are indications that Altaivitaminy and "Moschimpharmpreparaty" expect to continue the use of CFC for MDIs beyond 2011.

113. The Government has developed a management plan to phase-out MDI that is outdated. The country continues to import pharmaceutical grade CFC-12 by resorting to the Montreal Protocol's Essential Use regime. However, there is a risk that the supply of CFC propellants will not be approved by the Parties, if it is found to not comply with Decisions agreed by the Parties on Essential Uses. The Government may wish to consider the situation in the MDI sector as a matter of priority.

[5] Halon TOC Report, February 2009

[6] UNEP. Russia 212 tonnes; USA 67 tonnes.

15.7.5 Reporting

114. Historically, the Russian Federation regularly submitted data on the Consumption of ODS to the Ozone Secretariat, as required under Article 7 of the Montreal Protocol. The resources allocated through the technical assistance component and the creation of the PIU greatly facilitated the process of collection ODS Consumption and production data.

115. Currently, MNRE has been using the services of the former head of PIU as a consultant for the collection of the data and preparation of the annual reports. The Federal Customs Service has own ODS import/export database and quarterly sends information to the MNRE. The collected data varied in quality. The consultant reported that the collation and interpretation of data is difficult and could not be considered reliable in all cases.

116. Apart from the usefulness of submitting accurate data to the Parties, unless an electronic database is established and Customs Officers are trained in the proper use of ODS Harmonized Codes, there is a risk that the data will not be sufficiently accurate to promote the development of effective policies and regulations to improve ozone layer protection.

15.7.6 Illegal trade

117. Effective border security is regarded as essential to combat illegal trade that, if permitted, will undermine a country's effort to phase out ODS. In most countries, the Customs Authorities are recognised as the first line of control.

118. CFC-dependent refrigerator components were still being imported, which increased the demand for CFCs. Podolsktorgtechnika reported that repairing a domestic refrigerator by installing a CFC-12 compressor was about half of the cost of a new refrigerator in Russia. The CFC-12 compressors were available new from Belarus. The street price of CFC-12 was about $15 per kg, which provided an incentive for illegal trade. Mislabelling cylinders was the most common way to smuggle CFC refrigerant, as Customs officers were not equipped with detection equipment.

119. Training programmes have been put in place to familiarise Customs officers with the national regulations on ODS and in particularly the quota and licensing system, harmonized codes for ODS. However these programmes are not effective. There are 126 regional custom offices and 690 border checking points. None of these checking points is equipped with ODS detection equipment. The rotation of personnel is high. The Montreal Protocol permits the international trade of recycled refrigerant. However, this has created a loophole as smugglers can disguise virgin CFC-12 by labelling it as recycled. Licences issued by the Ministry of Industry and Trade do not always contain a clear indication that only recycled or reclaimed CFC-12 are permitted for imports. This situation creates another opportunity to bring virgin CFC-12 as not all customs officers are familiar with established legislation. There cases of forged licenses and mislabelling of shipments. It is estimated that about 200 tonnes of CFC-12 is illegally imported to the Russian Federation annually.

120. One of the two servicing centres that we visited demonstrated the relative ease of obtaining virgin CFCs, which indicated that they were still readily available in the Russian Federation at an affordable price compared to the cost of other refrigerants. There is a risk that unless Customs officers are trained in the Russian Federation and equipped with refrigerant identifiers to reverse this unreliable border control of ODS, illegal CFCs will continue to appear on the market in Russia.

15.8 IMPACT ON THE PHASE OUT OF OZONE-DEPLETING SUBSTANCES

121. In anticipation the needs in CFCs and Halons in post-2000 period, the Government breached the ODS phase-out benchmarks established by decision X/26 of the Parties and extended

the deadline for the complete phase-out of production and Consumption from June to December 2000 and increased production and Consumption in 1999 and 2000. Production of CFCs in 2000 was 25,535 ODP tonnes and 1,782 ODP tonnes of CFCs and halons respectively. The case was considered by the Implementation Committee and the Parties at its XII Meeting. The Russian Federation was in compliance with the Montreal Protocol each year from 1 January 2001, as its Consumption of 258 to 395 ODP-tonnes of ODS was based on quantities of ODS exempted within this range which were agreed by the Parties annually.

122. The closure of production by the Russian Federation on 20 December 2000 was noted by the Parties in Decision XIII/17 in 2001. The total production phase out achieved by the Russian Federation was believed to have reduced levels of illegal trade globally.

123. Enterprises involved in the Project became almost or exclusively ODS-free. Some have expanded their operations and increased the number of employees as a result of the Project, while others had become more financially stable through the implementation of more profitable operations. Some enterprises purchased similar equipment as that provided in the Project to further enhance productivity.

124. Typically, the conversion of the manufacturing processes to a non-ODS technology required a related change in the production equipment and working practices. Inherently, this change required personnel to adapt to the new machinery and working conditions, and training helped with the adaptation process. Introduction of new manufacturing equipment and processes, especially those dealing with flammable substitutes, required certification and permits from government and local authorities. All the enterprises successfully met all the requirements and became fully operational, and they all established national or international supply channels to obtain non-ODS substitutes and spare parts.

125. The Implementation Completion Report prepared by the World Bank gives the full account on 32 completed investment sub-projects and implementation of other components of the project in Russia. Since the project integrated several elements, ODS was phased out as a result of consorted efforts, including assistance in the development and establishing the legislative and regulatory measures.

16 TURKMENISTAN

16.1 BACKGROUND

1. Turkmenistan became independent from the Soviet Union in 1991. Immediately after independence, the country experienced several years of economic decline caused by the break-up of traditional economic ties with the Soviet Union, poor harvests and mismanagement of its energy exports. Virtually all of Turkmenistan's natural gas exports were suspended in 1997 because of payment difficulties, which was particularly damaging to the economy. By 1998, however, the economy began to recover and even accelerated when natural gas exports to Ukraine and Russia resumed in 1999 and 2000. The GDP was estimated to be 6% in 2006[1].

2. Turkmenistan acceded to the Vienna Convention and the Montreal Protocol in 1993; the London Amendment in 1994; and the Copenhagen, Montreal and Beijing Amendments in 2008. As a Party to the London Amendment, Turkmenistan's consumption of CFCs should have been zero by 1996, but instead it was reported as 29.6 ODP-tonnes. The bulk of CFC consumption in Turkmenistan was used for refrigeration, which played an important role in the nation's economy. In 1999, after a meeting with the Protocol's Implementation Committee, the Parties to the Protocol encapsulated Turkmenistan's commitment to a phase-out plan with interim benchmarks in a Decision[2] that aimed to:

    1) Not exceed imports of 22 ODP-tonnes in 1999;
    2) Implement an import/export licensing system by 1 January 2000;
    3) Ban the import of equipment using and containing ODS by 1 January 2000;
    4) Establish an effective system for monitoring and controlling ODS trade by January 2000;
    5) Complete recovery & recycling and training projects by 1 July 2001;
    6) Establish import quotas for CFCs not exceeding 22, 15, 10, 6 and 0 ODP-tonnes by 1 January each year from 1999 to 2003 respectively;
    7) Ban imports of Annex B substances by 1 January 2003;
    8) Complete the GEF project by 1 January 2003.

3. The Parties noted that in 1999 the GEF was already providing financing assistance to Turkmenistan to phase out its consumption of ODS.

16.2 INPUTS

4. The Country Programme (CP) was prepared and approved by Turkmenistan in July 1998, with the assistance of UNDP/UNEP and financial assistance from the GEF of $16,000. At that time, CFC consumption in Turkmenistan was 25.3 ODP-tonnes, instead of zero.

5. The Refrigerant Management Plan (RMP) was developed as a strategic tool to enable the

[1] IMF. The official government statistics show 21.4% growth in 2006, but these estimates are unreliable.
[2] Decision XI/25: Compliance with the Montreal Protocol by Turkmenistan.

reduction and subsequent phase out of ODS consumption for refrigeration in a coordinated, planned and cost effective way. The major elements of the RMP included appropriate and adequate training of servicing technicians in the environmentally-safe handling of refrigerants, legislation on ODS, retrofitting of existing equipment, and the recovery and recycling of ODS refrigerants. The RMP should be accompanied by a policy framework consisting of regulations of ODS imports, certification of servicing personnel and introduction of a system of economic incentives/disincentives. The RMP established an optimal time sequence that integrated all the activities.

6. In the light of the RMP, the GEF Council approved $361,120 for the ODS phase-out Project for Turkmenistan. The Government contribution was estimated to be $22,800. The Project comprised three sub-projects:

    1) A GEF budget of $115,693 for *Institutional Strengthening* that provided resources to the Ministry of Environmental Protection for strengthening the national institutional structure and monitoring the ODS phase-out activities for a period of three years.

    2) A GEF budget of $143,755 for *Training the Trainers and Refrigeration Technicians and Customs Officers* that aimed to provide training to refrigeration servicing personnel. This subproject was implemented by UNEP in cooperation with the local office of UNDP.

    3) A GEF budget of $139,772 for the implementation of the *Recovery, Recycling and Reclamation (3R) of ODS refrigerants*. This subproject was implemented by UNDP/UNOPS. The overall success of the 3R programme hinged upon the successful implementation of the two other sub-projects.

7. A representative of NOU participated during the implementation of the above sub-projects in a GEF regional project: Promoting Compliance with the Trade and Licensing Provisions of the MP in CEIT's, which was implemented by UNEP. The project rationale and objectives were to train officers in ODS monitoring and control; and in the establishment, operation and enforcement of a licensing systems to enable compliance with the Montreal Protocol trade and licensing provisions. Four regional training workshops were organized for representatives from 21 CEITs. The NOU officer from Turkmenistan participated in the workshop held in Kiev, Ukraine (December, 1999) and Baku, Azerbaijan (June 2000).

16.3 IMPACT DRIVER I: GOVERNMENT COMMITMENT

16.3.1 Institutional and legislative strengthening

8. The National Ozone Office (NOU) was established in October 1999 as a non-governmental non-profit organization under the supervision of the Ministry of Nature Protection (MNP). The NOU had direct access to the Minister of Nature Protection and communicated with other Governmental institutions via the Ministry and its departments. The Project funded the salary of the NOU staff.

9. The NOU assisted the MNP to manage the project and coordinated the implementation of the Country Programme and its Action Plan, including development of regulatory measures, reporting, organizing public awareness, and the three sub-projects. The GEF funds provided for computing and communications equipment, operating costs including telecommunications and office supplies, funding for public awareness and project support services.

10. The legislative base for ozone layer protection was adopted in 1991 in the Law "*On Nature Protection*", which contains general provisions on the regulation of the use of chemicals that deplete the ozone layer. The Law of 1996 "*On Air Protection*" provided measures to

prevent harmful impact on the ozone layer and emphasized the importance of ecological assessment.

11. In 1999, the government established an "*Inter-ministerial Commission on the implementation of the country commitments related to UN environmental conventions*"[3]. The working group on ozone was created as a part of this Commission and consisted of representatives of key national stakeholders.

12. In 2000, UNEP DTIE provided assistance to the NOU through a visit of a consultant who assisted with drafting the legislation. The legislation package was prepared and sent to the Cabinet of Ministers via the MNP. However, the proposal was halted when it was not approved by the Cabinet's legal department. A decree was approved by the President in September 2001 that required the import and export of chemicals and fertilizers to be licensed, but no specific provisions were included on ODS. On the basis of this decree, the National Company "*Turkmendokunkhimya*" (later the Ministry of Energy and Industry) became responsible for issuing licenses for the import and export of chemicals while another institution – the State Commodity and Raw Materials Exchange - was responsible for registration of contracts.

13. The number and diversity of Government institutions dealing with imported ODS created problems in reporting annual consumption. Under existing legislation, the NOU is required to collect data from four separate institutions[4]. The prime source of data on imported ODS were sourced from the Customs' log book entries. However, these entries were not always consistent with the World Customs Organisation Harmonized System Codes. Data from three other sources had been provided in incompatible formats and required time consuming work by the NOU to reconcile numerous entries. Import licenses issued by "*Turkmendokunkhimya*" were not reliable as they did not control quantities of imported bulk ODS or ODS-containing equipment. As a result of these difficulties, the NOU had problems reporting data on time to the Ozone Secretariat. Turkmenistan was listed as a country in non-compliance in reporting consumption data to the Parties at the Meetings of the Implementation Committee in July 2003 and July 2004. Given that the same legislation is still in place that requires data collection from four separate institutions, it is likely that delays in reporting official consumption data will continue.

14. In February 2005, the MNP established the ODS quota system by issuing annual import quotas. An import/export and licensing system regulated the trade of ODS in bulk and ODS-containing products.

15. In 2009, the NOU has developed a new draft of a legislative package, including a regulation on imports and exports of ODS and ODS-containing products, which indicated the government's commitment to phase out ODS. Before being sent for the consideration of the Cabinet, this package will be updated in light of recommendations of the UNEP DTIE Workshop on Legislation held in Ashgabat in March 2009.

16. The procedures for collection, verification and reporting of data on ODS consumption remain to be cumbersome and unreliable. The delay in adoption of the ODS import quota system was the major barrier in implementing the ODS phase out schedule established by the Parties in Decision XI/25.

16.3.2 Customs and border security

17. Prior to 2005, the legislation was not enforced and ODSs were imported without any

[3] Presidential decree of 1 March 1999.

[4] State Customs, "*Turkmendokunkhimya*" in 2001-2005, Ministry of Energy and Industry in 2005-2007, "*Turkmenchimia*" in 2007 -2008, State Commodity Exchange, and the State Standard Committee (SSC)

restriction. There were no cases of detained shipment or illegal trade registered during this period. Today, each imported chemical must be certified by the State Standard Committee (SSC) before entering the market. Once the documentation related to a shipment is checked by the Customs, the shipment is passed to warehouses of the local inspectorate of SSC. SSC inspectors test the content of imported cylinders and equipment using refrigerant identifiers provided by the NOU and issue a certificate. However, Customs officers at the entry points were not equipped with gas identifiers. The activities undertaken by the Customs is the result of training that was undertaken during the Project.

18. The Train-the-Trainer workshop for Customs officers and representatives of other key stakeholder agencies was delivered in July 2003 in Ashgabat. The workshop agenda included a number of presentations dealing, *inter alia*, with ozone layer depletion and the Montreal Protocol, national regulations concerning ODS, methods of identification of ODS, illegal trade in ODS, and a practical session on the identification of ODS using the refrigerant identifiers. At the end of the workshop, each participant received a certificate from the Government of Turkmenistan. ODS detection equipment was supplied to the Country to enable identification of ODS imported in bulk quantities and in equipment but not distributed to custom officers at checking points awaiting the Phase II training.

19. The participants developed a set of recommendations dealing with improvements to the legislation concerning ODS and enforcement of the ODS import/export licensing system in Turkmenistan. As monitoring and control of ODS in Turkmenistan had not been well established at that time, raising awareness of Customs officers and other stakeholders present at the workshop was very important for the future implementation of Montreal Protocol provisions in Turkmenistan.

20. Phase II of the training of Custom Officers never eventuated. The NOU was informed recently that new training facilities had been established in the Customs Headquarters and Phase II training would start in the near future.

21. There was only one instance of an ODS detained shipment reported to the evaluation team. In 2006, the surplus of 1,224 kg exceeding the 2006 quota was identified, detained and stored in the Customs warehouse. It was released one year later when it could be included in the 2007 quota.

22. It seems that some of the Customs officers in coordination with the inspectors from the SSC have been trained to detect illegal trade in ODS, and such trade has been intercepted on one occasion in 2006. However, the lack of equipment and more widespread training probably impedes a more comprehensive approach, which would be needed to ensure that ODS is not being imported illegally into Turkmenistan.

16.3.3 Awareness raising

23. The NOU disseminated information about the Montreal Protocol through mass media and TV, and organized lectures at schools and colleges, and held drawing competitions among children on the occasion of the World Environment Day. The public awareness activities were widely praised but appeared to not encourage the government to accelerate the implementation of legislation.

24. As in many other countries, Turkmenistan had undertaken activities on Awareness Raising to shore up support from the public, government and business stakeholders for legislation and activities that would restrict and eventually phase out ODS. As in other countries, a baseline and performance indicators to measure the benefits of ODS reduction were never developed. These could have been, for example, before and after data on the number of ODS-free refrigerators bought by the general public, an increase in ODS refrigerators being sent for recycling, demand for information on the website (as number of hits) on ODS-free

alternatives. It was therefore impossible to evaluate the impact of the awareness programme.

16.4 IMPACT DRIVER II: RECOVERY AND RECYCLING PROGRAMME

25. A comprehensive national recovery, recycling and reclamation programme (3R) in the refrigeration and air-conditioning was implemented as a part of the RMP. The sub-project aimed to eliminate about 7.53 tonnes of CFCs annually, and to extend the useful life-time of the refrigeration equipment without the need for CFC imports.

16.4.1 Recovery, recycling and reclamation equipment

26. In August 1999, UNOPS/UNDP delivered 31 recovery and 3 recycling machines, including auxiliary equipment (vacuum pumps, cylinders, refrigerant identifiers). The equipment arrived before the training had been started due to a delay in transfer of funds from the UNEP GEF financial manager for the training.

27. The NOU coordinated the establishment of recovery and recycle centres and organizing follow up monitoring. The equipment was distributed to four servicing companies according to their size and scale of servicing operations. The technical manuals on the recovery and recycling equipment were translated into Turkmen and Russian languages.

16.4.2 Training of technicians in refrigeration management

28. The NOU established three training centres to house the equipment provided by UNEP. Phase-I "*Train-the–Trainers*" workshop was held in May 2001 with 26 participants. Trainees were servicing technicians from the most important servicing companies, as well as professors from a polytechnic Institute and vocational schools. The syllabus covered the theoretical and practical aspects of advanced refrigeration servicing practices and technology. The technicians that attended agreed the workshop and the information were useful.

29. In Phase-II, the NOU organized the translation and dissemination of the training manual in the Turkmen and Russian languages to participants. In 2001 to 2003, 16 training workshops were organized in six cities that resulted in 366 technicians and students being trained. All participants passed the tests and obtained certificates.

30. The training program has brought the expertise and knowledge about good servicing practices and together with provided servicing tools contributed in reduction of ODS emissions and, subsequently, ODS consumption in the country.

16.4.3 Results of refrigerant recovery and recycling programme

31. A system for monitoring the quantity and quality of the CFC recycled was planned, to ensure the success of the programme. The monitoring of the recovery and recycling operations was organized by the NOU over two consecutive years. The total quantity of refrigerant recovered in 2000 and 2001 was 477 kg recovered and 249 kg recycled, which was much lower than the original target of 7,500 kg. The total amount recovered over the period of the Project was reported by UNDP to have eliminated 6.53 ODP-tonnes of ODS consumption. However, it would be difficult to assess if this had been achieved.

32. It appears that the impact of the 3R program was overestimated by UNDP. About 90% of CFC-12 is contained in commercial refrigeration equipment that is outdated and worn out. The annual leakage rate of about a third of this equipment is around 100% of its initial charge. Therefore, the potential for CFC recovery and recycling was low. In the domestic refrigeration sector, cases of a compressor burn-out are rather frequent in Turkmenistan because of voltage fluctuation. In such cases, the refrigerant is heavily contaminated with acid and usually not suitable for reclamation and reuse

16.5 IMPACT DRIVER III: ENTERPRISE SUSTAINABILITY

33. There were no enterprises that were funded by the GEF to phase out ODS in Turkmenistan.

16.6 IMPLEMENTING AGENCIES

34. The newly appointed NOU staff were faced with the challenges of keeping accounts and reporting to two international organizations: UNDP/UNEP. The establishment of the NOU was delayed by administrative errors in the UNEP training project document resulting in inaccuracies in the NOU financial record keeping. Financial record keeping by the NOU appeared to be problematic and always in need of repeated clarification. No introductory training was provided to the NOU personnel. The NOU learning curve was very steep. The situation was exacerbated by the frequent rotation in the CEIT desk in UNEP Paris office and language barriers.

35. UNDP/UNEP appeared to have not provided Turkmenistan with any additional support through remedial measures to assist the country with compliance. The Project Implementation Report in 2003 by UNDP and UNEP confirmed that the planned licensing system had not reached the final approval stage and that the import quota system was not in place. A similar report in 2004 acknowledged the potential for illegal trade. A collaborative and supportive role by UNEP DTIE and UNDP toward Turkmenistan would have assisted the NOU in their endeavour to comply with Decision XI/25 of the Parties (see paragraph 2: Benchmarks), possibly contributing toward the development of practical benchmarks in cooperation with the Implementation Committee. There were indications in the review that early actions by the Implementation Committee would have been taken very seriously by the Government, which would have promoted earlier development of the legislation important to the control and phase out of ODS.

36. There were no supervisory missions organized by UNEP DTIE to Turkmenistan from 1999 to 2004. The face-to-face meetings took place at the end of the project in April 2004 at the Workshop on Management of GEF-funded Ozone Projects. Countries with reporting problems (Turkmenistan, Tajikistan and Uzbekistan) were funded to visit DTIE's Paris offices to meet with the Fund Management Officer and UNEP DTIE staff who were dedicated to work with the region in early 2004. The Turkmenistan NOU and assistant were in attendance, and like others present, received training on procedure, and were allowed to raise any problems they were encountering. The meeting in Paris was focused mainly on management issues. The status of legislation was assessed in a brief statement as "*ODS legislation is in place all of the countries*." According to the Workshop Report, no issues were raised by UNEP DTIE in regard to the absence of the ODS import quota system, lack of reporting on consumption and potential non-compliance of Turkmenistan in meeting its benchmark targets outlined in the Action Plan approved by the Parties.

37. The implementation of the RMP presupposes a good coordination in sequencing of the delivery of individual components implemented by UNEP and UNOPS/UNDP and timing in funding, procurement and delivery of equipment. However, the UNEP training of refrigeration technicians did not precede the delivery of the equipment, which was delayed by the late transfer of funds.

16.7 IMPACT THREATS / RISKS

16.7.1 Illegal trade

38. Despite the ban on import of CFCs that has been in place for many years, CFC-12 refrigerant was available in the market in 2009 for about $5 to $7 per kg. This relatively low price suggested that the supply of CFC-12 is relatively abundant and, since recovery and recycling is very low, the most likely source is illegal imports.

39. The SSC inspectors were using the refrigerant identifiers to check the content of imported cylinders and equipment, and not the Customs Officers. The NOU established close working relationships with the State Standard Committee (SSC) and its regional inspectorates. Until recently, however, the working relationship between the SSC and the State Customs were poor, which increases the risk of illegal trade since both organizations were responsible for ODS detection at the border.

40. Due to high rotation of Customs personnel between the border patrol and other work, there were few Customs officers on duty that had been trained in Phase I of the Customs training workshop. The relative paucity of trained officers increases the risk of illegal trade in ODS. Furthermore, the ODS identifiers for Customs were stored by the NOU and had not yet been distributed to the Customs Officers. Completion of Phase II training of Customs officers and timely distribution of gas identifiers will be crucial for reducing the risk of illegal trade once the imports of CFCs and equipment containing CFCs is totally banned in 2010.

41. The CFC based equipment is still primarily available in the domestic refrigeration sector where the potential refrigerant recovery rate is intrinsically very low. The CFC-12 –based outdated and leaky commercial refrigeration equipment is located mostly in State-owned and insufficiently financed institutions. There is no incentive to pursue refrigerant containment policies and little finance to replace this out-dated equipment with new non-ODS based systems. The poor state of the economy is likely to result in a demand for CFCs from this equipment over the next 3 to 4 years, which enhances the prospects for illegal trade in CFCs.

42. A sizable portion of trained servicing technicians have emigrated. Now that Turkmenistan is classified as Article 5 (see page 220 Section 16.8: IMPACT ON THE PHASE OUT OF), the continuation of the training programme does not appear to be in the immediate agenda of the MLF and the NOU. Unlicensed servicing companies and independents are operating in the refrigeration servicing sector. In the absence of mandatory certification programme and the association of the refrigeration professionals, there is a risk of illegal use of CFCs and increased emissions to the atmosphere.

16.7.2 Government commitment

43. On the outset, it was recognized that compliance with the ODS phase-out by 2003 would require strenuous efforts by government to control imports of CFCs. Although the NOU is located in the Ministry and coordinates all the activities in relation to ODS phase-out, including implementation of UNDP/UNEP sub-projects, it is not funded from the central government budget. Instead the NOU depends on external sources of funding which have not been continuous. Periods of no external funding result in less activity than is necessary to maintain activities that protect the ozone layer, and that help to combat illegal trade. Moreover, the gains made in ozone layer protection recently are threatened by the lack of funding.

16.7.3 Collection, disposal and destruction of ODS

44. The Government and the NOU have not succeeded in meeting the promised targets on the collection and recycling of ODS. The successful implementation of 3R activities depends on well established and active legislation. Legislative support and economic incentives/disincentives on owners of CFC-based equipment owners are lacking, and cannot promote more effective recovery and recycling operations.

45. UNDP anticipated that with the legislation adopted by the Government and training in refrigerant recovery a total of 7.5 ODP-tonnes of ODS would be phased out annually. UNDP appears to have been optimistic in the initial calculation of 1kg per machine per day

with 90% of recovered ODS being recyclable. Moreover, there is a number of old commercial refrigeration units equipped with worn out open type compressors that typically release 100% of their charge annually. This level of recovery and recycling has not been achieved in other projects. The amount of contaminated ODS for destruction was negligible.

16.8 IMPACT ON THE PHASE OUT OF OZONE-DEPLETING SUBSTANCES

46. The project was completed two years later than planned in 2005, and the overall target of zero ODP consumption by 2003 was not met.

47. Figure 60 shows the ODS reduction schedule developed in the Country Programme and the actual ODS consumption reported by Turkmenistan. Turkmenistan reported CFC consumption of 58.4 ODP-tonnes in 2004, which was an increase on its reported CFC consumption for 2003 of 43.4 ODP-tonnes. The representative of Turkmenistan explained to the 35th Meeting of the Implementation Committee in December 2005 that its excess consumption of CFCs in 2003 and 2004 was due to the fact that it did not have regulatory authority to limit the import of ODS in those years. This authority was addressed in April 2005 when Turkmenistan implemented an import quota system.

48. Turkmenistan was reclassified as Article 5 country at the XVI Meeting of Parties in November 2004, taking into account that the per capita consumption of Annex A and Annex B substances of the Party was below the limits specified under Article 5 of the Montreal Protocol and the Party was classified as a low income country by the World Bank. Turkmenistan's reclassification meant that complete ODS phase-out would be required by 1 January 2010.

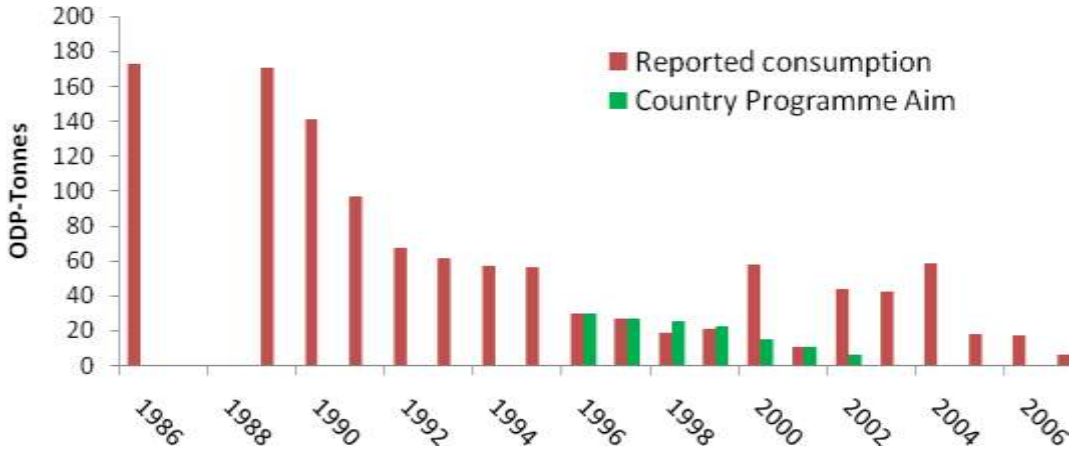

Figure 60: Planned reduction of ODS according to ODS consumption reported to the Ozone Secretariat (red) and Turkmenistan's Country Programme (green)

49. The Government updated its Country Programme and Plan of Actions and applied for assistance to the Executive Committee of the Multilateral Fund. The MLF granted funding to the NOU for the continuation of institutional strengthening, the implementation of methyl bromide phase-out project, and a national strategy for adaptation to non-CFC MDIs. The funding of the NOU is secured so far through the MLF institutional strengthening project. The continuation of the NOU support will be extremely important for the sustainability of the phase out, since there are no funds for the NOU envisaged in the Government budget. The recent observations demonstrate that Turkmenistan met the ODS 85% reduction target in 2007 reporting its CFC consumption of 5.6 ODP-tonnes, and reported zero consumption of methyl bromide.

50. The NOU assumed additional responsibilities and took initiatives to reduce methyl bromide consumption, to implement a national strategy to eliminate the use of CFCs in medical products, and to actively develop an HCFC phase-out strategy. The remaining amount of ODS which was not covered under this programme is likely to be phased out through market forces i.e., increasing prices of ODS chemicals and decreasing prices of their alternatives, as well as through legislative and/or taxation measures. The active engagement into the MLF network of regional ozone officers and support from the UNEP Compliance Assistance Programme provides the basis for a promising and positive result.

17 UKRAINE

17.1 BACKGROUND

1. Ukraine declared independence from the Soviet Union in 1991. In that year, the government liberalized most prices to combat widespread product shortages, and continued to subsidise government-owned industries and agriculture based on weak fiscal policies which pushed inflation to record levels. Following independence, the government pursued a course of privatisation, which was met with widespread public resistance. By 1999, the GDP had fallen to less than 40 percent of the 1991 level.

2. After a robust expansion beginning in 2000, Ukraine's GDP growth dropped from 7.7% in 2007 to 2.1% in 2008, and contracted 20-25% in the first quarter of 2009. Ukraine's economy remains burdened by excessive government regulation, corruption and lack of law enforcement, and while the government has taken steps against corruption and small and medium enterprises have been largely privatized, much remains to be done to restructure and privatise key state-owned industries.

3. Ukraine abounds in natural resources and industrial production capacity. Although proven onshore and offshore oil and natural gas reserves are small, Ukraine is one of the world's leading energy transit countries. Natural gas imports from Russia, Turkmenistan, Kazakhstan and Uzbekistan are delivered to Ukraine's border through a pipeline system. Ukraine owns and operates the gas pipelines on its territory that are also used to transit Russian gas to Western Europe. Ukraine's constitution forbids the sale of the gas pipeline network. The complex relationship between supplier, transporter and consumer has led to recent and widespread international tensions over the continuity of the supply of gas for energy.

4. In the 1990's, Ukraine was a significant consumer of ODS in the aerosol, refrigeration, foam and solvent industries, where ODS were used in the production of consumer and industrial products. Consumption of ODS in 1994 was 2,420 ODP-tonnes which represented a decline from 4,518 ODP-tonnes in 1991, largely due to deteriorating economic conditions. The refrigeration sector accounted for approximately 51% of this consumption, followed by the aerosol (22%), solvent (14%), and foam (13%) industries.

5. In relation to controls on ODS, Ukraine accepted the Vienna Convention in 1986 and the Montreal Protocol in 1988; ratified the London Amendment in 1997; ratified the Copenhagen Amendment in 2002; and ratified the Montreal and Beijing Amendments in 2007.

6. In 1995, after a meeting with the Protocol's Implementation Committee, the Parties to the Protocol predicted that there was a possibility of Ukraine's non-compliance with the Protocol's requirements in 1996 and recommended international assistance to enable compliance of Ukraine with the Montreal Protocol[1]. Ukraine promised to provide information to the Parties on its political commitment to the phase out of ODS. The

[1] Decision VII/19. 1995. Compliance with the Montreal Protocol by Ukraine

Committee was also interested in the linkages between Ukraine's sectoral approach for ODS phase out and the financial/institutional arrangements for implementation; the timeframe for reducing and phasing out ODS; and the measures for enforcement of the trade regulations in particular.

7. In 1998, the Committee again met with representatives of Ukraine and noted that, rather than a reduction in the consumption of CFCs from 1995 to 1996, consumption had in fact doubled[2] to 1,401 ODP-tonnes[3]. As a Party to the London Amendment, Ukraine's consumption of CFCs should have been zero. At that meeting, Ukraine committed to phase out the consumption of Annex A and B substances[4] by 1 January 2002. The Parties declined a request from Ukraine to allow CFC imports for refrigeration uses until 2010, and instead recommended that Ukraine increase its efforts to improve the recovery of existing ODS, or import recycled ODS.

8. The Committee recommended international assistance to enable compliance of Ukraine with the Montreal Protocol, and required Ukraine to submit annual reports detailing their progress in phasing out ODS for review by the Ozone Secretariat and the Implementation Committee.

17.2 INPUTS

9. Ukraine prepared (October 1995) and approved[5] (October 1996) its Country Programme for the phase out of ODS, with bilateral assistance from the Danish Government. Ukraine requested the financial assistance of the Global Environmental Facility (GEF).

10. In February 1998, the GEF Council approved the Ukraine ODS Phase-out Project with the budget of $32.84 million comprised of the grant of $23.34m and contributions from other sources that were expected of $9.50m. The Project commenced in June 1998 and ended on 31 December 2004. The Project's overall objective was to phase out of 1,464 ODP-tonnes Annex A and B substances (1996 consumption) by 1 January 2000, even though the Parties had granted an extension to 1 January 2002 in Decision X/27. A summary of the grant allocations in the Project are summarised in Table 22 and provided in detail in Table 22. There was no government co-financing which indicated a lack of government commitment to the GEF programme by Ukraine.

Table 22: GEF Grant Allocation from Initial Approval to Completion ($)

Component	Approved in June 1998	Upon completion in December 2004
Investment	20,999,476	21,457,256
Technical Assistance	1,551,000	785,216
Project Implementation Unit	676,514	938,927
Total	23,226,990	23,181,399

11. The comparison of approved and spent funds demonstrates that only about 50% of funds initially allocated for technical assistance, including strengthening of the institutional capacity of Ministry of Environment Protection (MEP) were spent. Some funds from the Technical Assistance component were utilized for the additional support of the Project Implementation Unit (PIU).

[2] Decision X/27. 1998. Compliance with the Montreal Protocol by Ukraine
[3] Ozone Secretariat Data Centre. Last updated 13 May 2009.
[4] CFCs, halon, carbon tetrachloride, methyl chloroform
[5] Cabinet of Ministers Decree 1274 of 17 October 1996

12. The Investment Component involved 8 enterprises as well as a framework sub-project covering the refrigeration servicing sector. There were two sub-projects in the consumer aerosol sector, one in the domestic refrigeration sector, four in the commercial/industrial refrigeration sector, and one enterprise in the solvent sector. There were two pilot sub-projects for the recovery and recycling of ODS refrigerant. One sub-project was cancelled within the commercial refrigeration sector (Odessaholodmash). Financial savings and transfers from underutilized technical assistance resources and a sub-project cancellation allowed an additional 5 refrigeration servicing sub-projects and a halon reclamation and recycling sub-project to be included in the Project.

Table 23: GEF Grant and co-financing of investment sub-projects in Ukraine

Company/ Subproject	Initial Cost, $			Final cost, $		
	Total	Funding Source		Total	Funding Source	
		Company	GEF		Company	GEF
Production of nonmedical aerosols						
Donetsk Chemical Plant	*3,526,480*	*655,260*	*2,871,220*	*3,595,354*	*496,198*	*3,099,156*
Pobutova Khimiya	*4,965,000*	*1,071,000*	*3,894,000*	*4,477,890*	*278,340*	*4,199,550*
Production of commercial and industrial refrigeration equipment						
Dnipro-TONNESO	*99,154*	*35,200*	*63,954*	*78,443*	*25,189*	*53,254*
Kharkivk-holodmash	*1,454,171*	*318,197*	*1,135,974*	*1,457,518*	*308,199*	*1,149,319*
Refma	*2,874,750*	*1,977,360*	*897,390*	*1,114,306*	*245,165*	*869,141*
Odesak-holodmash	*1,328,358*	*377,666*	*950,692*	-	-	-
Production of household refrigeration equipment						
Nord	*14,697,037*	*4,906,438*	*9,760,599*	*12,231,499*	*2,456,964*	*9,774,535*
Solvents						
Elektronmash	*307,010*	*172,810*	*134,200*	*300,797*	*167,081*	*133,716*
Refrigeration equipment servicing						
Dniprotekh-pobutservis	*559,223*	-	*559,223*	*533,020*	*106,250*	*426,770*
Retonnesor -gustatkyvannya	*559,224*	-	*559,224*	*422,122*	*17,395*	*404,727*
Tekhnoservis	*201,675*	*3,350*	*198,325*	*143,745*	*6,184*	*137,561*
Chernihiv Repair and Construction Co.	*167,589*	*3,140*	*164,449*	*157,108*	*5,663*	*151,445*
Dnipro-TONNESO	*43,995*	*1,460*	*42,535*	*43,367*	*2,820*	*40,547*
Elektronservis	*287,780*	*9,745*	*278,035*	*278,731*	*12,770*	*265,961*
Diana	*203,887*	*5,135*	*198,752*	*213,152*	*10,400*	*202,752*
Training course for technicians, study of the refrigeration equipment servicing sector	*143,000*		*143,000*	*137,892*	-	*137.892*
Fire protection						
Institut Spetsavto-matika	*310,900*	*17,000*	*493,900*	*442,859*	*24,573*	*418,286*
Project Total	***31,929,233***	***9,533,761***	***23,375,472***	***25,627,803***	***4,163,191***	***21,464,612***

13. The enterprises were expected to provide $9.5 million in co-finance to cover costs that included the dismantling and disposal of old equipment; laboratory and warehouse facilities; improvement or installation of new ventilation and exhaust systems; modification or installation of new electrical and water supply lines; design, engineering and development of the required technical documentation; production and testing of prototypes; testing of new product; implementation of the appropriate occupational and

fire safety measures; conducting environmental impact assessments before and after conversion; other activities such as customs clearance of imported equipment, retraining personnel. The co-finance provided by enterprises was $4.2m in the end.

14. The Technical Assistance component was intended to strengthen Ukraine's institutional capacity to manage the phase out of ODS by:

1) To strengthen country institutional capacity for management of ODS phase out within MEP's Ozone Office
2) Transferring hydrocarbon refrigerant technology to JSC "NORD" in the manufacture of domestic refrigerators;
3) Developing a halon management plan (HPM) within the national fire protection service; and
4) Organizing safety audits ore key companies and external procurement management capacity.

15. The third component supported the operation of the Project Implementation Unit (PIU) inclusive of staffing required for project supervision, procurement administration and financial management at a level of 3% of the grant. Resources for the PIU were increased, mainly to support local consultants and consulting firms employed within the MEP.

16. The Project established the following specific targets:

1) To assist eight high-ODS consuming enterprises to switch to non-ODS technologies prior the introduction of ban on ODS imports;
2) To provide assistance to two servicing companies in establishing ODS recovery, recycling and reclamation centres;
3) To provide assistance in the preparation of teaching materials and the organization of training courses for the refrigeration servicing technicians;
4) To provide technical assistance to Nord Inc. in switching to the use of refrigerants with low global warming potential (GWP) in the production of domestic refrigeration equipment;
5) To provide technical assistance to the Ukrainian Fire Safety Research Institute (under Ministry of Internal Affairs) to establish a halon information centre that would estimate the supplies and consumption of halon, review international codes and standards in this field, and develop a halon bank management programme;
6) To provide technical assistance to the PIU in conducting a safety audit at four beneficiary companies;
7) To involve international consultants and consulting firms to set up and carry out the procurements specified by the Project work plan;
8) To promote further development of the national legislative and regulatory framework aimed at meeting the ODS phase-out targets.

17. The Country Programme was updated in 2004[6] to take account of Decisions by the Parties to the Montreal Protocol that set a deadline for phasing out consumption of ODS on the basis of the regulatory framework adopted in Ukraine in the past few years.

18. In late 1996, the World Bank which was selected by the GEF as the implementing agency,

[6] Decree 256. 4 March 2004. 2004-2030 Programme for the Phase-out of the Production and Consumption of Ozone Depleting Substances in Ukraine.

began preparation of the Project, including working and financial plans. Experts from the MPE, national companies and specialized research institutions participated in these activities, together with international consulting firms such as COWI-Consult, Arthur D. Little and Price Waterhouse. The GEF Project was the largest and most complex project to be financed at that time in Ukraine. It was not simple to develop and implement. The project was slow to start as institutional infrastructure had to be created from scratch.

19. In 1996, the IBRD organised several seminars on procurement, finance and management over a two week period, as national consultants experienced in these areas were rare. The team obtained the basic knowledge from these seminars. However, civil servants that participated in these seminars were from the former Soviet Union and had little experience in finance and the market economy. Opportunities were lost because they were not able to fully absorb and use the information. The World Bank and MEP realized that specialized consultants had to be engaged. Eventually a good team of experts was established.

17.3 IMPACT DRIVER I: GOVERNMENT COMMITMENT

17.3.1 Institutional and legislative strengthening

20. The Government by its Decree of 28 December 1995 established the legal and organizational components for performing the relevant work and adopted a Regulation on an Interagency Coordinating Commission on Organization of Compliance with the Requirements of the Montreal Protocol (ICC), and designated the Ukraine Ministry of Environmental Protection Ministry as the coordinating organization. With the assistance from TA component, a number of laws and regulations were prepared and approved. The main Ukranian legislation on ODS is in Table 24.

Table 24: List of Laws and Regulations Governing the Handling of ODS in Ukraine

Date	Law Number	Description
16 October 1992	2707-XII	"On Protection of the Atmosphere." Article 16 states that "*companies, institutions, organizations and sole proprietors to cut and subsequently completely end the production and use of chemicals that have an adverse impact on the ozone layer…*"
22November 1996	545/96-VP	"On Ratification of the Amendments to the Montreal Protocol on Substances that Deplete the Ozone Layer," which ratified the London Amendment
4 March 1999	473-XIV	"On Ratification of the Agreement on the Global Environmental Facility Grant (Ozone Depleting Substance Phase Out Project) between Ukraine and the International Bank for Reconstruction and Development, which Acts as the Implementing Agency for that Facility," which approved the grant agreement between Ukraine and the IBRD;
2 November 2000	2083-III	"On Ratification of the Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer," which ratified the Copenhagen amendment
28December 1995	1062	"On Organization of Compliance with the Montreal Protocol on Substances that Deplete the Ozone Layer," which established the Inter-agency Coordinating Committee on Organization of the Compliance with the Requirements of the Montreal Protocol. This decree also adopted a decision to develop a national Programme to halt the production and use of ODS.

Date	Law Number	Description
17October 1996	1274	"On the Programme for Ending Production and Use of Ozone-Depleting Substances in Ukraine," which approved Ukraine's first Programme for ending production and use of ODS and specified priority measures aimed at Ukraine's compliance with its international obligations to protect the ozone layer.
30 March 1998	393	"On Regulation of the Import and Export of Ozone-Depleting Substances and Products Containing Them," which introduced a system for licensing the import and export of substances in Annexes A and B to the Montreal Protocol. The approval of the Ministry of Environmental Protection, a license from the Ministry of Economics and European Integration and State Customs Service were required.
18 December 2001	1703	"On the List of Goods, Export and Import of Which is Subject to Quotas and Licensing in 2002," which added substances in Annex C to the Montreal Protocol to the list of ODS, the export and import of which required licensing in 2002.
16 May 2002	624	"On Strengthening Government Regulation of Import into Ukraine and Export from Ukraine of Ozone Depleting Substances," which stated that the import / export of ODS are permitted only: a) when exempted by the Parties to the Montreal Protocol, b) They are used as feedstock or process agents, and c) in the case of transit shipment through Ukraine;
1 July 2002	870	"On Approval of the Fire Safety Assurance Programme for the Period up to the Year 2010," which adopted a comprehensive Programme for fire safety assurance in Ukraine which also specified the development and production of fire extinguishing devices based on non-depleting fire extinguishing substances.
4 March 2004	256	"On Approval of the 2004-2030 Programme for Ending the Production and Use of Ozone Depleting Substances in Ukraine," which adopted a new version of the Programme for ending the production and use of ODS in Ukraine.

21. From 1998 to 2004, the Government adopted seven decrees related to the basic regulations required to control the import & export of ODS and ODS-containing equipment, including a licensing and quota system. The most important one was the "*Regulation of the Import and Export of Ozone-Depleting Substances and Products Containing Them*"[7]. These control measures were further reinforced by later legislation on quotas of specific goods[8].

22. The ability to import ODS was restrictive and administratively burdensome. All importers of ODS were required to obtain a permit from the Inspectorate for imports. On the basis of this permit, the importer applied to the Ministry of Economy for a license allowing imports of specific commodity and the quantity, within the overall quota. The ecological inspectors checked the permit and license. Customs officers, that often worked alongside their Inspectorate colleagues, checked all the documentation including the shipment itself at the entry point. The Inspectorate with its regional offices played an important enforcement role.

[7] Decree 393. 30 March 1998

[8] Decree 1703. 18 December 2001.

23. The early adopted legislative measures were not supported by economic instruments. Taxes that dissuade ODS use were not in place in Ukraine. Furthermore, reduced taxation for non-ODS equipment did not materialize. The evaluation team was advised that the sub-project on Nord refrigerator manufacturing conversion to non-ODS technology benefited from taxation policy that promoted introduction of innovative technology in Donetsk region.

24. The major problems in the implementation of the Project occurred due to administrative barriers, which primarily include the following: i) Frequent changes in management at the Ministry, which resulted in a protracted process for appointing new officials and updating the pro-forma signing sheet for Project financial transactions; ii) The change in the status of the Inspectorate that the PIU was affiliated with, which required numerous official documents to be re-issued Project implementation; iii) The need to prepare and issue financial documents and clear them with the treasury, which greatly delayed the execution of any contract; iv) The complex and protracted procedure for processing financial documents within Ministry departments; v) The discrepancy between the World Bank procedures and rules, which were reflected in the GEF Grant Agreement, and national laws and regulations, which established rules for tenders and financial transactions with respect to international technical assistance funds.

25. There were lengthy delays obtaining customs clearance for equipment that Ukraine required for the Project. Under the GEF Grant Agreement, which Parliament ratified, this equipment should not have been subject to any taxes. But the Customs Service did not agree to this requirement, and cited the lack of relevant regulations. The problem was not resolved until the end of 2001, after the appropriate decision was made on the governmental level.

26. There is no evidence of active legislative performance of the MEP in recent years. The last legislative initiative was taken in the 2004 by the Cabinet of Ministers by adopting the updated 2004-2030 national ODS phase-out programme. There is a long list of priorities in the ODS control area that covers the adoption of a comprehensive Law on Protection of the Ozone Layer, approval of a number of new and amendments to existing regulations, and introduction of a list of administrative and technical support measures[9].

27. The PIU was disbanded after the completion of the project, and much of the capacity and knowledge built during implementation was eroded. The responsibilities on collection of ODS data, implementation of the ODS imports/exports licence system, monitoring and reporting to the Ozone Secretariat were until recently within the Inspectorate attached to the MEP. In second quarter of 2009, the Ozone Unit was established and four posts existed within the Department of Air Protection and Climate were filled. The responsibilities related to ODS issues were transferred to the newly organized branch on ozone and greenhouse gases (see also Threats/Risks section).

17.3.2 Customs and border security

28. The National Customs Authority became responsible for border control through legislation on the licensing of ODS imports and exports. The involvement of national customs authorities in ODS phase activities is considered as a corner stone by the international community and has to be incorporated in any successful national policy. The design of the GEF phase-out project had no specific component associated with financial assistance to

[9] Ukraine informed participants in the GEF workshop held in Tashkent on 8 September 2009 that in future legislation it intends to integrate ODS and greenhouse gases into common national legislation that links the requirements of the Montreal and Kyoto Protocols.

the Customs. It was the Inspectorate initiative to involve ecological inspectors and undergo joint training with customs officers on a yearly basis. The training is funded by the ecological fund.

29. There was good co-operation between the Regional Inspectorates and Customs Office. Environmental inspectors (more than 1500[10]) are present at each customs check point that check ODS imports permits and licences together with the Customs Authority.

30. The training programme covers Montreal Protocol issues, national and international legislation, and practical techniques for detecting cases of illegal trade, including the use of incorrect permits by smugglers and mixed codes of CFCs and HCFCs, to check if customs officers could detect the smuggled goods. The Inspectorate developed a questionnaire to determine if officers could understand fully the requirements of the legislation and the licensing. Publicly-available UNEP and Environmental Investigation Agency materials were used to support the training. It was not possible to obtain data on the number of custom officers present at the border checking points, number of training courses and the number of trainees. The government had discussions with the importers of equipment from China and were monitoring imports in particular from that country[10].

31. No cases of illegal trade or detained shipment of ODS were reported. However, the prospects for illegal trade appear high for a number of reasons. Customs officers were not provided with ODS detection equipment as part of the Project, which reduced their opportunity to detect illegal trade coming into 179 entry points. CFC-12 was reported in Ukraine to cost of about $15-20 per kg in 2008. It was not possible to establish the source of CFC-12 supply. The absence of cases of discovered and/or detained ODS by Customs might be interpreted as a lack of ability in detecting ODS illegal trade. No specific penalties are envisaged for illegal ODS trade. There appeared to be some demand for the CFCs as significant quantities of CFCs were reported to be installed in the large industrial refrigeration units at the steel mill owned by Mittel (India) in Krivyi Rig.

17.3.3 Public awareness

32. The PIU informed all the enterprises involved in the project about forthcoming changes. The regional inspectors raised an awareness on implications of the Montreal Protocol, using the enterprises covered by the project as a vehicle for the dissemination of information on ODS related regulations and new alternatives. There was a chain of communication and exchange of information that promoted transition to the new technology in enterprises not participated in the project. It appears that a targeted awareness raising can be a very useful tool for disseminating information on activities to protect the ozone layer beyond the entities involved in the project.

33. There was no a planned and widespread awareness campaign in Ukraine. A modest public information programme was mounted by PIU. No attempts were made to measure the effect of this information program on ODS reduction in the country. It was therefore impossible to evaluate the impact of this programme.

17.4 IMPACT DRIVER II: RECOVERY AND RECYCLING PROGRAMME

34. A comprehensive national recovery, recycling and reclamation programme (3R) in the refrigeration and air-conditioning was aimed to eliminate about 500 tonnes of CFCs annually, and to extend the useful life-time of the refrigeration equipment without the need for CFC imports. The scope of the programme included provision of equipment and

[10] Information provided by the representative of Ukraine at the GEF Impact Evaluation Workshop held in Tashkent 7-8 September 2009.

tools for field service operations, vacuuming and charging units, flushing and degreasing units to promote retrofits and delivery of portable refrigerant recovery machines, stationary recycling machines and reclaiming facilities for processing heavily contaminated refrigerant. The principle training provided was as part of the equipment supply done individually at each enterprise.

17.4.1 Recovery, recycling and reclamation equipment

35. Seven investment sub-projects on servicing in the domestic and commercial refrigeration sector were implemented covering 6 major regional servicing centres in Ukraine. The training of servicing personnel and study in the sector was also funded from the project. (See Annex **) All the enterprises were private sector successors to the old regional or major city based state-owned servicing centres. DNK Servis was the major service provider in Eastern Ukraine. The scope of DNK Servis and Kyiv Servis sub-projects covered both equipping field service operations and technicians with recovery/charging equipment and upgraded tools as well as analytical capability, and a reclaim centre. Similar equipment was provided to Diana, in Lviv which was the major service provider in Western Ukraine. The scope at the remaining conventional service providers enterprises was limited to the field operations/technician packages. The small sub-project at Dnipro-MTO involved supporting the service operation of a manufacturer of specialty refrigeration and cooling medical equipment and was essentially technician equipment.

36. Altogether, the seven enterprises received 420 technician toolkits, 260, units for field evacuation and charging of cooling systems, 343 portable recovery machines, 17 recycling machines. Three reclaiming facilities were installed equipped with analytical capability and equipment for handling the refrigerant in bulk. The servicing centres-beneficeries of the project organized the advertising in mass-media and carried out seminars in which the representatives of smaller servicing enterprises from different regions of Ukraine took part. As a result a number of servicing enterprises were selected for further development of pilot servicing sub-project. The servicing centers has concluded the agreements with all of them on the following basic provisions: 1) the participating servicing enterprises receive free of charge the portable servicing equipment and toolkits for service works. During the terms of agreements (i.e. 5 years) the ownership of the equipment remained with servicing centres. The ownership for the equipment will be transferred to the enterprises after the agreements completion; 2) servicing centres-beneficiaries were obligated to service and repair the equipment during the terms of agreements; 3) enterprises were also obligated to supply of used ODS-based refrigerants at fixed price to the three servicing centres with reclaiming facilities for its further reclaim.

37. There was a significant delay in the implementation of sub-projects in the servicing sector due to different administrative reasons. The last project was completed in 2005, three years after ODS consumption was officially terminated in Ukraine. The use of virgin CFC-12 continued in servicing enterprises covered by the project going down from 68.4 ODP tonnes in 2002 to 28.5 ODP tonnes in 2005. Based on the World Bank ICRs , the overall quantities of CFC-12 recovered and recycled by seven servicing centres are estimated to be 65 ODP tonnes in 2005.

38. The sub-projects in the servicing sector helped to spread information on changes in servicing equipment and practices. There was good co-operation between regional inspectors and technicians from enterprises in the project in checking together the equipment in servicing companies across the region. The Inspectorate monitored the use of the recovery equipment several years after the Project concluded. However, no information was made available to the evaluation team on the quantities recovered and recycled

Electroservis refrigerator servicing

39. Electroservis was one of the centres that currently services and repairs domestic refrigerators. The company received a GEF grant of $287,780 for establishing servicing and recovery/recycling. This enterprise was also designated as a training centre. Electroservis received 83 recovery machines and servicing toolkits, and one reclamation machine. Ten of these recovery machines were kept for their own use and the remaining 73 were sent to 26 small scale servicing enterprises throughout Ukraine. Electroservis also maintained and repaired the machines when necessary. The number of machines distributed to these enterprises was dependent on the volume of CFCs handled at each centre, and the number of technicians. The list and criteria were discussed with the Inspectorate.

40. Recovery machines were valued because they were portable and generated additional income to improve business profitability. It became cost effective to recover the CFCs rather than pay for expensive new refrigerant. Some companies not in the Project purchased their own recovery machines when they saw the free ones that were provided to some companies. Those that received them free paid for new ones. So the project had a positive effect in starting the 3R process and having it continue in a more widespread way.

41. The quantity of domestic appliances charged with CFC-12 refrigerant is constantly decreasing as almost 90% of end-users in the domestic refrigeration sector are equipped with non-ODS appliances. Therefore, the share of recovered HCFC-22 refrigerant especially from air-conditioning units is growing while the volume of recovered CFC-12 has diminished. Typically, each air conditioning unit is charged with about 1.5 kg of HCFC-22 compared to 200-250 g of CFC-12 in a domestic appliance. The recovered refrigerant usually has been recharging on spot to the same unit after the repair is done using the recovery machines. Therefore, the recycling and reclaiming machines have not been used very often. Electroservis was also concerned that the recovery equipment provided by the GEF Projects was approaching its end life-time, based on the additional maintenance demand of these machines, at a time when they were expected to be fully utilized to recover HCFCs.

42. The establishment of the recovery and recycling program was an effective mechanism to reduce the demand for imported CFC refrigerants. The distribution of the recovery and recycling equipment was organized through regional servicing centres strategically located throughout the territory of Ukraine.

43. Data on the quantity of recovered and recycled refrigerants were reported to have been collected regularly and reported to the PIU during the GEF project. However, the results were not available and therefore it was not possible to assess the impact of the ODS recovery programme in Ukraine.

17.4.2 Training of technicians in refrigerant management

44. In 2005, 6 technicians from two training centres were sent to St Petersburg for 2 weeks of Train-the-Trainers, with Russian instructors (selected by WB and qualified). On return they trained 150 technicians in Kiev.

45. Two training centres were established at Elektroservis (Kiev) and Dniprotekhpobutservis(DNK) (Dnipropetrovsk). The Dniprotekhpobutservis training centre used to be one of the largest in the region. It now retrains technical specialists not only from Ukraine, but also from Belarus, Moldova, the European part of the Russian Federation and Central Asian countries. These centres have qualified instructors and are equipped with modern equipment. They received GEF funding for the training and for the development of the manuals. Altogether more than 300 technicians have been trained. The training continued as part of the team work during servicing operations. Currently,

the training is paid for by technicians.

46. Since the end of the Project, the private enterprises have attempted to organize the training of technicians on the commercial basis using established training facilities. The companies advertised that they had the training facilities, but spaces were not adequately filled as there was no incentive for potential trainees. Legislation does not require qualifications so there is no incentive to undertake the training.

47. The MEP advised that it is considering restarting the training at the Academy of Ecology or Vocational Schools by adjusting their curricula. Both options are under consideration and would be used in parallel. MEP did not mentioned any time table associated with these two options.

48. The training of personnel was part of each industrial conversion sub-project. In this case, training was conducted by the equipment supplier as part of contracts on installation and commissioning. Special attention to training was attached at enterprises using flammable ODS substitutes. In these cases, training Programmes have been supervised by local safety authorities and international safety inspectors. Continuation of safety training is mandatory at enterprises using flammable substitutes.

49. The training program was necessary to introduce the best practices in the management of refrigerant resulting in reducing emissions of ODS refrigerants during servicing operations. The availability of training manuals facilitated further training both at the enterprise level and centrally at two training centres.

50. The sustainability of the training program is impaired, however, in the absence of the legislation that would mandate the qualification of servicing personnel.

17.4.3 Halon recycling and recovery

51. A halon collection, recycling and reclamation facility was established at the Spetsavtomatika Institute at Lugansk. The facility was funded by a GEF grant of $493,900 with co-finance of $17,000. Spetsavtomatika collected halon from various locations using a special truck equipped with cylinders and pump that was provided as part of the investment component. The collected halon was transported to Lugansk where the recycle system was installed. The purity was checked with the gas chromatographer. Reclaimed and purified halon was returned to user. Each end user searched for halon, and then purchased it to use it in their fire protection system.

52. For the period 2005 to 2008, the total quantity of recovered, reclaimed and reused halon was about 4,600 kg of halon 1301 and about 3,000 kg of halon 2402.

53. Users of halon in Ukraine were not actively seeking alternatives to halon. There is legislation that requires halon to be decommissioned and recovered, but it was not enforced.

17.4.4 Halon Task Force

54. The GEF also provided $275,000 of assistance to establish a halon information centre at the National Fire Safety Research Centre (NFSRC) that aimed:

    1) To estimate supply and consumption of halon in Ukraine;
    2) To review relevant international codes and standards, and
    3) To develop a concept of the Halon Management Plan (HMP).

55. The HMP was prepared by NFSRC and approved by MEP in May 2001. The major objective of the HMP was to reduce and prevent halon emissions to the maximum extent possible, to decrease gradually halon applications in fire fighting systems and to promote the introduction of halon alternatives in existing and new fire fighting systems. The aim is to

eventually eliminate all dependence on halon which is very ozone depleting. The HMP stipulated a series of administrative, legislative and other measures, including *inter alia* R&D, design and engineering, data management system, creation and management of the halon bank.

56. A Task Force was established in the NFSRC by order of the decree to implement the HMP. The Task Force included staff from the NFSRC and from the MEP, and participated in the implementation process as well, not just the planning of the phase out. A Halon Management Centre was created with 6 staff. Laptops were used for field missions around Ukraine to record halon use into a database. The data have not been updated since 2001. A computerized system was planned that would provide on-line access to data and improve data collection and information dissemination. All users could have access to the database, and they would be able to add information directly on their halon quantities. However, the computerized database is yet to be installed subject to the availability of funds.

57. The Task Force harmonized standards for development of legislation, including the codes for replacement of halon with alternatives. There are 20 standards altogether, of which 17 were finalized. National Standards were fully harmonized with international standards. About six more standards were required to be developed and finalized. The Standards were harmonized using National Norms approved by the National Standards Committee. The updated standards will be used as the blue print for replacement of halon-based systems.

58. However, the maintenance and sustainability of the system are questionable now as the resources are not sufficient. Co-financing is needed for the NFSRC to upgrade the system for the halon monitoring and dissemination of information. The most recent data on banks of Halon contained in existing installed fire fighting systems in Ukraine are shown in Table .

Table 22: Halon contained in installed fire fighting systems (tonnes) in the major sectors

Sector	Halon 2402	Halon 1301	Halon 1211	"3.5"Mixture
Oil and gas industry	40	70.7	Not used	Not used
Metallurgy, engineering	30.6	Not used	Not used	29.5
Transport, communication	11.5	0.6	3.2	Not used
Public health, culture and education institutions	6.2	Not used	Not used	Not used
Commercial banks	27.2	Not used	Not used	Not used
Military	12.3	Not used	Not used	3.5
Total (tonnes)	128.1**	71.3	3.2	33.0
ODP Multiplier	6.0	10.0	3.0	0.6
Total in ODP-tonnes	768.6	713	9.6	19.8

*"3.5" Mixture or BF-2 is composed of bromoethane and methylene bromide with estimated ODP equal to 0.6; ** Halon TOC estimated the quantity of Halon 2402 contained in fire suppression equipment equal to 182 tonnes and the current bank of Halon 2402 is estimated at 300-340 tonnes[11]

59. Currently, the total ODP value of halon contained in fire fighting systems was equal to 1,511

[11] Halon TOC Report, February 2009

ODP-tonnes. The total quantity of halon in installed systems was estimated at 2,500 ODP-tonnes in 2002. The overall reduction in halon quantities in installed systems was about 1,000 ODP-tonnes over the last six years, equivalent to about 166.6 ODP tonnes per year. It was achieved primarily through the replacement of halon-based system with non-ODS alternatives.

60. About 63% of the total halon was used in fire fighting systems installed at gas pumping stations located on the gas pipelines that supplied gas to Europe from Russia. There are 19 gas pumping stations which were installed from 1970 to 1980. So far, no halon has been replaced with a CO_2 fire-suppression system. Two other pumping stations are scheduled for halon replacement[12].

61. Lack of investment prevents earlier replacement of halon in the other 16 pumping stations. The NFSRC has estimated total cost of the replacement is about $1m[13] for each pumping station. An ecological audit would be also required at additional cost. The pumping stations are powered by natural gas. A consortium of gas buyers was reported to have offered to pay for the energy (gas driven) for the gas pumping turbines and fire suppression (halon replacement), but Ukraine feared a loss of sovereignty if this were to occur.

62. The provision of GEF funding for the establishing of the halon recovery and reclamation facility and the creation of the halon information centre was a very positive initiative. However, the expected matched efforts on the part of the Government were grossly inadequate given the quantity of halon contained in existing fire fighting systems. Over the last six years, the total halon quantity of about 1000 ODP tonnes have been reduced at the rate of about 166.6 ODP tonnes annually. The halon recovery and reclamation operations started in 2005 with the total quantity recovered and reused of about 64 ODP tonnes that represents only 6.4% of the total decommissioned halon. The Halon TOC estimated the quantity of Halon 2402 recycled in 2007 at about 7 tonnes.

17.5 IMPACT DRIVER III: ENTERPRISE SUSTAINABILITY

63. The Country Programme identified 31 enterprises, service organizations and agencies as ODS consumers. Nineteen of them submitted proposal for GEF funding, which were appraised by the World Bank. They were further evaluated by Arthur D. Little and Price Waterhouse auditing companies for their financial viability. Some companies did not pass the test because of their poor financial situation, while others failed to supply financial documents of sufficient quality to the auditors. As a result, the number of enterprises was reduced to nine.

64. Two major investment projects: Nord Domestic Refrigeration Manufacturer and Donetsk Aerosol Chemical Plant (DACP) were the most complex. The PIU designated a procurement expert providing support to these two enterprises during the whole implementation process. This measure proved to be very effective.

65. The evaluation team assessed the impact of the Project by visits to three enterprises: Electroservice (refrigeration servicing); Nord (domestic refrigerator production); and Donetsk Chemical Plant (aerosols). The results of the visit to Electroservis were reported in Section 17.4.1: Recovery, recycling and reclamation equipment.

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[12] The representative of Ukraine informed the GEF Impact Evaluation Workshop (Tashkent 7-8 September 2009) that Ukraine was provided with a credit line from European Bank for Reconstruction and Development to upgrade their gas pipeline, including the installation of halon-free fire protection equipment

[13] Eusebi Impianti (Italy) equipped with automatic fire detection and control system to be provided by SecuriPro (Switxerland), including cost of engineering and installation

17.5.1 Refrigeration sector

NORD Domestic refrigerator manufacturer

66. NORD is a core enterprise of the NORD Group that has 5,600 employees and produces refrigerators of two trademarks: NORD and OCEAN. NORD is a part of Holding Company "NORD GROUP" that consists of 27 enterprises.

67. The ODS consumption in NORD was about 500 ODP-tonnes in 1994. The total cost of the NORD sub-project was $12.2 million including $2.45 million committed by the enterprise. The GEF financed $9,774,535 for the replacement of CFC-11 blowing agent with cyclopentane in the insulation foam; and for the replacement of CFC-12 refrigerant with HFC-134a or iso-butane alternatives. The enterprise was also committed to replace the CFC-113 used for the degreasing of compressor parts with non-ODS cleaning agent.

68. The management of NORD had been actively involved in the choice of technology, bidding process, discussion of technical specifications of manufacturing equipment and selection of suppliers. The new production equipment (Figure 61) had been delivered and successfully commissioned, and non-ODS production started in 2002.

Figure 61: Foam insulation (top left), compressor assembly (top right) and finished products (bottom). NORD, Ukraine.

69. NORD attributed the success of the Project to the technical and political skills of the chairman of the Board of Directors, who was also a former vice premier of Ukraine and later Parliament deputy. In addition, the expertise of the World Bank personnel and consultants helped to make up for expertise that was lost during the implementation phase when a number of key people changed.

70. NORD reported a steady production growth of about 10% annually (Figure 62). The overall production of NORD group reached 1.2 million refrigerators in 2007. The growth in production of domestic appliances leveraged the capacity of the enterprise to expand its operations in manufacturing commercial refrigeration equipment at its affiliated company Donbass Plus.

71. The foaming lines were equipped with Cannon Afros automatic fixtures for cabinet foaming and drum units for door foaming. NORD had adapted the door machine to take on more than a single door, thereby enhancing the value of the Cannon machines. The refrigerant part was equipped with Galileo equipment. New water based cleaning line for the compressor manufacturing line was supplied by Mac Dry Sp.A., and the CFC-113 cleaning agent was completely phased out. All the necessary safety features were in place for isobutane and operational. In 2009 the plant was operating three shifts a day, in spite of the economic crisis when many similar enterprises worldwide had reduced their production.

72. The introduction of new non-ODS technology required additional work on the new

materials, compatibility, quality and reliability of products, warranty and potential liabilities. New sources of supply were established that often resulted in higher operating costs. As an example, the transition from CFC-12 to HFC-134a refrigerant required a different refrigerant and compressor supplier, compressor lubricant and supplier, and other changes.

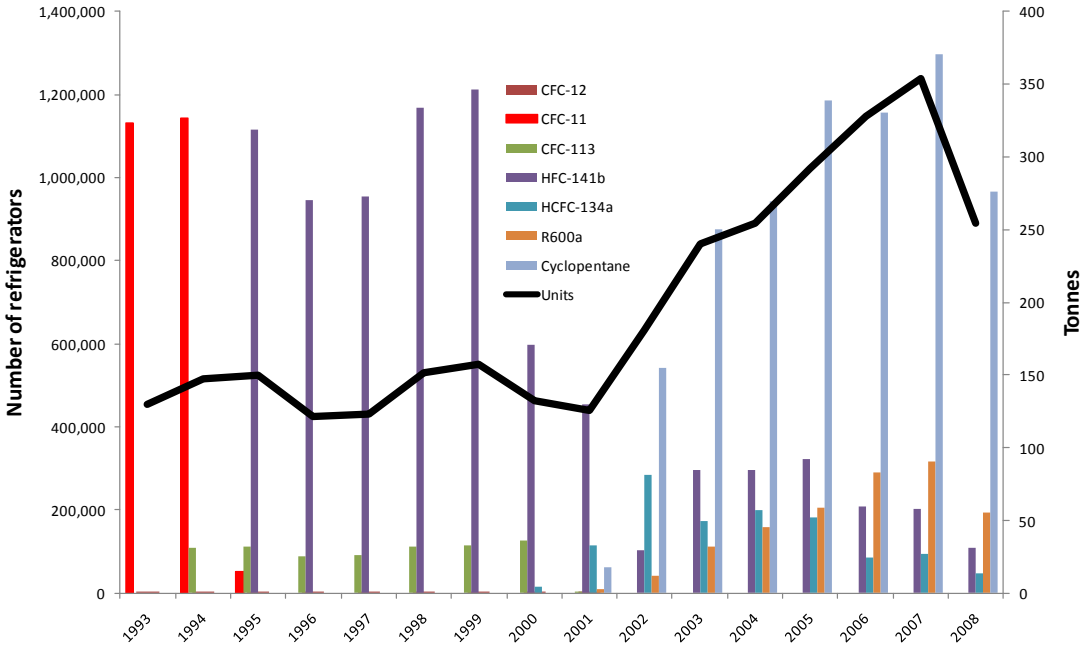

Figure 62: Replacement of ODS with non-ODS in the production of refrigerators in 2001, with a resultant 3-fold increase in production

73. The direct result of the NORD project is the phase-out of about 130 ODP tonnes of CFCs used in its manufacturing process. NORD reported that without the GEF grant "… it would have stopped its operations because of shortage of major materials and components". Furthermore, the grant facilitated NORD's accreditation to the ISO 9001, and its energy efficient refrigerators based on iso-butane qualified for the EN-153 Class A standard. NORD plans to construct a new facility in Russia in 2009 to produce 100,000 domestic refrigerators per year for the Russian market[14].

Figure 63: Unused valve assembly equipment as imported and assembled valves (top) were less expensive. Ukrainian Aerosols, Ukraine.

17.5.2 Aerosols sector

Ukranian Aerosol Company

74. Ukranian Aerosols Company (UAC since 2007, formerly Donetsk Aerosol Chemical Plant) is a manufacturer of household and automotive aerosol products. In

[14] Nord Donetsk to complete construction of refrigerator producing plant in Russia by 2009.

1998, the GEF grant of $3.1m financed the conversion of about 500 ODP-tonnes of CFC-11 and CFC-12 to HCFC-21, HCFC-22 and propane propellants, with co-financing from UAC of $0.28 million. A valve assembly machine was also provided (Figure 63), but this was never used as imports were cheaper than on-site production.

75. UAC has four lines each with a maximum capacity of 10m cans per year, in effect doubling the capacity that existed prior to the Project (Figure 64). Production is currently well below capacity because of the downturn in the market for aerosol products. UAC produced 5m cans in 2007 and 8m cans in 2008. The company expects to manufacture 21m cans in 2009 and 40m cans in 2010. An important outcome of the Project is that UAC has been negotiating a commercial deal with the Simferopol Aerosol Plant (that was also part of the Project) and together they expect to produce 40 million cans. UAC is currently working 2 shifts due to the economic crisis.

76. The use of CFC propellants ended in 2002, but the use of HCFC-21 and HCFC-22 propellants did not start until 2004. There were no operations during the intervening period while the new equipment was being installed, which resulted in other competitors entering the market. Since that time, UAC has managed to regain much of the market share that it lost during the conversion period.

77. Gaining back market share was reported to have been difficult mainly because Customs applied a reduced tax rate to cans. Their competitors declare that the imported cans cost only 10c each instead of 40c. UAC was therefore forced to compete with another local company that manufactured at a lower cost due to false import tax declarations.

78. Some modifications that were not foreseen in the sub-project will be necessary to support the increased production. UAC financed installation of a propane tank, as the small propane demand made the tank ineligible for inclusion in the original sub-project. UAC also has to modify the equipment to allow low dose applications (4% hydrocarbons of total volume) for new products, instead of 9% currently.

Figure 64: Aerosol cans (top left), valve addition (top right) and finished products (bottom). Ukrainian Aerosols, Ukraine.

79. The direct result of the UAC project is the phase-out of about 500 ODP tonnes of CFC-11 and CFC-12 aerosol propellants. The director of UAC assessed the impact of the sub-project as follows: "*Notwithstanding the deficiencies, the project was positive for the company. It would have been worse without the grant, but it is not possible to say exactly how much impact the grant had on the factory. We realise that CFC propellants would not be available. The equipment would have been at the end of its life anyway.*"

17.6 IMPLEMENTING AGENCIES

80. The start up of the PIU was not easy. Initially, there were frequent changes in the World

Bank Ukraine desk that complicated the communication between PIU and the Bank. Later, the situation stabilized and good working relationships were established. The presence of the Russian-speaking staff member in Washington DC and in Moscow office was an asset.

81. In the beginning, disbursement of Institutional Strengthening funds was delayed, which in turn delayed the start of the organizational work.

82. The seven servicing centres – beneficiaries of sub-projects in the refrigeration servicing sector were made legally responsible for 5 years for repairing the equipment. This was unpaid work that was not covered by the initial contract. The company resented that some reimbursement was not included for servicing the machines used by other companies for this 5 year period, as this was a financial burden that was not made clear at the beginning of the Project. They have agreed service the machines until the end of 2009, even though the warranty with the machines was only one year.

83. The equipment was selected by the international consultants as a result of the bidding process. The servicing companies regretted that they were not consulted in this phase.

17.7 IMPACT THREATS / RISKS

17.7.1 Illegal trade

84. As discussed in 17.3: Customs and Border Security, the prospects for illegal trade appear high for a number of reasons: 1) Customs officers were not provided with ODS detection equipment as part of the Project, which reduced their opportunity to detect illegal trade coming into 179 entry points. No cases of discovered and detained ODS by Customs were reported. 2) CFC-12 was still available on the market in Ukraine. It was not possible to establish the source of CFC-12 supply. There was also a demand for CFCs in industrial refrigeration sector.

17.7.2 Government commitment

85. Two main teams were created to ensure that the Project objectives were achieved: the World Bank working group and the PIU, which operated under the Inspectorate (part of the MEP). The overall supervisory role was provided by the World Bank staff.

86. The main tasks of the World Bank working group were to: i) Oversee the fulfilment of the Project working and financial plans; ii) Assist the PIU and companies in solving problems related to the Project execution; iii) Approve technical specifications and tender documentation; iv) Verify compliance with procedures for tenders and for approving their results; v) Carry out supervisory missions; vi) Prepare the final Project report.

87. At the beginning, the roles of the Ozone Unit established in the MEP and the PIU have not been clearly delineated. A number of Government experts were designated to the Project Implementation Unit (PIU) that became responsible for the operational management of the implementation of the Project. Once the PIU was established under the MEP Inspectorate it took over several tasks from the MEP ozone office and assumed a full responsibility of the implementation of the Project, including the duties of the financial and procurement agent. The PIU was funded by funds transferred from the IS sub-component.

88. The roles and responsibilities of the MEP (policy) and the Inspectorate (implementation) did not appear to be clearly defined and accepted by both organisations, leading to difficulties in the execution of their tasks and a risk that a range of effective activities to further protect the ozone layer are not being undertaken.

89. The MEP was assigned the role of executing agency for the Project. It also acted as the secretariat to Interagency Commission, which broadly represented government interests, and was responsible for reporting consumption to the Ozone Secretariat, for attending the

Meetings of the Parties, and for promoting the adoption of draft legislation. Although the NOU was located in the MEP, the expenditure toward strengthening its activities was only 3.5% ($28,210) of budget ($797,500), which indicated a lack of government commitment. Because the NOU was not in a strong position to implement the Project in the beginning, the PIU assumed this function when the GEF Project was ratified in March 1999 by the Ukranian Parliament.

90. The Inspectorate, which would normally be responsible for the collection of data on ODS and the enforcement of legislation, in fact saw its role as much broader. The Inspectorate regarded itself rather than MEP as being in constant contact with the stakeholders that were transitioning from ODS to ODS-free technology. It contended that the MEP was therefore not in a position to develop and promote new initiatives that would see the replacement of ODS with alternatives and to promote activities on ODS that would minimise its environmental impact. These initiatives and practical resolution of the remaining issues included the continuation of the training and certification of servicing technicians, promotion of the establishment of a refrigeration association, establishment of an active halon management system including promotion of the replacement of halon-based equipment, and the transition to non-CFC based MDIs.

91. Many of these initiatives should have been put in place when the RMP was implemented, but it was not developed and adopted as a national strategy to address the ODS phase out in the refrigeration servicing sector. The ODS phase out in the refrigeration servicing sector requires a systematic approach based on a comprehensive, multi-faceted strategy. There was no information on the effort by Ukraine to introduce incentives to promote ODS-free technology and ODS reduction activities. There were no reports provided to the evaluation team that showed the quantities of ODS recovered and reclaimed. There was no legislation in Ukraine with penalties for emissions of ODS when servicing refrigeration equipment, which is the basis for the training programmes on good practice.

92. The Government indicated that some of these issues could be addressed through the continued financial assistance from the GEF, but an agency other than the World Bank might need to be involved if funding were to continue in the future. The World Bank suspended interactions with MEP pending resolution of financial irregularities associated with the Azov-Black See Biodiversity Project.

93. A national report on the implementation of the ODS phase-out project identified priorities in further strengthening the legal and regulatory environment to harmonize national law with the requirements of the Montreal Protocol and EU standards on protection of the ozone layer. The priorities in this area cover the adoption of a comprehensive Law on Protection of the Ozone Layer, approval of a number of new and amendments to existing regulations, and introduction of a list of administrative and technical support measures. Until this legislation is implemented, there is a risk that lower standards of control will be in place for ODS, which increases the risk of damage to the ozone layer.

94. Recently, the MEP Deputy Minister was appointed as a Head of the Inter-Agency Coordination Committee on Issues Related to the Montreal Protocol. The Deputy Minister replaced the Head of the Inspectorate who occupied this post for many years. The new Branch on Ozone and Green House Gases was established in the MEP Air Protection and Environment Monitoring Department. It is staffed with four officers. The responsibilities for the collection of ODS related data, the implementation of the ODS imports/exports licence system, and monitoring & reporting to the Ozone Secretariat were transferred from the Inspectorate to the newly created Branch. It can be viewed as a positive step and intention to have an NOU in the Ministry which has largely been absent for a number of years.

95. The complex political process in Ukraine requires involvement of a political champion to push the project through the political hierarchy. The implementing agency and beneficiaries need to ensure an effective political support for their projects.

96. The economic crisis delays actions to phase out ODS which was shown, for example, in the programme to install non-ODS fire suppressing systems on gas pipelines in Ukraine. Lack of funding for environmental projects risks further damage to the ozone layer.

17.7.3 Methyl Bromide Project

97. Ukraine last produced methyl bromide in 1995, but since that time the facility has been closed. The country's remaining uses of methyl bromide were reported to have been for the treatment of grain in storage, where consumption of about 150 to 841 ODP-tonnes per year were reported from 1996 to 2000 (Table 25).

Table 25: Non-QPS and QPS methyl bromide consumption reported by Ukraine

Year	Non-QPS	QPS	Year	Non-QPS	QPS
1995	390.0		2002	0	*-14.4
1996	*-451.2	841.2	2003	0	
1997	0	189.0	2004	0	
1998	0	189.0	2005	0	
1999	0	245.4	2006	0	
2000	0	154.2	2007	0	
2001	0	*-231.3			

*Negative values indicate destruction of methyl bromide; blank cell = no report; zero = no consumption

98. The MEP believed about 100 tonnes of methyl bromide were in stock, and that actual use for grain was about 8-10 tonnes per year. The quantity of methyl bromide used for QPS and non-QPS purposes required clarification, as controlled uses of methyl bromide were phased out in developed countries on 1 January 2005.

99. Ukraine requested financial assistance from the GEF to phase-out methyl bromide and carbon tetrachloride. The project was prepared by the World Bank and the grant of $4.7 was allocated by GEF in 2005. The Project is in abeyance for the reasons provided in paragraph 90. A lack of resolution of this issue results in the continued use of methyl bromide for uses that might not be consistent with the requirements of the Montreal Protocol.

17.7.4 Halon sector

100. The Task Force was established in Ukraine to prepare the Halon Management Plan (HMP). Only a fraction of necessary activities have been implemented under the HMP. The Task Force formulated the action plan and the list of priorities that require actions on behalf of the Government. Until this Plan is implemented with subsequent legislative support, there is a risk that lower standards of control will be in place for halon, which increases the risk of damage to the ozone layer. Only a fraction (6.4%) of decommissioned halon was reclaimed and reused. This is particularly relevant since halon is the most ozone-depleting of all ODS.

17.8 IMPACT ON THE PHASE OUT OF OZONE-DEPLETING SUBSTANCES

101. The GEF Project assisted Ukraine to achieve compliance with the Montreal Protocol of zero CFCs imported by 1 January 2002, as required Decision X/27 of the Parties. Ukraine benefited from an Essential Use exemption of 144 ODP-tonnes, which was authorised by the Parties to the Montreal Protocol for the use of CFCs for medical uses. Ukraine reported consumption of 119.7 ODP-tonnes of CFCs imported in 2002, which was within the

exempted limit. Similarly, Ukraine remained within or equal to its exempted limits for its reported consumption of 77.8 (limit 120), 80.0 (limit 83.5) and 53.1 (limit 53.1) ODP-tonnes in 2003, 2004 and 2005 respectively. Zero ODP consumption for all ODS except HCFCs, for which consumption was still permitted, was reported by the Ukraine in 2006 and 2007.

102. The ODS phased out by the GEF Project was 800 – 1400 ODP-tonnes, based on reported consumption from 1997 to 2001. In relation to the facilities visited by the evaluation team, about 130 ODP-tonnes of ODS were phased out at the NORD refrigerator production facility, and further 500 ODP-tonnes of ODS were phased out at the Ukrainian Aerosols company. The servicing sector had a target of about 500 ODP-tonnes for phase out, but the amount that was phased out in practice was not reported by Ukraine.

103. The GEF funding was used for the establishing of the halon recovery and reclamation facility and the creation of the halon information centre. About 64 ODP tonnes was recovered, reclaimed and reused in existing fire fighting systems. The halon information centre developed the concept of the national halon management plan and harmonized standards for development of legislation, including the codes for replacement of halon with alternatives.

104. Ukraine remains exposed to the possibilities of illegal trade in ODS and insufficient ODS for servicing existing equipment, primarily because of insufficient transfer to non-ODS technology which would reduce the demand for ODS. The government has established unclear roles and responsibilities between government departments, and has insufficient legislation in place that would mandate key activities to protect the ozone layer.

18 UZBEKISTAN

18.1 BACKGROUND

1. Uzbekistan became independent from the Soviet Union on 1 September 1991. Since independence, the government has been committed to a gradual transition to a free market economy but has been cautious in moving to a market-based economy. It was difficult to accurately estimate economic growth after independence in Uzbekistan as government information on the economy tended to be politically motivated. More recently, Uzbekistan's GDP growth was estimated to be 9.5% in 2007 prior to the global economic downturn[15].

2. In the mid-1990s, there was a significant demand for CFCs for refrigeration and air-conditioning as a result of increased company privatisation and expanded economy activity. Uzbekistan is not a producer or exporter of ODS, and at that time relied mainly on the Russian Federation for ODS supplies.

3. The Republic of Uzbekistan acceded to the Vienna Convention and the Montreal Protocol on 18 May 1993; the London and Copenhagen Amendments on 10 June 1998; and ratified the Montreal and Beijing Amendments on 31 October 2006.

4. In order to comply with the control measure requirements of the Montreal Protocol as a developed country, Uzbekistan was required to phase out of the consumption of halon on 1 January 1994; and to phase out CFCs, methyl chloroform and carbon tetrachloride on 1 January 1996. Although the reported consumption of CFCs had been reduced by about 76% in 1993 (585 ODPP-tonnes) compared to 1989 (2,455 ODP-tonnes), reported CFC consumption in 1996 was 260.3 ODP-tonnes, instead of zero. In 1998, the Parties to the Montreal Protocol noted the following benchmark commitments[16] by Uzbekistan:

    1) To reduce consumption of CFCs by 40% by 2000, by 80% by 2001, and completely by 2002;
    2) To reduce consumption of carbon tetrachloride by 35% by 2000, by 67% by 2001, and completely by 2002;
    3) To reduce consumption of methyl chloroform by 40% in 2000, by 82% in 2001, and completely in 2002;
    4) To put in place in 1999, import quotas in order to freeze the imports at the current level and to support the phase-out schedule noted above;
    5) To put in place by 1999, bans on imports of ODS and equipment using and containing ODS;
    6) To put in place policy instruments and regulatory requirements to ensure progress in achieving the phase-out

[15] IMF as quoted in US State Department.
[16] Decision X/28: Compliance with the Montreal Protocol by Uzbekistan

5. The Parties at that meeting noted that Uzbekistan was working toward compliance by focusing on training in the refrigerant sector, and recovery and recycling of refrigerants. The Parties saw the need for Uzbekistan to address with urgency a licensing and quota system to control the import of ODS.

6. Uzbekistan believed that it would be in non-compliance until 2001, which proved to be the case as Uzbekistan reported CFC consumption in each year from 1997 until 2001. The consumption of Annex A Group 1 and Group 2 were reported by Uzbekistan to have been zero by the due date.

18.2 INPUTS

7. GEF provided financial assistance to Uzbekistan in order to assist Uzbekistan to become compliant with the requirements of the Montreal Protocol. The budget was approved on October 1998 and completed on 31 December 2004. The Institutional sub-project was the last of the sub-projects to finish when training concluded in 2007. The total budget was $3,356,194 which consisted of $3,203,364 from the GEF, $31,000 from the government of Uzbekistan and $121,830[17] (in-kind) from SINO refrigerator producer company.

Figure 65: Government ministries building, including the State Committee for Nature Protection. Tashkent, Uzbekistan.

8. The Ministry of Foreign Economic Relations (MFER) was responsible for developing and concluding contractual agreements in this Project. The State Committee for Nature Protection (SCNP), within the Department of the Atmosphere and Air Protection (DAAP), was responsible for preparing and implementing the sub-projects, as well as monitoring and reporting on their progress. A National Ozone Unit[18] (NOU) was established within SCNP in March 2001, almost 2 years after the sub-projects had started. The SCNP interacted with a range of Ministries in the course of its work on the phase out of ODS, the most important being the State Customs Committee, MFER, the Ministry of Justice, the Ministry of Finance and the Cabinet of Ministers. The government ministries were housed in an environmental area near the centre of Tashkent (Figure 65).

9. The Project aimed to phase out 142 ODP-tonnes of ODS in the refrigeration sector by:

   1) Establishing a network of refrigerant recovery, recycling ("3R") and reclamation operations that would provide sufficient CFCs to service existing equipment; delivering training course in the best practices of refrigerant management to minimise emissions of CFCs in the stationary air conditioning;
   2) Eliminating the use of CFCs in the production of domestic refrigerators; and

[17] For certification and training of personnel

[18] Called in Uzbekistan an "Ozone Office", but in this report NOU to allow comparison with other country reports

3) Strengthening the government institutional capacity to coordinate and manage the phase out of ODS, including providing training to Customs officers to improve the monitoring and control of ODS.

10. The incremental costs for each component are shown in Table 26.

11. The 3R and training sub-projects were expected to phase out 75% of the targeted CFCs; and the sub-project on domestic refrigerator production 25% of the targeted CFCs. The remaining CFC consumption (about 118 ODP-tonnes in 1996) would be phased out without GEF financial assistance as a result of the introduction of cost-effective alternatives and the implementation of legislative measures. UNDP/UNEP were the Implementing Agencies for the investment and technical assistance sub-projects respectively.

12. Uzbekistan was also a member of a group of seven CEIT countries that participated in a Project[19] to phase out all non-exempt uses of methyl bromide. The project commenced in March 2005 and concluded in July 2008. The GEF allocated $5 million to phase out 167 ODP-tonnes of methyl bromide. The countries provided a further $2,245,329 in co-finance. Uzbekistan participated in one workshop in this project.

13. The NOU was funded from several sources: the State budget, a fee for issuing licences for ODS import/export and export of products containing ODS, and from international sources such as the GEF/UNEP funds for institutional strengthening. There were two delays in funding the Institutional Strengthening work of the NOU, during which time the staff worked on the programme without salary (see Section on Implementing Agencies in this Chapter for further details).

14. There are currently 5.8 FTEs[20] within the NOU that work on ozone layer protection. The FTE number could increase depending on grants and other projects[21]. The Coordinator was also involved in other duties that were not related to ozone layer protection within DAAP. Staff from DAAP also worked part time on ozone-related issues. The chair of the SCNP reported to the Parliament.

15. The SCNP had inspection staff in regional offices in 14 parts of Uzbekistan, which *inter alia* informed the NOU of the number of ODS licences issued, issued certificates of compliance for enterprises that made products that contained ODS, received payments for ODS taxes, and oversaw the construction of new buildings to ensure ODS-free materials and equipment were being used wherever possible.

[19] GEF 2118 involving, Azerbaijan, Bulgaria, Hungary, Latvia, Lithuania, Poland and Uzbekistan

[20] Full Time Equivalents

[21] Expected to increase to 10 FTEs for the upcoming HCFC work. The maximum in the past was 13 FTEs.

Table 26: Incremental costs paid by the GEF for each project

Sub-Project/Enterprise	Sector	Description	I.A.	ODP-tonnes per year	Incremental Investment Costs ($)	Incremental Operating Costs ($)	Total Project Costs ($)	Enterprise or Gov. Financing ($)	Proposed GEF Financing ($)
SINO	RAC	Phase-out of CFCs in the production of domestic refrigerators	UNDP	35.00	1,515,536	121,830	1,637,366	121,830	1,515,536
Refrigerant Management Plan	RAC	Refrigerant recovery and recycling – demonstration of equipment	UNDP	91.48	1,327,980	NA	1,327,980	0.00	1,327,980
Refrigerant Management Plan	Technical Assistance	Training of trainers for use of ODS-free refrigerants in maintenance and service	UNEP	15.5	134,244	NA	134,244	0.00	134,244
State Committee for Nature Protection	Technical Assistance	Institutional Strengthening and Capacity Building	UNEP	NA	256,604	NA	256,604	31,000	225,604
TOTAL				**141.98**	**3,234,364**	**NA**	**3,356,194**	**152,830**	**3,203,364**

RAC = Refrigeration and air conditioning

18.3 IMPACT DRIVER I: GOVERNMENT COMMITMENT

Institutional and legislative strengthening

16. The NOU drafted and implemented a range of legislative measures on ozone layer protection, which are summarised in Table 27. This legislation on ODS included:

- An import/export licensing system;
- A ban on the import of halons (except for essential uses) and fully halogenated CFCs;
- The introduction of import quotas for CFCs, carbon tetrachloride and methyl chloroform;
- A ban on the import of refrigeration and air conditioning equipment containing CFCs;
- Legislation that targeted customs control of ODS;
- A tax on ODS because of its polluting properties and the need for waste disposal, which defined payments for ODS import and products containing ODS;
- Obligatory certification of some goods including domestic and commercial refrigerators, air conditioners and heat pumps to improve the operations of Customs;
- Amendments to previous legislation that improved the implementation of existing regulations applicable to the import/export of new, used, recycled ODS and ODS-containing products;
- Qualification requirements;
- Import quotas for HCFCs from 2005 to 2030;
- Mandatory importer reports to SCNP on the quantity of ODS imported; and
- Better definition of procedures for issuing permits for the import/export of ODS within the established quotas, and the export of products containing ODS.

17. In order to monitor the use of ODS by companies, they were required by legislation to submit a form annually to the Regional Inspectorates on the type and quantity of ODS used annually and the amount they had stored. The NOU maintained a database on the quantity and type of ODS installed by these companies. Environmental Inspectors from the SCNP inspected companies, verified the reports received and followed up on cases of non-compliance.

Table 27: Legislation adopted in Uzbekistan on ozone-depleting substances

Date	Number	Description
27 December 1996	The Law	"*About protection of atmosphere air*" of the Republic of Uzbekistan
24 January 2000	Decision No 20	"*About measure on international obligations Implementation of the Republic of Uzbekistan on agreements of Protection of the Ozone Layer*"
14 March 2000	Decision No 90	"*On Regulation of import and export of ODS and products containing them*"
1 May 2003	Resolution No	"*On the improvement of the system of*

Date	Number	Description
	199	*payments for Pollution of the Natural Environment and Waste Disposal on the territory of Uzbekistan*"
6 July 2004	Resolution No 318	On further actions for simplification of the products certification procedure
11 November 2005	Decision No 247	"*On the improvement of regulation of the import into the Republic of Uzbekistan and the Republic of Uzbekistan from the export of ODS and products containing them*"
18 January 2006	The order State Committee for Nature Protection No 4	About the organization of work in the State Committee for Nature Protection of Republic of Uzbekistan on the implementation of Resolutions of the Cabinet of Ministers of the Republic of Uzbekistan dated 11 November 2005 № 247

18. Legislation implemented in 2005 provided quotas to restrict the import of HCFCs, which are now recognised as too restrictive given the 48% increase in 2007 (compared to 2006) for permits for refrigeration and air-conditioning equipment that depends on HCFCs. To overcome this problem, the NOU planned to import and stockpile about 350 tonnes of HCFCs[1]. Uzbekistan would remain compliant with the requirements of the Montreal Protocol if this amount of HCFCs were to be imported prior to 1 January 2015, but its 2005 legislation would need to be amended to permit these additional imports. Uzbekistan's legislation would also need to be amended to take into account the changes to the control schedule affecting HCFCs that were agreed by the Parties to the Montreal Protocol in 2007.

Customs and border security

19. The NOU has established a range of activities with the SCNP and State Customs Committee (SCC) to combat illegal trade. The sub-project Training Programme for Customs Officers started on December 2001 and concluded in October 2007. In the first phase which took place in August 2002, 17 customs officers and 13 employers of other ministries and committees were trained as trainers. In the second phase in September and October 2007, 291 customs officers and 30 SNCP inspectors were trained in 10 courses each of 2-days.

20. The 2-day programme familiarized the officers with the issues and activities to combat illegal trade, including a description of the Montreal Protocol and ODS, the Refrigerant Management Plan, licensing system, HS codes for refrigerants, customs regulations, and methods for smuggling ODS. Officers learnt how to examine ODS safely, and how to identify types of refrigerants using the identifiers. At the end of the course the officers sat an examination. Basic manuals included "*Training Manuals for Customs Officers*" and "*Manual for controlling the import and export of ODS and products containing ODS*".

21. Uzbekistan hosted a Green Customs Initiative in Tashkent from 14-17 February 2006. The meeting resolved to have greater regional cooperation to combat illegal trade by electronic data exchange of electronic licences, procedures to exchange information on export and

[1] Uzbekistan was reported to have stockpiled CFCs in the early 1990s for ongoing servicing needs in the late 1990s.

import consignments between countries, and to establish joint training sessions for customs officers. Since the end of the Project, some Customs Officers also attended a training course in Thailand in 2008 to continue to improve skills in ODS detection.

22. In Uzbekistan, there are 14 regions and about 4000[2] customs officers. The SCC received 19 Refrigerant Identifier Machines (RIMs) in August 2003. Fifteen were deployed to officers at the border, 2 were kept in laboratories and 2 were kept in the teaching venues. The Customs reported that they were generally satisfied with the operations of the RIMs. The officers use standard samples of HCFC-22 which have been checked with 99% purity to calibrate the RIMs. Certificates of accuracy have not been requested in court cases, but these could be provided if requested.

23. Customs checks the labelling of the cylinders and the documentation. If they suspect that these are not in order, the refrigerant is tested using the RIM. The Customs also look for behavioural cues in the truck drivers e.g. nervousness. There is a check to make sure that drivers have not deviated from their intended destination for the ODS delivery. The small fine for smuggling in Uzbekistan is apparently compensated for by the 'additional scrutiny and administrative delay' that drivers must face when returning for a subsequent customs check.

Awareness raising

24. During the three-year period from March 2001 until December 2003, a range of activities were carried out by the NOU to build and maintain public support for legislation and policies on ozone layer protection. There were formal meetings 3-4 times per year with regional offices to discuss NOU issues and specific topics e.g., licensing. The public was informed of the danger of high UV for health and environment when ODS is used, and the actions that are needed to replace ODS with substitutes.

25. The NOU: Published 25 articles in the mass media; Participated in 15 radio and 18 TV shows; Delivered 41 lectures attended by 1,055 people of different age; Printed and distributed almost 14,000 calendars in multiple languages; Published and distributed 4,400 books for children "Our ozone umbrella"; Designed and printed a postage stamp; Staged an ecological play for children "Rustik – the alien"; Carried out at the beginning of June annual ecological festival "Chimgan-Eco", which attracted 1100 participants; Arranged on a discussion on the International day of the ozone layer protection; and Distributed 6 bulletins and printed a special publication "Let's save the ozone layer".

26. As in many other countries, Uzbekistan had undertaken extensive activities on Awareness Raising to shore up support from the public, government and business stakeholders for legislation and activities that would restrict and eventually phase out ODS. The public was continuously informed of the possible negative effects for human health and the environment. There was a special focus on making children more aware of the ozone layer problem: 4000 books called "Our Ozone Umbrella" were published in three languages and distributed; a screenplay called "Rustik – the Alien" was written and staged. Various PR materials related to the ozone layer protection, such as calendars, posters, and postage stamps, were produced and distributed. The State TV and Radio Committee broadcast the "Ozzy Ozone" in the Uzbek and Russian languages. The brochure "Ozone layer" was published and circulated in the Uzbek and Russian languages in 2007. In total, 78 articles were published and there were 75 radio and television broadcasts.

27. As in other countries, a baseline and performance indicators to measure the benefits of ODS reduction were never developed. These could have been, for example, before and after

[2] The precise number of officers is confidential.

data on the number of ODS-free refrigerators bought by the general public, an increase in ODS refrigerators being sent for recycling, demand for information on the website (as number of hits) on ODS-free alternatives. It was therefore impossible to evaluate the impact of this extensive awareness programme.

18.4 IMPACT DRIVER II: RECOVERY AND RECYCLING PROGRAMME

28. This programme aimed to recover, recycle and reclaim as much refrigerant as possible during the transition period between CFCs and CFC-free technology, at a time when imports of CFCs were banned. Therefore the only available CFC refrigerant to service existing equipment was obtained from the CFCs in the market that were recovered, recycled and reclaimed. This programme consisted of two parts:

- Training of technicians in refrigeration management; and
- Recovery, recycling and reclamation equipment.

18.4.1 Training of technicians in refrigerant management

29. The government aimed to have all personnel operating in this sector certified, and all enterprises to be licensed. Some of the ODS legislation targets technicians that repair, service and assemble ODS equipment. Enterprises were financially encouraged to ensure technicians were trained as ODS they recovered and reclaimed was tax-exempt.

30. The training programme began with the Train-the-Trainers programme. Twenty-six trainers were trained in April 2001. Of the 26 trained, 6 became trainers for the remainder of the Project. As a form of quality control in the teaching method and content, the first course delivered by the trainer was supervised by an experienced trainer, who provided suggestions for improvement. This uniformity of training was not addressed in other countries, and this was assessed by the evaluation team as a useful element.

31. There were 1,500 applicants for the training courses. Those that already some skills and worked in servicing centres with a significant volume of operations were given priority for training. In the period from the first training course on 23 April 2001 to the last in the sub-project on 3 December 2007[3], 853 personnel were trained by 9 trainers in 35 courses, each 5 days and held at 13 locations. This included 127 specialists from the Syrdarya refrigerating depot that were trained by specialists at the depot.

32. Technicians were recommended to renew their qualifications every 3 to 4 years, in order to remain up to date with best practice. There was no Greencard system that is used by technicians to prove to potential customers that they are qualified and registered to work with refrigerants and refrigeration equipment, which was present in some of the other CEITs. Such a system encouraged customers to hire trained rather than untrained technicians.

33. The training syllabus was judged by the evaluation team as comprehensive as it covered both theory and workshop practice: ozone layer depletion and global warming, refrigeration technology and refrigerants, thermodynamics, maintenance including leak detection and equipment, commercial and domestic refrigerators, mobile and stationary air conditioners, extracting-refining-recycling refrigerants, alternatives to ODS, and worker safety (Figure 66). Students had to pass an examination to be accredited. Guidebooks for the courses were translated into Russian[4]. TSTU added a special section to a degree course on 'refrigerants', as a result of the additional interest in Uzbekistan on refrigerant management. The training which costs about $35 is paid for by the companies that employ

[3] The sub-project started 23 April 2001; intended finish date in December 2004; actual finish in December 2007

[4] "Best practices of refrigerating equipment" and "Chillers and refrigerant management".

the technicians.

34. Despite this emphasis the government focus on the need for qualification requirements by those that service and repair refrigerators, the NOU estimated that there were still 450-500 unregistered technicians in Uzbekistan. One of the problems identified was that there was no legislative requirement to compel refrigerant technicians to be qualified. To address this omission, the SNCP has drafted legislation that required all businesses that repair, assemble or service refrigeration and air conditioning equipment to be licensed. The legislation will help to reduce the number of unlicensed technicians, but is expected to take several years to be adopted.

35. Legislation was also drafted in other areas because of deficiencies in the programme that were highlighted as a result of the training courses. For example, the NOU realised that codes of practice for refrigeration servicing and repair were not available. The NOU drafted and published legislative and regulatory norms for codes of refrigeration practice. These norms were assessed as a useful step that would encourage even better control of emissions of refrigerants than were in place originally. They also demonstrate the commitment of the government to a programme of continuous improvement in ozone layer protection.

Figure 66: Training room (top), demonstration air conditioning chiller (middle) and gas chromatograph (bottom). Tashkent State Technical University, Uzbekistan.

36. Another area that was seen by the NOU to be missing was the presence of a refrigeration Association. To address this issue, the NOU drafted the legislation to facilitate its establishment. Although the first Association of Refrigeration Technicians was established recently (based on the Tashkent State Technical University (TSTU), it had yet to be registered with the Department of Justice[5], which can take several years because of the political nature of the Association. The NOU saw the role of the Association as being particularly valuable for assisting with the delivery of the training programmes and for providing practical advice to the government on future legislation affecting refrigerants, among other activities.

37. The training was satisfactorily completed and was useful in supporting phase-out. This was a view shared also by the refrigeration service enterprises. The training courses gave

[5] Association leadership has the same standing as a politician. Association establishment can take several years.

practical guidance to technicians, which was evident to the employers when the technicians returned to work and were able to competently carry out repair and maintenance work. Based on the NOU estimate of total number of personnel that work on refrigeration and air-conditioning equipment, about 75% had received training in courses delivered during the project. However, there were no technicians trained after 2007 when the project finished.

18.4.2 Recovery, recycling and reclamation equipment

38. The 3R sub-project received 300 manual pumps, 430 TX-200 RTI recovery machines (not recycle), 12 reclamation machines and a range of other equipment[6]. The recovery equipment was dispatched to 100 companies in 13 regions. Most of the machines were sent to Tashkent, Fergana and Fergana Oblast regions as they were the most populated. The 12 reclamation units were allocated to 11 companies. Small and large enterprises as well as entrepreneurs qualified for the equipment. The distribution of the equipment to different parts of the service industry highlighted its importance in addressing socio-economic criteria important to Uzbekistan. Company financial viability was not one of the criteria for receiving equipment.

39. Equipment re-distribution by the NOU became necessary when the equipment that had been distributed was not being used, or was being used incorrectly. For example, when technicians were fired, or when the equipment was used for the wrong purpose (recovering halon), the machines were recovered and sent to another company. The NOU maintained a database on the equipment location and functionality, and found irregularities in several cases which were partially amended through actions imposed on the companies by the NOU[7].

40. Although the equipment was reliable, some service companies reported that there were insufficient filters to maintain the operations of all of the machines, while other companies reported that generally spare parts for the 3R equipment were difficult to obtain. As a result some machines were no longer used, or in some cases one machine was cannibalised to keep others operational. The NOU reported that the reclamation machines were not used heavily because of the filter required replacement every 75 hours of operation. New filters were in short supply. There was also a problem with two of the reclamation units at the largest centre because of a faulty part. Some companies commented that the 3R equipment would become increasingly valuable, given the restrictions coming up on HCFC consumption in the near future, and therefore there was a need to keep them operational as long as possible.

41. In general, the NOU was very satisfied with the continuous technical and financial support from UNDP, and in general the operational reliability of the equipment. Further comments on the value of the 3R equipment are provided by 5 servicing enterprises (see further details in this Chapter in the Section on Enterprise Sustainability). The companies were generally positive about the 3R equipment, particularly as it meant they did not have to purchase CFCs and their profits were better. Uzbekistan is one of the few countries in the survey where 3R activity continues and information is reported to the NOU. The NOU has continued to record and analyse the amount of ODS recovered.

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[6] 12 detectors; 12 vacuum pumps; 24x1000 lb cylinders; 12 leak detectors; 1350 x 30 lb cylinders; 60 x 100 lb cylinders; and a range of tools, and spare parts for the equipment

[7] For example, the Tashkent airport machine went missing and the airport reimbursed the Project for the loss. On another occasion, the equipment was sold and exported to Russia but no money could be recovered as the company was bankrupt.

18.4.3 Results of ODS recovery, recycling, reclamation and destruction

42. The companies that received the 3R equipment were obliged in the contract (not by legislation) to report on the results of the recovery, recycling and reclamation programme[8]. These reports contributed to the results shown in Figure 67, which show a change over time in the type and quantity of refrigerants recovered and recycled. CFCs (blue line) declined rapidly from 2001 to 2003 and were replaced mainly with HCFCs (red line), then M1LE and HFC-134a.

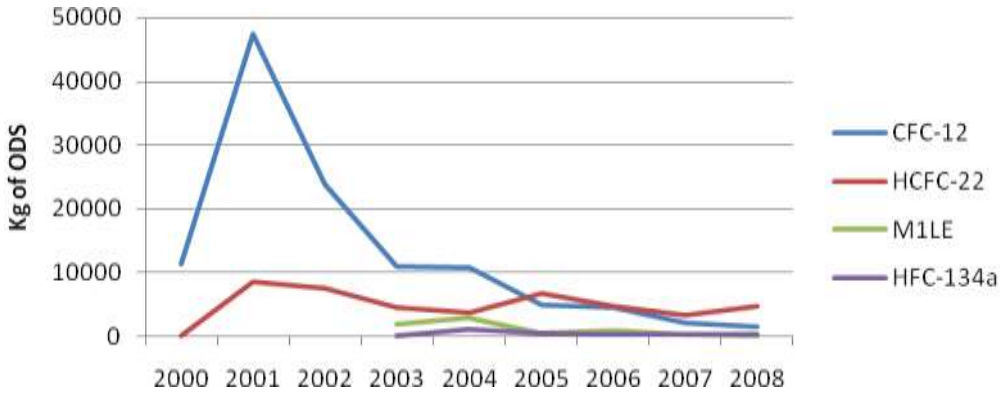

Figure 67: Quantities of CFC-12, HCFC-22, M1LE and HFC-134a recovered in Uzbekistan

43. Most (about 70%) of the total CFCs (83 tonnes) were extracted during the first 3 years of the project period from 2000 until 2002, and then the quantities recovered reduced significantly. About 117 tonnes of CFCs were extracted from 2000 to 2008, and of these about 8 tonnes were recycled (about 7%). In general, the quantities of all refrigerants recovered declined after 2003. After the sub-project concluded from 2003 to 2008, 44 tonnes of HCFCs, 7 tonnes of M1LE[9] and 2 tonnes of HFC-134a were also reported to have been extracted but not recycled.

44. The project targeted 92 tonnes per year, so the amount recovered of an average of about 15 tonnes per year was well below the target. The NOU commented that they were not particularly satisfied with the amount of CFCs that were recovered, but attributed the relatively small amount to the fact that CFCs were not as prevalent as in 1995 and 1996. This view was also shared by several of the servicing companies, who handled more CFCs in the mid-1990's than when the Project was operational.

45. In an effort to increase refrigerant recovery, however, the NOU examined the rate of recovery and recycling of ODS between the different servicing companies. They found that some companies were more efficient at recovery and recycling ODS than others, which suggested that perhaps the company average had not been considered in the formulation of the Project. As a result of the NOUs examination of the efficiency between companies, the NOU re-assigned machines from low to highly efficient companies in an endeavour to increase the amount recovered.

46. Some of this ODS was being recovered from unwanted refrigerators. Legislation adopted in 2000[10] in Uzbekistan banned the disposal of unwanted refrigerators in a landfill, and required municipalities and companies to put in place procedures to manage the

8 There is no required in the legislation requiring the RSEs to report on ODS recovered, recycled and destroyed. As a result, about 30% of the companies no longer submit reports.

9 R-22/HFC-21/R-141b as 65%/15%/20%

10 Decision No 20. 24 January 2000.

environmentally-safe recovery of ODS from the cooling circuit. Used refrigerators were sent to the metal recycling facility, after the ODS was removed from the compressor circuit but not from the foam (which contains about twice the quantity of ODS as the compressor). Failure to recover ODS from the compressors and the foam in unwanted refrigerators resulted in increased emissions of ODS when they are destroyed. It is possible that Uzbekistan will address this deficiency in the future.

47. Destruction of ODS was not a routine and practical option in Uzbekistan, and therefore contaminated ODS that could not be reclaimed was not destroyed. This was a point of contention for many companies who reported that they were running out of space to store contaminated ODS. Moreover, they were frustrated by the lack of solution to the problem.

48. To destroy a small amount of ODS, Uzbekistan used small-scale destruction equipment located at a research facility that proved to be costly, slow and impractical. Continued storage of ODS increases the prospect of significant emissions to the environment. In addition, the lack of cost-effective options for destruction undermines the value of the work by servicing companies that have made best-endeavours to recover the ODS and to prevent it being released.

49. The recovery and recycling component of the Project was achieved , despite the targeted amounts not be achieved and possibly for the reasons mentioned above. The NOU had put in considerable effort to optimise the recovery programme. Moreover, the programme is ongoing, which bodes well for the work on HCFCs coming up in the near future. The legislation mandating reporting will continue to emphasise the importance of ODS recovery and recycling to those personnel that undertake refrigerator repair and maintenance in Uzbekistan.

18.5 IMPACT DRIVER III: ENTERPRISE SUSTAINABILITY

18.5.1 Servicing

50. As the 3R equipment is about 8 years old, the current use of the ODS recovery and recycling machines was assessed as a result of discussions with 5 companies: Savdotekhnikamontazh (Tashkent); Shark Shaboda (Tashkent); Yo'L REFTRANS (Syrdarya); Kerio Servi (Samarkandt); Savodo Teknika (Samarkandt).

Savdotekhnikamontazh refrigeration service and sales

51. Savdotekhnikamontazh is the largest of the retailers in Tashkent that assembles, installs, repairs and services commercial refrigeration equipment. The company, which has been in operation since 1949, currently employs about 100 technicians. At the time of the 3R subproject, they employed over 200 technicians. Savdotekhnikamontazh received a range of equipment and tools including 106 recovery machines, 54 hand pumps and 2 reclamation units. Savdotekhnikamontazh

Figure 68: ODS reclamation equipment and storage cylinders (above), and recovery equipment (below). Shark Shaboda, Uzbekistan.

said that the tools were not particularly suitable for the work, and the hand-pumps were inefficient and not used as much as the recovery machines. Spare parts were supposed to have been supplied but they did not receive them. Obtaining spare parts from RTI (such as hoses[11], filters and pressure meters) has been impossible, so they cannibalized 16 of the recovery machines to keep the remaining 90 operational. The training of the technicians was highly valued as this improved their skills and volume of work. Training continues to take place in Spring every year.

52. Old CFC refrigerators are the main sources of CFCs, which are located in the summer houses. In the past, Savdotekhnikamontazh imported 300t of CFCs per year to service commercial refrigerators and chillers, but these have since been replaced with non-CFC equipment. The director said he had about 20t of CFCs in storage which is slowly leaking. The company regretted that there were no disposal or destruction facilities for stored ODS that was no longer required. Quarterly reports were still submitted to the NOU, even though the project finished in 2002. The most common refrigerants in order of quantity were reported to be M1LE, HCFC-22, HFC-134a (for MAC), and R404a for low temperature. Isobutane was rarely used. M1LE in 2009 was $7.60/kg, HCFC-22 $6.50/kg, and R404a $16/kg. In 2001 during the project CFC-12 was $3/kg, and the black market price in 2009 is $5/kg which is less than the price of HCFC-22 (see Section on Illegal Trade in this Chapter).

Shark Shaboda refrigeration service and sales

53. Shark Shaboda, which was established in 1968, assembles, installs, repairs and services air conditioning and commercial refrigeration equipment. They employ about 100 technicians. Shark Shaboda received a range of equipment and tools including 30 recovery machines, 10 hand pumps and 1 reclamation unit (Figure 68). All of the machines are still operational. The company has the contract to service several important buildings in Tashkent including the Senate and the Cabinet of Ministers[12]. The Senate building used to have a CFC-based chiller for air conditioning, but it has since been converted to operate on R407a. The Cabinet of Ministers building is still air conditioned by a CFC-chiller and the company is waiting for approval to convert it to HCFC-22 or 407a, as their supply of CFC-12 is down to 1,400 kg. The company reported that the 3R machines helped with the profitability of Shark Shaboda. Since the project commenced, more than 2.5t of CFC-12 and 20t of HCFC-22 has been recovered and recycled, which represents a saving to the company of about $15,000 per year for HCFC-22 alone. Shark Shaboda reported on the amounts recovered every quarter to the NOU. The number of clients increased as a result of the 3R equipment.

54. Shark Shaboda regarded the training as very important. Two employees of the company became national trainers. They deliver training courses in the company to technicians each year as a refresher course, including a surprise test of skills. Other companies are invited to Shark Shaboda's training courses. The national courses have not operated since 2007 when the sub-project was completed. There was no requirement for qualifications to be updated. The company's comments on the lack of spares and resultant operational problems were very similar to those described by Savdotekhnikamontazh. The company was concerned that the machines would not be sufficiently operational to recover HCFCs when they would be needed most in the future, as they were at the end of their life.

[11] A hose pipe costs $22-$37 to replace. Relative to a technician's salary of $100 per month, the hoses are expensive.

[12] Other buildings include the Conservatory Music School, the State Committee for Property, the Beijing Cooperation and Organisation Building, and the residence of the President. They all operate on HCFC-22.

Yo'L REFTRANS railway wagon refurbishment facility

55. Yo'L REFTRANS[13] is a large workshop facility that specializes in the refurbishment of railway wagons that are used for transporting refrigerated products (Figure 69). Previously it was the second largest such facility in the Soviet Union. The company was provided with 12 recovery machines and 1 reclaim unit. Ten years ago the enterprise employed 4,500 workers. Today, the number employed has dropped to 1,600 workers due to the difficult economic times. However, business was reported to be increasing because of a Presidential Decree to grow 50,000t more food in Uzbekistan, which in 2007 resulted in 200 wagons being used to export cherries and apricots to Russia. More than 130 of their technicians had been trained in refrigerant recovery and reclamation. Quarterly reports were provided to the NOU.

Figure 69: Refrigeration unit (above) and refrigerated railway wagon (below). Yo'L REFTRANS, Uzbekistan.

56. The company has stored about 120t of CFCs to service refrigeration units in 200 wagons. About 25% of the wagons have been retro-fitted to operate on HFC-134a or ML1R, but most still operate on CFCs. The leakage rate of the units was estimated to be about 15% per year. The life of the refrigeration equipment was expected to be 12-15y, but this has doubled as a result of regular servicing every 5000 hours of operation. Yo'L REFTRANS did not have any plans to prematurely end the use of CFCs, but the NOU was interested in pursuing options to retire their use as soon as possible because of their potential global warming and ozone depletion impact.

Kerio Servi refrigerator service

57. Kerio Servi is a small domestic refrigerator repair and service shop in Samarkandt. The shop received one recovery machine. The shop serviced about 100 fridges per year. There were 4-5 similar businesses in Samarkandt (population about 1 million). Most of the fridges that were serviced operated on CFC-12 (90%), and the remainder on HFC-134a. The shop recovered and recycled 24-30 kg of CFCs each year in 2007 and 2008. Kerio Servi reported that the equipment had helped his business to be profitable as it reduced the need to purchase CFCs.

Figure 70: CFC-12 compressor from China. Savodo Teknika, Uzbekistan

Savodo Teknika refrigerator service

58. Savodo Teknika is a small domestic refrigerator repair

[13] Since 2006, ownership is 51% state and 49% Korean.

and service shop that received 10 recovery machines and one reclamation unit. The manager was also a licensed trainer. The shop serviced about 60 fridges per year, half of them operating on HFC-134a and the remainder on CFC-12. The shop replaced faulty compressors with CFC-12 compressors that were reported to be imported from China[14] (Figure 70). Obtaining filters for the RTI units was a problem. The business had increased as a result of the 3R equipment.

18.5.2 Refrigerator production

SINO domestic refrigerator manufacturer

59. SINO is the only producer of domestic refrigerator equipment in Uzbekistan (Figure 71), employing about 450 people including 250 technicians. The company also produces deep freezers and air conditioners. It is regarded as a strategically-important state enterprise. The government is looking to reduce its 88.8% stake to about 33%. Beginning in December 1999 and ending in June 2003, the GEF financed $1,516,648 to phase out 35 ODP-tonnes of CFC-12 used in the compressor and CFC-11 used in the foam. Co-finance expenditure during and after the project was estimated by SINO to be $3m - $3.5m. The compressor was converted to operate on HFC-134a, and the foam was blown with cyclopentane. Cannon equipment was used for the foam production, and Galileo equipment for charging the circuit with HFC-134a. The equipment was delivered in December 2001.

60. The factory began operations in 1973. Prior to 1990, just 5 models of refrigerators were marketed. SINO supplied about 210,000 refrigerators per year to the Soviet Union until this market collapsed in the mid-1990s to just 28,000 refrigerators per year. The number of refrigerators and models produced from 2003 to 2008 are shown in Table 28. In many cases each model has a production run of less than 30 refrigerators.

Figure 71: Template unit for cutting out door lining (left), welding compressor circuit to compressor (right), and finished refrigerators (below). SINO, Uzbekistan.

61. SINO said that they planned to increase the output to 50,000 refrigerators in 2010, and 200,000 - 250,000 by 2012, and to export at least half of them[15]. There appears to be a business agreement with Haier (China), but this was not made clear. The market size in Uzbekistan was estimated by SINO to be 250,000 refrigerators per year. SINO is reported to have been working to 5-10% of its capacity for many years[16].

62. SINO commented that the GEF funds were essential for preventing the total collapse of the company. The company was satisfied with the Cannon and Galileo equipment and

[14] Illegal if they were imported after 1 January 2005.
[15] Mr Ravshan Rahimov, director of Tashkent branch of Sino JSC. Exhibitor at Expo.Uz, 2008
[16] The President of Uzbekistan Mr Islam Karimov. 15 April 2008

the procedures that were used to select it[17]. SINO received local government authorisation without difficulty to use and store cyclopentane. The main difficulties experienced by SINO during the project were the delay in signing the sub-project; the theft of the high pressure pipes; delays in local construction works; lack of project management personnel during key parts of the implementation phase, including changes in the chief executive[18]. The preparatory phase was delayed by 18 months, whereas installation was on time and start-up was three months ahead of schedule. Overall the sub-project took 15 months longer than planned to complete.

Table 28: The number of refrigerators and models produced from 2003 to 2008 by SINO

Year	No of refrigerators	Models	Production size per model
2003	2,513	14	10 models 30 units or less
2004	3,099	11	8 models 30 units or less
2005	723	20	12 models 30 units or less
2006	5,044	14	5 models 30 units or less
2007	10,774	18	8 models 30 units or less
2008	3,209*	13	10 models 30 units or less

* Half year results

63. The NOU commented that they had undertaken 18 visits to SINO to assist with all stages of the sub-project. Assistance from UNDP at that time, in their capacity to ensure a smooth implementation of the project, was minimal. The NOU opined that sub-project would have been much longer if their visits had not taken place.

64. SINO reported that there was a pressing need to install R600 as this was demanded by all the export markets, but there was little capital within the company to finance the conversion given the low refrigerator production volume. SINO intended to install R-600 capacity in the production facility by raising capital from increased production, and through joint-venture partnerships with another company from Korea, China or Belarus (See Implementing Agencies).

18.6 IMPLEMENTING AGENCIES

65. The actions of the Implementing Agencies have affected the operations of the NOU in a number of ways, causing severe difficulties that have been difficult to resolve. These issues concern funding for the NOU at the start of the Project, and ongoing issues related to funding for institutional strengthening. The second issue involved the formulation of the sub-project at the SINO domestic refrigerator manufacturer.

66. At the beginning of the Project, the NOU reported that there was not a clear understanding of the source of the operational funds in the discussions with UNDP/UNEP. UNDP considered that the national co-finance provided the operational finance for the sub-project. However, GEF allocated finance to the IAs for operational costs for both investment and non-investment activities. The NOU wanted the source of the operational funds to have been clarified at the beginning of the Project.

67. There was a funding delay of 17 months from when the project was signed in November 2000 until payment in April 2001, which resulted in staff in the NOU working for this period with 15% of their salaries paid by the SNCP. The NOU contacted UNDP several times, as all

[17] Foam-blowing choice was Impianti, Perros, Sicplant, Cannon, Hennecke, Krauss Maffie, Elastogan, Gusmer; Refrigerant charging unit choice was Galileo, Sikplant, Gramkov, Prodakshen Control Unit and RSP

[18] The chief executive changed 5 times during the sub-project.

transfers even from UNEP came to the NOU from UNDP, to try to establish the cause of the delay. The problem was only resolved when procedures for the transfer of funds had been agreed between UNDP and the Ministry of Finance. At that stage when the contracts were just beginning, the NOU did not know whether the delay should be considered normal operations for UNDP/UNEP, or whether they had a genuine reason for concern.

68. It appeared that the funding issues have still not been fully resolved. A prolongation of the funds for Institutional Strengthening was approved by the GEF in 2008, but as at May 2009 these have still not been received by the NOU.

69. UNDP did not follow the MLF guidelines when formulating the SINO investment sub-project. If they had been followed, the grant would have been about $135,000 based on a production of about 4,000 refrigerators per year. Instead, UNDP calculated the funding level on the basis of 250,000 refrigerators per year, which resulted in funding to SINO of more than $1.5 million. The results showed that the refrigerator production since 2003 has averaged 4,761 refrigerators per year.

70. It appeared that level of financial support was in excess of that required because the process for calculating the appropriate value of the funding level was fundamentally flawed. The GEF funds were therefore used as though the GEF were a joint-venture partner, rather than a funding body responsible for strategically phasing out a relatively small quantity of ODS used annually in this refrigerator production facility. UNDP said that they did not have the financial expertise to undertake the viability test on the company, and that their role was mainly acting as an intermediary in the financial transactions between SINO and UNOPS.

71. The NOU visited SINO 18 times and effectively undertook the work of UNOPS in supervising and assisting with the implementation of the investment sub-project. As the responsibility for implementation and supervision of the SINO sub-project was the responsibility of UNOPS, it appeared that UNOPS did not execute its duties.

72. On another issue, UNEP was reported by the NOU to be late delivering the Manuals for the training programmes, and late making payments for the training that had been undertaken. It was unfortunate that the training was late as this meant the 3R equipment had to be stored. Once the training was finished, the 3R equipment could be send to the companies that had trained technicians.

18.7 IMPACT THREATS / RISKS

18.7.1 Illegal trade

73. On 1 May 2002, the SCC and SCNP identified the illegal import of CFC-12 refrigerators from the Russian Federation, resulting in 596 units being returned 3 months later. Since 2004 there have been 30 formally registered cases of illegal importation of ODS and products containing ODS into Uzbekistan, 5 of which were in 2006 and 17 in the first half-year 2007. There were 11 cases of illegal CFC imports from 2000-2005. There were 13 instances of illegal imports in 2007, consisting of CFCs, HCFCs, and blends. The CFCs were held pending destruction, and the HCFCs were allowed to be placed on the market. In 2007, there were 5 separate illegal imports intercepted from China of deep-freeze cabinets (more than 7,200 units) containing CFC-12.

74. There is now joint SCC/SCNP control of goods, checks of chemicals imported and confiscations of contraband. In 2008, the NOU formally requested an increase in SCC staff that are needed to share the responsibility with SCNP for reviewing and issuing ODS import/export license applications, for entering the data into a consolidated database, and for collecting the fees from license applicants. Regulations are also needed to define how

the fees collected could contribute toward the costs of additional SCC staff.

75. The illegal CFCs (328 kg) from some of the interceptions were subsequently destroyed in at a small-scale facility using procedures that were costly[19] and impractical. There is a further 505 kg in two lots awaiting destruction from seizures in 2006 and 2007. In Uzbekistan and probably many other countries, key elements of the destruction process were missing such as an automated process for destruction, a national standard to ensure no emissions of hazardous waste, a specialised facility for destruction, and trained personnel to carry out this work. There was a limited capability to analyze emissions. The NOU opined that the penalties for import needed to be more of a deterrent (currently $15) and the importer should be bear the costs of re-exporting all equipment that was illegally imported.

18.7.2 Halon

76. Uzbekistan has banned the import of halons except those intended for Essential Uses from 1 January 2000. Omitting plans to manage halon decommissioning and bank formation appeared to be an oversight in Uzbekistan's Country Plan, particularly as the country required the use of halon for about 22 aircraft. As halon replacements are governed by the ICAO Council approval, and that such approvals are likely to be slow coming forward, it would seem prudent for Uzbekistan to develop a Halon Management Plan as soon as possible. The Plan should include decommissioning halon uses where alternatives are available, and storing the decommissioned halon for uses of halon that do not have an alternative, such as those uses in aircraft described by Uzbekistan. Reclamation and banking equipment would be essential in order to stock as much decommissioned halon as possible.

77. SJSC Tapoich (TAPC) supplies halon 1211, 1301, 2402 and CFC-13 fire extinguishing equipment for use on 3 types[20] of aircraft that are used for fire and explosion suppression. The ODS fire extinguishers are used in different parts of the aircraft such as the engine nacelles, wings, cargo hold and crew-passenger compartments. The last of the halon stocks held by TAPC were depleted in 1996.

78. Halons have been used as fire-extinguishing agents in commercial transport aircraft for 45 years. Minimum Performance Standards for each application of halon have been developed by the International Aircraft Systems Fire Protection Working Group, in cooperation with the aircraft industry and regulatory authorities. Any potential replacement for halon must meet stringent aircraft-specific requirements currently applied to each application of halon. In the light of dwindling halon supplies, the ICAO Council in 2007 said that it may consider coming forward in 2014 with timeframe for the replacement of halon in hand-held extinguishers for new production aircraft. There was no comment on the replacement of halon in the engine nacelles, wings and cargo hold.

79. The NOU only discovered the need for halon after 2002 when the aircraft assembly plant requested a licence to import halon. Uzbekistan applied to the Montreal Protocol in 2002 for Essential Use exemptions to allow the import and use of halon 1211, 1301, 2402 and CFC-13 in 2002, 2003 and 2004. A total of about 1.9 tonnes was requested in each year. The Parties to the Montreal Protocol did not approve Uzbekistan's request[21], but instead recommended that the halon be imported from the Russian Science Federation (in St. Petersburg). The halon has been imported and the quantities stored at each location are

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[19] $5000. The importer paid a $15 fine for the illegal imports. The NOU is seeking to have the penalty adjusted so that it is more dissuasive.

[20] 12 x IL-76: Multi-purpose heavy transport aircraft with a payload capacity of 60 tons; 10 x IL-114: Regional 52-64 seat passenger aircraft; and 6 x IL-78: Aerial refuelling tanker. Export News. 2005.

[21] The last approval for Essential Uses by the Parties for halon was 90t for use in the Russian Federation in 2000.

known to the NOU. Imports of halon will increase the ODS consumption for Uzbekistan. Uzbekistan was not required to report any imported-recycled halon as consumption, which remained at zero[22].

18.7.3 Methyl bromide

80. In regard to the phase out of methyl bromide, Uzbekistan representatives were invited to attend one regional meeting in October 2006 in Bulgaria. UNEP invited Uzbekistan to the meeting to encourage a continuation of the nil consumption of methyl bromide, which had been reported to the Ozone Secretariat as zero since 1996.

81. Uzbekistan reported that consumption was still zero as methyl bromide was used only for QPS, which was currently exempted in the Montreal Protocol. Methyl bromide was not used for the treatment of soil, but instead Uzbekistan used a combination of soil freezing and solarisation for the disinfestation of soil in greenhouses. Uzbekistan had in place legislation that permits growers and organisation to use only listed chemicals.

82. Methyl bromide was permitted only for use on agricultural products and grains, in ways that were consistent with the Montreal Protocol's definitions for quarantine and pre-shipment uses of methyl bromide. The NOU downloaded information on the programme from the website at regular intervals, which expanded their understanding of the range of alternatives to methyl bromide that were available. The information provided by the Regional Project on methyl bromide alternatives was regarded by the NOU as somewhat useful, but the most useful element for maintaining zero consumption was the legislation that Uzbekistan already in place.

83. Uzbekistan reported imports of methyl bromide for QPS on three occasions: 12.3, 30.6 and 20.4 ODP-tonnes in 2000, 2003 and 2005 respectively. Both reports since 2005 have indicted increased use of methyl bromide for QPS. Strict tracking and accountability procedures are required to ensure that methyl bromide imported for QPS is not diverted into soil uses, which would undermine the work that has been undertaken to phase out all non-exempt uses of methyl bromide.

18.7.4 Government commitment

84. At least 200 Customs officers have been trained in all aspects of ODS detection. The SCC has been issued with 15 refrigerant identifiers. Together with the SCNP, the SCC has successfully intercepted refrigerant and equipment that is not permitted in Uzbekistan. However, the number of interceptions has risen in recent years, suggesting that illegal imports are continuing to find their way onto the market.

85. The black market price of CFCs in 2009 was about $5/kg, which was less than the price of HCFC-22. This would suggest that CFCs are still prevalent on the market in Uzbekistan, despite the concerted efforts of the SCC/SCNP to control its entry.

86. Both SCC and SCNP planned to put into effect more dissuasive penalties for those caught contravening ODS legislation, to implement legislation that supported the SCC on illegal trade in ODS, and to implement a number of regional activities that combated illegal trade. In order to avoid an increase in CFCs being illegally imported, the government had given these actions a high priority, so that illegal trade did not undermine the achievements in the programme so far.

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[22] "Production" means the amount of controlled substances produced, minus the amount destroyed by technologies to be approved by the Parties and minus the amount entirely used as feedstock in the manufacture of other chemicals. The amount recycled and reused is not to be considered as "production". MP Art 1(5): Definitions; and Decisions IV/24 and VI/9.

87. The government is fully committed to eliminating the use of all ODS, including HCFCs. It appeared that HCFCs imports may increase in the near future to cope with service demand that was larger than originally anticipated. The NOU planned to change the legislation to allow for an increase in the import quotas for HCFCs. The NOU also planned to investigate the potential for an accelerated retrofit programme that would convert HCFC-based equipment to ODS-free operations, thereby reducing the demand for HCFCs.

18.8 IMPACT ON THE PHASE OUT OF OZONE-DEPLETING SUBSTANCES

88. Uzbekistan's objective to phase out of 142 ODP-tonnes as a result of the Project was fully met. Uzbekistan reported zero ODS consumption for CFCs, carbon tetrachloride and methyl chloroform from 1 January 2002. For the CFC component, Uzbekistan phased out 35 ODP-tonnes in the domestic refrigerator production facility, and a further 83 ODP-tonnes of CFCs were extracted in the 3R sub-project. The remaining 24 ODP-tonnes could have been replaced by reductions in imports of CFCs as a result of legislation in place than banned their imports, coupled with reduced demand for the use of CFCs in refrigeration and air-conditioning equipment that had been converted to ODS-free alternatives.

89. Uzbekistan also complied with Decision X/28 of the Parties to the Montreal Protocol which, based on the 1996 reported consumption of 260.3 ODP-tonnes, required CFCs to be reduced by 40% by 2000 (Target 165 ODP-tonnes / Achieved 41.7 ODP-tonnes), 80% by 2001 (55 / 15.3) and 100% reduction by 2002 (0/0). Targets were also established in Decision X/28 for carbon tetrachloride and methyl chloroform and in each case Uzbekistan met the targets and phased out by the date required in the Decision.