GEF Impact Evaluation of the Phaseout of Ozone-Depleting Substances in Countries with Economies in Transition

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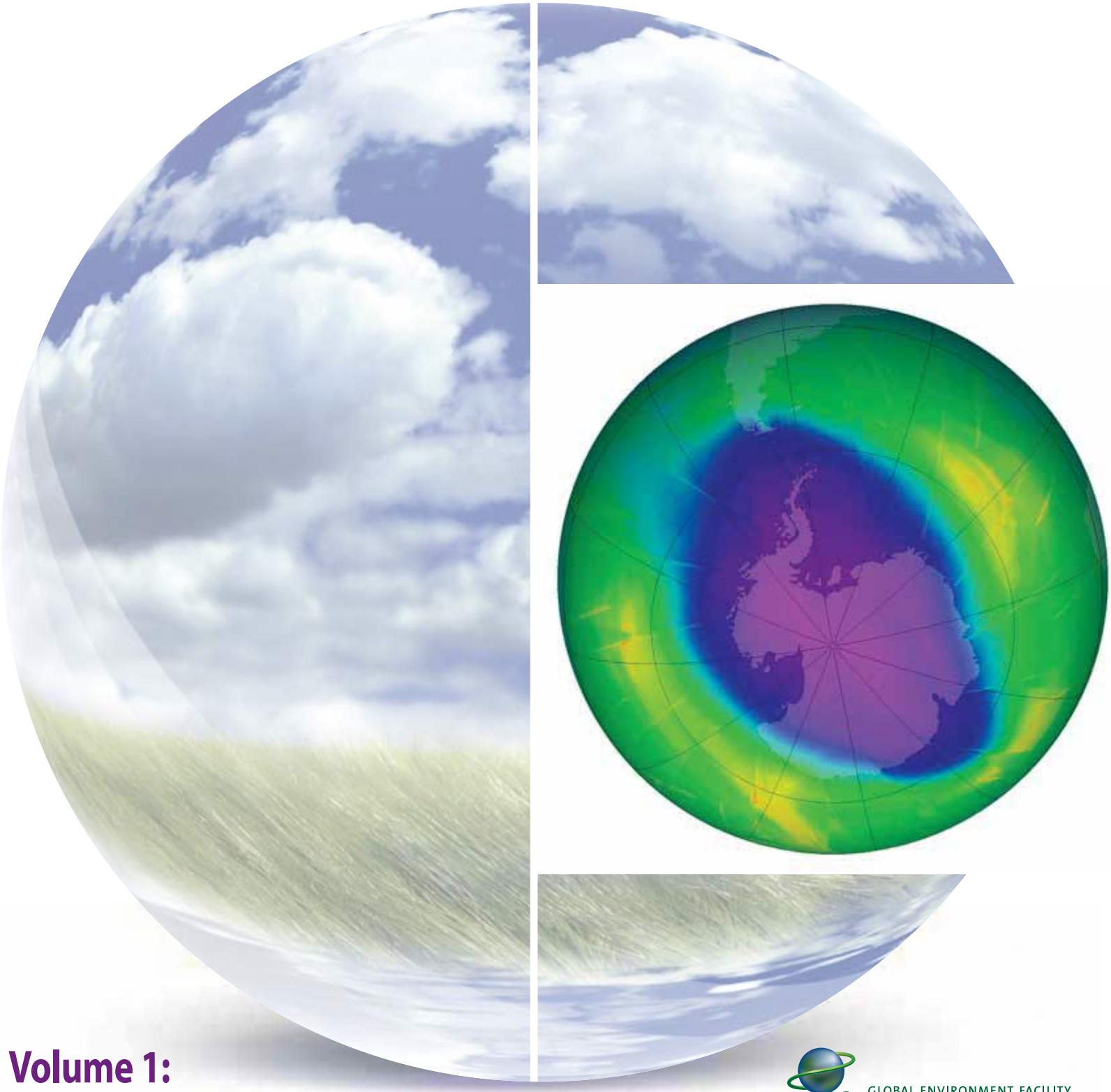

Volume 1: Theory of Change

GLOBAL ENVIRONMENT FACILITY
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Global Environment Facility
Evaluation Office

GEF Impact Evaluation of the Phaseout of Ozone-Depleting Substances in Countries with Economies in Transition

Volume 1: Theory of Change

September 2010

(The main findings and recommendations of this evaluation were presented to the GEF Council in November 2009.)

Evaluation Report No. 56

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This paper is an input into the GEF Evaluation Office program of impact evaluation. The findings, interpretations, and conclusions expressed herein are those of the authors and do not necessarily reflect the views of the GEF Evaluation Office, the GEF Council, or the governments they represent.

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Foreword

The Evaluation Office of the Global Environment Facility (GEF) is pleased to present the Impact Evaluation of the Phaseout of Ozone-Depleting Substances in Countries with Economies in Transition (CEITs). The evaluation was undertaken to assess the longer term results of GEF support to Eastern European and Central Asian countries to stop the production and consumption of these substances, in order to save the ozone layer.

Scientific concerns about the depleting effects of chlorofluorocarbons and other halocarbon chemicals on the ozone layer emerged in the 1970s, followed by the discovery of the hole in the ozone layer over the Antarctic in the early 1980s. These chemicals were used for their coolant, propellant, blowing-agent, and solvent properties in such everyday items as air conditioners, refrigerators, foams, and aerosols. The recognition of the emerging destruction of the ozone layer constituted the first environmental challenge that required a global solution and resulted in countries negotiating and adopting the Vienna Convention for the Protection of the Ozone Layer in 1985 and the Montreal Protocol on Substances that Deplete the Ozone Layer in 1987.

The GEF provided assistance to the countries of the former Soviet Union and Eastern European countries that were ineligible for funding from the Multilateral Fund of the Montreal Protocol, which targets only developing countries. The aim of the GEF support is to protect human health and the environment through the phaseout of ODS production and consumption while enabling alternative technological and chemical substitutes according to countries' commitments under the Montreal Protocol. The first project began in 1992 in the Czech Republic and was followed by 25 projects across Eastern Europe, the Russian Federation and the Central Asian republics, with total GEF funding of over $183 million.

The evaluation methodology combined an overall theory of change approach, through in-depth field case studies with a quantitative assessment of before- and after-project ODS consumption and production in CEITs, compared with countries supported by the Multilateral Fund. In-depth case studies were conducted in four CEITs: Kazakhstan, Russia, Ukraine, and Uzbekistan. These were complemented by a further 10 field case studies which were coordinated with the Evaluation Offices of the United Nations Environment Programme and the United Nations Development Programme.

The evaluation found that GEF support for the phaseout of ODS production and consumption in the CEITs was successful and made a contribution to global environment benefits. Two elements proved to be critical to securing success: first, government commitment to develop and implement policy to support the phaseout of con-

sumption and promote commercially viable alternatives; and government institutional capacity to manage, monitor, and enforce phaseout including reducing illegal international trade in ODS, particularly in those CEITs that are now part of the European Union. Second, the GEF financing was strongly focused on providing working capital and technological resources to the private sector to develop and/or convert to non-ODS technologies and chemicals to maintain or gain market share, therefore, clearly demonstrating the link between profit and environmental protection. Of the 71 companies that were provided with financing, 54 are still in business.

The evaluation also identified some remaining challenges in the CEITs that are not members of the European Union: illegal trade in ODS, inadequate halon recovery and banking, and lack of government support for ozone units to address ODS phaseout. Countries that have joined the European Union have received additional assistance to comply with European regulations for the phaseout of ODS.

The draft evaluation was discussed with representatives from the governments of Kazakhstan, Russia, Ukraine, and Uzbekistan at a workshop in Tashkent; the comments provided were incorporated into the final evaluation report, where appropriate.

The evaluation recommended to the GEF Council that the GEF should consider further investments in the CEITs to address the remaining threats to the ozone layer. Furthermore, the GEF should take the lessons from private sector engagement in phaseout of ODS and incorporate them into other focal areas. The GEF Council, based on its review of the GEF Annual Impact Report 2009 and the management response to the report, decided that GEF-5 strategy proposals should include further investment in capacity development to help CEITs address the remaining threats to the ozone layer. The Council also stated that the GEF Secretariat should incorporate lessons from the positive private sector engagement in the ozone layer into the other focal areas.

I would like to the thank the governments of Kazakhstan, Russia, Ukraine, and Uzbekistan and the many private sector partners who participated in the evaluation for their support and enriching comments. Our thanks also go to all GEF partners, as well as to the Evaluation Offices of the United Nations Development Programme and the United Nations Environment Programme.

Rob van den Berg
Director, Evaluation Office

Acknowledgments

This report was prepared by a team led by Lee Alexander Risby, Evaluation Officer, GEF Evaluation Office, and consisting of two consultants; Tom Batchelor and Valery Smirnov of Touchdown Consulting in Brussels. The team was assisted by Shaista Ahmed (statistical analyses) and Oswaldo Gomez-Rodriguez and Vichya Kim (translation), all consultants to the GEF Evaluation Office. David Todd, Senior Evaluation Officer, provided overall guidance for the impact evaluation.

Members of the governments of Kazakhstan, the Russian Federation, Ukraine, and Uzbekistan provided full cooperation during the field missions to their countries and participated actively in this evaluation. The team is grateful for the logistical support and advice provided during the field missions by Valentina Kryukova and Syrym Nurgaliev (Kazakhstan), Vassily Tselikov and Vassily Rodonov (Russian Federation), and Gennady Geyyer and Anatolii Gamera (Ukraine). Special thanks are due Nadejda Dotsenko and Farhkat Saydiev of the State Committee for Nature Protection and Iskander Buranov of the World Bank (Uzbekistan) for their assistance with the field mission and in the organization of the workshop to discuss the draft report.

A draft document was presented in Tashkent, Uzbekistan, September 7–8, 2009, to the governments of Kazakhstan, Russia, Ukraine, and Uzbekistan; GEF Agencies; and private sector representatives. The feedback received was very constructive, and the comments have been incorporated in this evaluation report. The Evaluation Office remains fully responsible for the contents of the report.

Abbreviations

3R	recovery, recycling, and reclamation
BHL	Bratri Horakove Ltd
CEIT	country with economy in transition
CFC	chlorofluorocarbon
CO_2eq	carbon dioxide equivalent
EC	European Commonwealth
EU	European Union
GDP	gross domestic product
GEF	Global Environment Facility
HCFC	hydrochlorofluorocarbon
MLF	Multilateral Fund
ODP	ozone depletion potential
ODS	ozone-depleting substances
PCC	Pavlodar Chemical Company
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNOPS	United Nations Office for Project Services

All dollar amounts are U.S. dollars unless otherwise indicated.

1. Conclusions and Recommendations

From 2008 to 2009, the Evaluation Office of the Global Environment Facility (GEF) conducted a full-scale impact evaluation in the GEF's ozone layer depletion focal area. The work focused on the GEF financial assistance that was provided from 1993 to 2007 to 18 countries with economies in transition (CEITs) to support the phaseout of ozone-depleting substances (ODS). The evaluation findings are documented in a two-volume report, *GEF Impact Evaluation of the Phaseout of Ozone-Depleting Substances in Countries with Economies in Transition*, of which this is the first volume. It summarizes the theory of change assessment that was conducted in the CEITs along with the major findings, conclusions, and recommendations. Volume 2 contains the detailed impact evaluations of GEF-supported activities in each of the CEITs.[1]

This chapter provides the background of GEF support to CEITs and a summary of the impact evaluation methodology, followed by conclusions and related recommendations to the GEF Council and the CEIT governments.

1.1 Background

The ozone layer is part of the Earth's atmosphere and contains high concentrations of ozone.[2] This layer absorbs approximately 93–99 percent of the sun's high-frequency ultraviolet radiation which, if allowed to pass through, would end life on Earth. Mainly located in the lower stratosphere, the ozone layer is approximately 10–50 kilometers above the Earth's surface.

Free radical catalysts such as nitric oxide, hydroxyl, atomic chlorine, and atomic bromine can destroy the ozone layer. While natural sources for these ODS exist (such as volcanic aerosols), the concentrations of chlorine and bromine in particular have increased over the last decades as a result of the release of large quantities of manufactured organohalogen compounds, especially chlorofluorocarbons (CFCs) and bromofluorocarbons (halons) which have been used in refrigeration, air conditioning, agricultural treatment products, and fire-suppression systems. These organohalogens are highly stable compounds and are capable of surviving in the stratosphere, where chlorine and bromine radicals are liberated by the action of ultraviolet light. Each radical is then free to catalyze a chain reaction breaking down ozone.

[1] Both volumes are available on the GEF Evaluation Office Web site (www.gefeo.org) as well as on a CD-ROM. A print version of volume 1, excluding the annexes, is also available.

[2] The background information presented here, along with more details, can be found on Wikipedia (http://en.wikipedia.org/wiki/Ozone_depletion).

A single chlorine atom is able to react with up to 100,000 ozone molecules. The breakdown results in insufficient ozone molecules being available to absorb ultraviolet radiation.

The environmental effect of ODS was first observed in the mid-1980s over the Antarctic stratosphere, where ozone levels had dropped by up to 60–70 percent of their pre-1975 levels. In the mid-latitudes, ozone levels have also dropped by approximately 3–6 percent of their pre-1975 levels. The consequences of ozone depletion are increases in ultraviolet B radiation reaching the Earth's surface, which in turn leads to increases in health and environmental problems such as skin cancers,[3] immune system suppression, and cortical cataracts; damage to plants, including lowered crop production caused by the reduction in photosynthesis; and reduction in the diversity of important marine species such as plankton and phytoplankton. Reduction in phytoplankton also contributes to global warming, as they play a significant role in oceanic carbon storage.

It was primarily the impact on human health and crop production of a damaged ozone layer that led to intergovernmental action, culminating in the development of the Vienna Convention for the Protection of the Ozone Layer in 1985 and the subsequent Montreal Protocol on Substances that Deplete the Ozone Layer in 1987; both of these aimed to gradually phase out ODS production and consumption.[4]

Although the GEF is not linked formally to the Montreal Protocol, its ozone layer depletion focal area and the subsequent strategic revisions are an operational response to the Montreal Protocol and its adjustment and amendments. The strategic objective of the focal area is to protect human health and the environment by assisting countries in phasing out the consumption and production, and in preventing releases, of ODS while enabling alternative technologies and practices according to countries' commitments under the Montreal Protocol. The expected long-term impact of GEF interventions is a contribution toward the return of the ozone layer to pre-1980 ozone levels, which is expected by 2065.

The GEF focuses on providing support to developed countries of the Montreal Protocol, specifically CEITs that are not eligible for funding under the Multilateral Fund (MLF) of the Montreal Protocol, which targets only developing countries. Since the early 1990s, the GEF has allocated nearly $183 million to 18 CEITs through 21 national and 5 regional projects. Half of these CEITs are now members of the European Union (EU)—Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia; the non-EU CEITs are Armenia, Azerbaijan, Belarus, Kazakhstan, the Russian Federation, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.

The overall objective of this impact evaluation is to evaluate the impact of GEF support in its ozone portfolio of projects on the phaseout of ODS in CEITs. It has five subobjectives:

- To evaluate the impact of GEF ozone portfolio investments in CEITs to reduce **ODS production**

[3] A study of people living in Punta Arenas at the southern tip of Chile showed a 56 percent increase in malignant melanoma and a 46 percent increase in nonmelanoma skin cancers over a period of seven years, concurrent with decreased ozone and increased ultraviolet B levels (Abarca and Casiccia 2002).

[4] This report defines *consumption* in accordance with the Montreal Protocol as "production plus imports minus exports of controlled substances" (UNEP Ozone Secretariat 2000, p. 2).

- To evaluate the impact of GEF ozone portfolio investments in CEITs to reduce **ODS consumption**
- To assess the **sustainability** of GEF investments in terms of maintaining ODS phaseout in CEITs
- To assess the extent to which the GEF investments **catalyzed** further changes in the behavior and decisions of stakeholders, in particular those in the private sector
- To compare these parameters with a limited number of projects on ODS phaseout in MLF-funded countries

The GEF's ozone layer depletion focal area was selected for an impact evaluation based on the maturity of its projects, the relatively homogeneous objectives of the projects implemented separately by the World Bank and jointly by the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP), and the availability of quantitative and qualitative data. These factors made it possible to adopt a portfolio-wide impact evaluation approach as opposed to focusing on discrete projects.

1.2 Design and Methodology

This ODS phaseout impact evaluation was developed and implemented by staff from the GEF Evaluation Office and Touchdown Consulting, Brussels. It combined three approaches to investigate impact from several perspectives, using a mix of quantitative and qualitative methods of data collection and analysis: an overall theory of change approach; in-depth field case studies to assess whether the theory of change approach had accurately described the process; and before and after measures of ODS consumption and production in CEITs for a comparison among the countries evaluated, as well as an external comparison with a matched sample of MLF-supported countries.

The **theory of change** approach was applied early in the evaluation development. It was based on an initial meta-analysis of GEF ODS strategies, project documentation, and available evaluations. The majority of the projects lacked a logframe, as they were developed between 10 and 15 years ago, when logframe analysis was not a GEF requirement. Consultations were held with the GEF Secretariat, Implementing Agency staff, evaluation offices, national government stakeholders, and businesses. The function of the consultation was to provide an opportunity for stakeholders to give input at an early stage prior to the theory of change being applied and tested in the field case study approach.

In-depth **case studies** were conducted in four CEITs: Kazakhstan, Russia, Ukraine, and Uzbekistan. A further 10 field case studies were conducted as part of a parallel UNDP-UNEP terminal evaluation which addressed similar issues in other Eastern European, Baltic, and Central Asian countries. Four countries were examined through desk review alone.

In the absence of available control groups for an experimental or quasi-experimental design, **before and after measures** of CEIT consumption and production were undertaken. In addition, four MLF countries were examined to compare ODS consumption and production (using panel data from the UNEP Ozone Secretariat) and cost-effectiveness with a matched set of CEIT countries.

The evaluation conducted in-depth interviews using standardized, semi-structured guides and questionnaire surveys with government, research institutes, and private sector businesses. Quantitative assessment was also conducted to substan-

tiate internal and external comparisons of ODS consumption phaseout, compared with a business-as-usual approach in which ODS consumption and gross domestic product (GDP) increased together. A cost-effectiveness analysis was undertaken to compare World Bank and UNDP-UNEP project performance.

A number of limitations constrained the impact evaluation:

- The annual data relating to ODS consumption by CEITs and the MLF comparison group countries were incomplete. Although countries were required under the Montreal Protocol to submit data on consumption of classes of ODS annually, many did not do so every year. Data gaps forced the evaluation to assess only CFCs and halon across CEITs and MLF countries, since annual reporting on these substances was more consistent. This limitation was not serious, because CFCs and halon are among the most ozone depleting of ODS and have been the most commonly produced and consumed ODS.
- A time-series regression analysis would have been a useful tool to explore the impact over time of GEF funding on ODS phaseout. Two main obstacles prevented such an analysis. First, the consumption data were incomplete, as mentioned above; second, only the World Bank could provide information on disbursement of funds on an annual basis. A time-series regression analysis thus was not conducted. Correlation analysis of ODS consumption, GDP, and GEF funding was used as a broad measure of the relationship between funding and change in ODS consumption in CEITs assisted by the GEF.
- Data on GEF funding across CEITs and cofinancing available in the GEF database are not always consistent with data obtained from implementation completion reports of the World Bank and UNDP-UNEP project documents. Where possible, actual disbursements have been used for external and internal comparisons of ODS phaseout activities in the ODS consumption sector.

1.3 Conclusions

Conclusion 1: GEF support for the phaseout of ODS consumption and production in CEITs has made a contribution to global environmental benefits.

The CEITs had a baseline consumption of about 304,000 ozone depletion potential (ODP) tonnes in 1986, amounting to 17 percent of the global total. However, much of this consumption was reduced significantly by the early 1990s because of the poor economic conditions following the collapse of communism. GEF funding was provided at the time CEIT economies were recovering in the mid-1990s and aimed to prevent a return to business as usual with regard to ODS use. Assessment indicated that GEF financing contributed to a decoupling of the relationship between GDP growth and ODS consumption growth.[5] This was achieved through project interventions that provided the foundation for the following key impact drivers (also see Conclusions 2–5).

- **Impact Driver 1—Government Commitment to ODS Phaseout:** indicated by the development and implementation of policy and legislation to phase out consumption and promote ODS-free alternatives; government institutional capacity to manage ODS phase-

[5] *Decoupling* refers to the ability of an economy to grow when environmentally damaging chemicals and technology that are important to the economy are reduced and replaced with environmentally friendly technology.

out; government customs and border security measures to curtail illegal trade in ODS; and recycle, reclamation, and reuse programs

  - EU CEITs have, in general, exhibited greater post-project commitment to ODS phaseout than have other CEITs; EU accession has ensured regular updates of legislation and policy to phase out ODS, and the conduct of activities to reduce illegal trade in ODS.
  - Government commitment was weaker in the non-EU CEITs, where several governments—including those of Russia and Ukraine—lacked national ozone units. Ex post policy and legislative updates have not occurred in many countries. Several non-EU CEITs indicated that illegal trade in ODS was a significant challenge to phaseout.

- **Impact Driver 2—Private Enterprise Sustainability and Commitment to ODS Phaseout:** indicated by a company's financial and economic status as a going concern (that is, actively in business) in refrigeration production, the foam/aerosol/solvent industries, or refrigeration and air conditioning servicing; and by ex post private enterprise investments in non-ODS technologies and processes

  - GEF financing enabled businesses to make important technological and production changes that helped them comply with the Montreal Protocol and maintain and/or gain market share, and thus make profits.
  - Of the 71 businesses visited and surveyed, 54 were still going concerns as of 2009.

The CEITs' consumption changed from about 21,000 ODP tonnes in 1996 (1.2 percent of the global baseline) to 1,665 ODP tonnes in 2007 (0.1 percent of the global baseline). The GEF portfolio contributed to the elimination of about 19,260 ODP tonnes of annual consumption and to 1.1 percent of the global benefit to the ozone layer. Russia was the only one of the CEITs still producing ODS at the time funding commenced. Under a special initiative within the project investment, the GEF contributed to the phaseout of nearly 29,000 ODP tonnes of production capacity.

The ODS consumed by the CEITs in 1996 produced approximately 147 million tonnes of carbon dioxide equivalent (CO_2eq) per year, falling to 42 million tonnes of CO_2eq per year in 2007. The GEF portfolio contributed to avoided greenhouse gas emissions equal equivalent to approximately 105 million tonnes of CO_2eq per year, or 1.155 gigatonnes of carbon dioxide. This is equivalent to approximately 10–25 percent of the total carbon dioxide phaseout commitments under the present Kyoto Protocol.

Conclusion 2: Legislative and policy changes supporting ODS phaseout provided a foundation for success and ensured sustainability.

The evaluation found that such measures as legislative and policy changes to restrict ODS import and export, import bans, mandated recovery and recycling of ODS, and ensuring training of technicians in the refrigeration sector played a critical role in signaling to the private sector and individual consumers to move into more environmentally friendly alternative chemicals and technologies. These legislative and policy changes were observed to be most successful in those CEITs that are now part of the EU. EU CEITs tended to have legislation in place before or soon after the beginning of the GEF project intervention, and all of them continued to update their legislation after joining the EU, which has led to further reductions in ODS and more restrictive measures than those required by the Montreal Protocol.

In contrast, in the non-EU CEITs, legislative and policy changes were slow to develop and imple-

ment following many of the projects because the institutional infrastructure needed to carry out such changes was not in place. The lack of legislation and policy led to problems in controlling ODS, particularly in relation to trade and customs controls. This resulted in ODS consumption exceeding Montreal Protocol limits for many years. Since project completion in the non-EU CEITs, institutional capacities have diminished, with insufficient focus on updating legislation to address emerging issues such as the hydrochlorofluorocarbon (HCFC) phaseout which was accelerated in developed countries in 2007 by the parties to the Montreal Protocol.

Conclusion 3: Private sector commitment to ODS phaseout was a critical driver in the success of the GEF investments in CEITs.

The GEF ODS portfolio has been characterized by strong private sector involvement from the early stages of project design through implementation. The umbrella structure of the projects developed by the GEF Implementing Agencies based on targeted subproject investments with the private sector, which provided cofinancing, were efficiently executed and contributed to the rapid phaseout of ODS and implementation of alternative technologies and chemicals. This approach was necessary, given the difference in ODS industrial processes and uses. Highlights of the results achieved by each industrial sector follow (for more detail, see chapter 7 and volume 2):

- **Refrigeration industry:** The evaluation surveyed 22 companies that received support from the GEF and found that 13 were still going concerns in 2009. The companies reported that GEF financing was relevant and had helped in providing new technologies that enabled conversion to non-ODS production and achievement of phaseout targets. GEF financing had been provided at a time when the market was changing quickly (in the late 1990s and early 2000s), and it had helped companies remain competitive and profitable, as well as in phasing out CFC use. Hence, the investment was good for profits and good for the environment. Several companies, including Nord (Ukraine), Snaigė (Lithuania), and Atlant (Belarus), expanded their operations through internal and acquisition-based growth after the GEF investment. They believed the initial GEF investments allowed them to capture market share, enabling growth and thereby demonstrating a catalytic effect.
- **Foam, aerosol, and solvent industries:** The evaluation surveyed 33 companies, 11 in each of the three industries. Thirty-two had reached their individual ODS phaseout targets, and 26 were going concerns as of 2009. Some reported that the GEF investment had contributed to a quick and timely conversion to non-ODS production technologies, which in turn contributed to improved profitability.
- **Refrigeration and air conditioning servicing sector:** The evaluation surveyed 16 companies, of which 15 were going concerns in 2009. These companies received ODS recycling and recovery equipment through the GEF project; the majority of this equipment was still in use after nearly 10 years. The companies reported that the quantity of recycled and reused ODS was falling as old ODS-based equipment had been replaced with non-ODS alternatives, indicating positive changes in market and consumption patterns. One outstanding threat observed was the stocks of unwanted and decommissioned ODS (CFCs) held by private companies in drums or other containers, which were at risk of leaking. Over time, this would diminish the global environmental benefit that had accrued as a result of the GEF investment.

Macroanalysis of the results (see chapter 6) in some of the CEITs showed that financing the phaseout of environmentally damaging technology can be undertaken without damage to the economy of the country. In effect, GDP continued to rise annually as the economies improved, while ODS consumption declined as ODS technology was replaced with non-ODS technology. Consequently, the commercial performance of many of the businesses improved, demonstrating that the conversion to non-ODS technology had been good for business as well as for the environment.

Conclusion 4: Illegal trade threatens to undermine gains in ODS reduction in the non-EU CEITs.

Efforts to combat illegal trade are not yet fully effective, and many of the non-EU CEITs exhibit a lack of technical and legal capacity to curtail such trade. This is particularly true in Kazakhstan, Russia, Tajikistan, Turkmenistan, and Ukraine.

The existence of old CFC-based equipment has created an ongoing demand for illegal imports of CFCs for refrigeration and air conditioning. Interceptions of illegal trade in ODS, most of which is reported to originate in China, have become frequent in countries such as Kazakhstan and Uzbekistan. Illegal trade in ODS was frequently reported by representatives of companies and government customs officers interviewed, which supports similar findings by specialist bodies such as the World Customs Organization.

ODS-containing products such as refrigerators and air conditioning equipment can be imported unknowingly, which increases the demand for ODS that has already been restricted or banned in the importing country. This is a particular problem when ODS have been used in part of the exported equipment, such as the insulation foam. The specifications usually do not provide information on the use of ODS in the manufacture of the entire product.

The parties to the Montreal Protocol have agreed to three times as many decisions in the last 8 years on ways to combat illegal trade as they had in the previous 12 years of the protocol's existence, which is a measure of the growing concern countries have for illegal trade. ODS trade that is transhipped through one country to another is particularly problematic, as procedures and responsibility for monitoring such shipments are less well defined than for single-country destinations.

Conclusion 5: Halon recovery and banking has been neglected in the non-EU CEITs.

Halon is used in firefighting agents. Its production has ceased globally because of its severe ozone-depleting properties; it destroys about six times more ozone than CFCs. Globally, halon has been decommissioned from many installations where a suitable alternative exists, and the used halon has been stored for firefighting applications where an alternative has yet to be developed. Halon is therefore a global resource that has been managed and conserved in well-sealed storage facilities or banks in many countries.

The EU CEITs had management plans in place for halon for many years, and have been actively decommissioning halon and replacing it with alternatives according to legislative requirements. The quantities decommissioned and banked are reported annually. In the non-EU CEITs, however, there was little evidence of any active management of halon, or of policies and measures that required action to replace halon with alternatives. For example, halon is still used to protect the majority of the pumping stations on the gas pipeline from Russia to Europe through Ukraine, despite the availability of a non-ODS alternative for this purpose.

Funding had been provided by the GEF for equipment, training of technicians, and management plans in most non-EU CEITs. In many countries, the equipment provided was not being used. In Russia, the halon program was not implemented because the proposed purchase of recovery and banking equipment did not comply with World Bank procurement procedures. Halon use is not currently monitored in most of the non-EU CEITs, and existing databases were reported to be out of date. Failure to invest in halon management and banking is an oversight in the GEF ODS program.

Conclusion 6: In some countries, the national ozone units ceased to function after GEF support ended, and this may prevent measures being put in place to address the remaining threats to the ozone layer.

The EU CEITs in the early and mid-1990s depended on international aid to finance ODS reduction and phaseout programs. This is not the case today, with the improvement of their economies and links to financial programs in the EU that provide sustainable support to address the remaining challenges of ODS phaseout, such as HCFCs, banking, and safe destruction of ODS.

The non-EU CEITs, however, are not in this position. Many of them have continually faced funding shortages that threaten the existence of the national ozone units that were established to manage, reduce, and phase out ODS. Kazakhstan had a unit that was funded by external contracts rather than the central budget; Ukraine and Russia had no identifiable ministry staff who were actively managing policies and measures on ODS; Turkmenistan was also dependent on external funding. The GEF approved additional financing for some of these CEITs in 2007, but administrative barriers to disbursement have resulted in only one being funded so far. As a result, the national ozone units in the non-EU CEITs reported difficulty in completing the tasks assigned by the GEF Implementing Agencies.

Delays in funding from donors, communication difficulties, and administrative burdens within and among countries have hampered the development and implementation of new programs. This is leading to increased threats or risks to the successful phaseout of the remaining ODS—in particular, HCFCs—and to actions to address the destruction of banks of unwanted ODS stockpiles.

Unwanted CFC stockpiles were reported as a serious problem by many businesses in the non-EU CEITs, as there were no facilities available to destroy them. Prolonged storage in decentralized facilities increased the risk of diminishing benefits, as the substances leak out of storage containers or are dumped by private sector stakeholders. Over time, this will undermine the work that has been performed by servicing companies.

1.4 Recommendations to the GEF Council

Recommendation 1: The GEF Council should consider further investment and capacity development to assist CEITs in addressing the remaining threats to the ozone layer.

Three threats remain to be mitigated: illegal trade in ODS, phaseout of HCFCs and halon, and lack of destruction facilities for banks of unused CFCs and other ODS. The GEF could consider the following actions, particularly in the non-EU CEITs:

- Investment projects to help the government and private sector recover and recycle HCFCs and increase the market penetration of non-ODS or low or zero global warming potential alternatives in the refrigeration and foam sectors
- Investment in destruction facilities to provide government and the private sector with appro-

priate options for safe and cost-effective disposal of obsolete ODS

- Capacity development for national ozone units and customs authorities to function more effectively; this may include further support to update legislation and policy, ODS and non-ODS refrigerant detection equipment, and training and technical assistance to improve enforcement to reduce illegal trade in ODS

These actions would present opportunities for the GEF to attain double global environmental benefits—not only for the ozone layer, but also for the climate—because ODS is both ozone depleting and global warming. Furthermore, destruction of ODS would create synergies with ongoing efforts to safely destroy persistent organic pollutant stockpiles in many of the CEITs. There may be opportunities for the GEF to finance development of joint ODS–persistent organic pollutant destruction facilities.

Recommendation 2: The GEF should learn from the positive private sector engagement in the ozone layer depletion focal area and incorporate similar approaches in its efforts to engage the private sector in other focal areas.

The portfolio of projects assessed as part of the impact evaluation exhibited strong engagement with the private sector, which contributed to the attainment of global environmental benefits and financial benefits to the businesses involved. Such strong performance is not observed in other GEF focal areas. As the GEF is now placing greater emphasis on private sector partnerships going forward into GEF-5 (fiscal years 2010–14),[6] it is important that experiences and lessons from the ODS projects are examined and, where possible, incorporated into other focal area operations.

Some lessons for consideration identified by the impact evaluation include the following:

- Undertaking a viability test directed at measuring organizational, economic, and financial sustainability, which provides the foundation for targeted and informed "green" business investments
- Focusing on a wide range of businesses—small, medium, and large, from start-ups to established firms with a proven track record for product innovation and profitability
- Targeting a few specific sectors for green business investments that best align the environmental goals of the GEF and financial (profit) growth possibilities
- Keeping bureaucratic procedures to a minimum, bearing in mind that companies often have to make quick decisions on investments
- Identifying champions who have innovative product ideas and technical and political skills, as the work in the ODS portfolio demonstrated that private enterprise champions were critical in producing good business and environmental results
- Investing in countries with government policies and procedures that actively support green business and the ease of doing business in these countries

1.5 Recommendations to Non-EU CEITs

Recommendation 3: Non-EU CEITs should consider making improvements in the implementation of legislation, policies, and standards on all aspects of ozone layer protection.

Legislation and policy implementation is essential for phaseout of ODS consumption and for providing the basis for market transformation through

[6] The GEF fiscal year runs from July 1 to June 30.

the introduction of alternative technologies and chemicals. This is particularly important in non-EU CEITs, which face greater challenges than EU CEITs in phasing out HCFCs and reducing illegal trade in ODS.

Countries could consider drafting new or updating existing legislation and policies on the following aspects of ODS phaseout:

- ODS recovery, recycling, and reporting
- Establishing private enterprise standards and requirements, particularly in sectors such as refrigeration and air conditioning servicing
- Import bans for ODS and ODS-containing equipment, and/or licensing and quotas for ODS imports and exports
- Setting appropriate penalties or deterrents for illegal trade in ODS
- Establishing and promoting the activities of professional refrigeration associations

A critical ingredient for effective implementation of legislation and policy is baseline government funding for national ozone units. Experience from the EU CEITs indicates that post-completion government funding is resulting in continued phaseout of ODS and lowered threats and risk to the ozone layer.

Recommendation 4: Non-EU CEITs' existing efforts to prevent illegal trade need to be further strengthened.

Many approaches could be implemented to combat illegal trade. The most important is to reduce national demand for ODS by encouraging the installation of ODS-free equipment, which removes the servicing demand for ODS by using economic and financial instruments and promoting voluntary commitments in the end user sector. Many countries encouraged businesses to substitute their CFC-based equipment for non-ODS alternatives, thereby reducing demand for CFCs.

Other approaches to reduce the illegal supply of ODS include the following:

- Training and workshops for customs officers and inspectorates on a regular basis to maintain and improve detection capacities
- Implementation of customs codes for all common ODS and blends to enable customs authorities to differentiate legal from illegal trade
- Establishment of send-and-receive communications between countries to monitor all ODS shipments
- Use of specialized equipment to differentiate legal from illegal ODS
- Certified laboratory methods for confirming the nature of the ODS intercepted
- Participation in regional meetings and networks to collate, evaluate, and share intelligence on illegal trade as a basis for agreement on further action
- Raising awareness of illegal trade in ODS among private companies and the general public

These activities need to be supported by legislation that empowers customs officers to take appropriate actions against smugglers and suppliers of illegal ODS.

Recommendation 5: Countries need to take further action to manage and bank halon.

Experiences from countries that have successfully banked and managed halon indicate that the following approaches could be adopted:

- Development of a management plan that includes identification of the quantities of halon installed by location, the quantities that can be replaced by alternatives, and a timetable for decommissioning the installed halon

- Equipment and facilities for recovery and reclamation of halon, with appropriate training for technicians to ensure safe management
- Accounting and reporting procedures showing quantities decommissioned, reclaimed, stored, and recycled
- Promoting market mechanisms that enable responsible management of the available halon stock

Non-EU CEITs could also considering making more use of UNEP's halon trader Web site (**www.halontrader.org/home**), which offers the potential to use funds derived from sales of halon to support national halon recovery and banking operations. Further emphasis on development of appropriate legislation and policy is important to provide a stable foundation for halon management plan development and implementation.

2. Background

2.1 The Ozone Layer Problem

The ozone layer is part of the Earth's atmosphere and contains high concentrations of ozone.[1] This layer absorbs approximately 93–99 percent of the sun's high-frequency ultraviolet radiation which, if allowed to pass through, would end life on Earth. Mainly located in the lower stratosphere, the ozone layer is approximately 10–50 kilometers above the Earth's surface.

Free radical catalysts such as nitric oxide, hydroxyl, atomic chlorine, and atomic bromine can destroy the ozone layer. While natural sources for these ODS exist (such as volcanic aerosols), the concentrations of chlorine and bromine in particular have increased over the last decades as a result of the release of large quantities of manufactured organohalogen compounds, especially CFCs and halons.

The emergence of ozone-depleting chemicals occurred in the 1920s with the discovery of the CFC freon by U.S. scientist Thomas Midgley Jr. some 50 years before their impacts on the ozone layer were recognized. CFC compounds replaced hazardous materials such as sulfur dioxide and ammonia as coolants in refrigerators and air conditioners. They were also adapted for use as propellants in aerosol sprays, feedstocks for plastic production, extinguishing agents for firefighting, solvents for electronic components, blowing agents, and numerous other applications. Because CFC chemicals were notably long lasting and did not harm humans, they were considered for many decades "wonder chemicals" (Andersen, Sarma, and Taddonio 2007).

The importance of the ozone layer in terms of shielding life on Earth from the harmful effects of the sun's ultraviolet radiation was well known by atmospheric science, but the link between CFCs and ozone depletion did not emerge until the mid-1970s. In 1974, Mario Molina and F. Sherwood Rowland hypothesized that when CFCs reach the upper atmosphere they decompose under ultraviolet radiation and release chlorine atoms, which subsequently react with and destroy as many as 100,000 ozone molecules (Molina and Rowland 1974). This hypothesis was confirmed in the late 1970s and early 1980s through scientific experiments and observation of the ozone layer, notably leading to the discovery of the "ozone hole" over the Antarctic stratosphere, where ozone levels had dropped by up to 60–70 percent of their pre-1975 levels. In the mid-latitudes, ozone levels have also dropped by approximately 3–6 percent of their pre-1975 levels. Since the discovery of the damaging effect of CFCs, many other chemicals have been recognized as having damaging effects on the

[1] The background information presented here, along with more details, can be found on Wikipedia (**http://en.wikipedia.org/wiki/Ozone_depletion**).

ozone layer as well, including haloalkanes, methyl bromide, carbon tetrachloride, and HCFCs. All of these are now covered by amendments to the Montreal Protocol.

Scientific evidence defined the key problem by relating CFCs and other chemicals with stratospheric ozone depletion and increased ultraviolet radiation penetration into the lower atmosphere. This penetration leads to increases in health and environmental problems such as skin cancers,[2] immune system suppression, and cortical cataracts; damage to plants, including lowered crop production caused by the reduction in photosynthesis; and reduction in the diversity of important marine species such as plankton and phytoplankton. Reduction in phytoplankton also contributes to global warming, as they play a significant role in oceanic carbon storage.

Once the destructive effect of CFCs and other chemicals on the ozone layer had been recognized, a standard baseline measurement for each chemical's potential to damage the ozone layer was needed, as not all substances had the same effect. The established benchmark was the potential for a single molecule of a particular substance to destroy the ozone layer. The baseline reference chemical selected was CFC-11, which has an ODP of 1.0; other chemicals, such as the haloalkanes, were indexed against CFC-11. The higher a substance's ODP value, the more damaging it is to the ozone layer and the environment. Table 2.1 shows the ODP values for the main substances discussed in this report.

It was primarily the human health and crop production threats that led to intergovernmental action, culminating in the development of the Montreal Protocol on Substances that Deplete the Ozone Layer in 1987. In recent years, the link between ozone-depleting chemicals and climate change has increased dramatically with the recognition that many of those chemicals also have significant global warming potential many hundreds to thousands of times greater than carbon dioxide (see section 7.5). Table 2.1 also shows the global waming potential values for the main substances discussed in this report. These values are indexed against the global warming potential of an equal mass of carbon dioxide, which has a global warming potential of 1. The higher the value, the more damaging the substance is for the environment.

2.2 The Montreal Protocol and the Role of the GEF

The Montreal Protocol

The Montreal Protocol came into force January 1, 1989. As of 2009, 191 countries have signed the protocol.[3] Its key articles are summarized in box 2.1.

By signing the protocol, countries are

> …Recognizing that world-wide emissions of certain substances can significantly deplete and otherwise modify the ozone layer in a manner that is likely to result in adverse effects on human health and the environment…Determined to protect the ozone layer by taking precautionary measures to control equitably total global emissions of substances that deplete it, with the ultimate objective of their elimination on

[2] For example, UNEP estimates that for every 1 percent loss of the ozone layer, there is a 2–3 percent increase in the incidence of skin cancers (Synthesis Report Panel 1995). A study of people living in Punta Arenas at the southern tip of Chile showed a 56 percent increase in malignant melanoma and a 46 percent increase in non-melanoma skin cancers over a period of seven years, concurrent with decreased ozone and increased ultraviolet B levels (Abarca and Casiccia 2002).

[3] As of July 2008, all the world's countries except San Marino and Timor-Leste had ratified the Montreal Protocol.

Table 2.1

ODP and Global Warming Potential for Key Substances Cited

Substance	Short name	Examples of use	ODP	GWP
Trichlorofluoromethane	CFC-11	Foam insulation, aerosol	1.0	4,750
Dichlorodifluoromethane	CFC-12	Refrigerant, aerosol	1.0	10,900
Trichlorotrifluoroethane	CFC-113	Solvent	0.8	6,130
Bromochlorodifluoromethane	Halon-1211	Fire protection	3.0	1,890
Bromotrifluoromethane	Halon-1301	Fire protection	10.0	7,140
Dibromotetrafluoroethane	Halon-2402	Fire protection	6.0	1,640
Chlorodifluoromethane	HCFC-22	Refrigerant, aerosol	0.055	1,810
Dichloro-1-fluoroethane	HCFC-141b	Foam insulation	0.11	725
Methyl bromide	MB	Pesticide/fumigant	0.6	5
Hydrofluorocarbon	HFC-134a	Refrigerant, aerosol, foam	0	1,430
Propane	R290, C_3H_8	Refrigerant, aerosol	0	3.3
Isobutane	R600A, C_4H_{10}	Refrigerant	0	20
Cyclopentane	C_5H_{10}	Foam insulation	0	—

Sources: IPCC 2007, pp. 212–15; RTOC 2007.

Note: — = not available; GWP = global warming potential.

> the basis of developments in scientific knowledge… Acknowledging that special provision is required to meet the needs of developing countries…shall accept a series of stepped limits on CFC use and production… (UNEP Ozone Secretariat 2000).

The protocol is structured around several groups of halogenated hydrocarbons that have been shown to play a role in ozone depletion. All of these ODS contain either chlorine, fluorine, or bromine. For each group of ozone-depleting chemicals, the treaty provides a timetable by which the production of those substances must be phased out and eventually eliminated. Since 1989, the protocol has undergone seven revisions or amendments, which have placed further restrictions on its parties.[4]

[4] The 1990 London Amendment added methyl chloroform and carbon tetrachloride and tightened the phaseout schedule; the 1992 Copenhagen Amendment added HCFCs and methyl bromide and further accelerated phaseout schedules; revisions were also made in 1991 (Nairobi), 1993 (Bangkok), 1995 (Vienna), 1997 (Montreal), and 1999 (Beijing).

Multilateral Fund

The protocol established the Multilateral Fund as a financial mechanism to support the phaseout of ODS production and consumption in developing countries. Article 5 (developing countries) are eligible for support from the MLF, but Article 2 (developed countries) are not. The Implementing Agencies for the MLF are the World Bank, UNDP, UNEP, and the United Nations Industrial Development Organization. As of March 2007, more than 5,520 projects had been approved, with funding of $2.1 billion in assistance to 143 developing country parties.

GEF Role to Support ODS Phaseout

When the Montreal Protocol was approved in 1987, the countries of Eastern Europe and the republics of the former Soviet Union were not classified as developing countries under Article 5 of the protocol and therefore had to fulfill the same phaseout schedule as developed countries. With the collapse of communism in 1989 and 1990, the coun-

Box 2.1

Key Articles in the Montreal Protocol

Article 2. Mandates the phaseout of ODS by protocol parties according to a prescribed timetable

Article 4. Obliges all parties to ban trade in ODS with nonparties, as well as specifying obligations for control between parties

Article 5. Permits developing countries that consume ODS in quantities less than the specified limits to delay implementation of control measures by a specified number of years; makes developing countries eligible for MLF funding to assist them in reaching compliance with the protocol

Article 7. Mandates baseline and annual reports from parties on both production and consumption of ODS

Article 8. Provides the basis for action in the case of noncompliance of a party

Article 9. Requires parties to conduct research and development and to exchange information on ODS substitutes

Article 10. Establishes the financial mechanism—the MLF—for implementation of the protocol for Article 5 parties

tries had limited financial and technical resources to allow them to meet the schedule, but they were not eligible for funding from the MLF. The GEF agreed to support the implementation of the Montreal Protocol for the CEITs of Eastern Europe and the former Soviet Union republics. Although the GEF is not formally a financial mechanism for the Montreal Protocol, the GEF's operational strategy for ODS is congruent with the Montreal Protocol and its amendments and adjustments.

The GEF developed an initial focal area operational strategy to address ODS in 1995 with the goal of contributing "to measures that protect human health and the environment against adverse effects resulting, or likely to result from, human activities that modify or are likely to modify the ozone layer" (GEF 1995).

The 1995 operational strategy focused on short-term investment measures and enabling activities in CEITs to achieve ODS phaseout emphasizing

- the greatest reduction of ODS for the lowest cost within each recipient country,
- avoidance of noncompliance with agreed control measures under the Montreal Protocol,
- complete phaseout of ODS (except in essential uses) in entire countries or sectors,
- achievement of additional global environmental benefits in other GEF focal areas.

Based on emerging experiences, the GEF ODS goal and strategy were refined further during the GEF-3 (2003–06) and GEF-4 (2006–10) replenishment periods:

> to protect human health and the environment by assisting countries to phase-out consumption and production and prevent releases of ozone depleting substances according to their commitments to the Montreal Protocol phase-out schedules while enabling energy efficient alternative technologies and practices (GEF 2007)

During GEF-3 and GEF-4, ozone focal area funding has been targeted at capacity development for methyl bromide and HCFC phaseout, mostly through regional project interventions (see chapter 7).

3. Evaluation Framework

3.1 Objectives and Key Questions

The objectives and questions for the evaluation were derived from a preliminary review of the GEF ozone focal area strategies, existing project documentation and evaluations, as well as discussions with members of the GEF Secretariat and the GEF Implementing Agencies.

The overarching objective of the impact evaluation was to evaluate the impact of the GEF ozone portfolio of projects on ODS phaseout in CEITs. The evaluation had five subobjectives:

1. To evaluate the impact of GEF ozone portfolio investments in CEITs to reduce ODS production
2. To evaluate the impact of GEF ozone portfolio investments in CEITs to reduce ODS consumption
3. To assess the sustainability of GEF investments in maintaining ODS phaseout in CEITs[1]
4. To assess the extent to which GEF investments catalyzed further changes in the behavior and decisions of stakeholders[2]
5. To compare these parameters with a limited number of projects on ODS phaseout in MLF-funded countries

This last was achieved with the evaluation comparing impacts across CEITs that received GEF funding (internal comparison) with MLF-funded countries (external comparison) matched to four GEF countries selected for in-depth field assessments.

The conduct of the evaluation was guided by the following questions:

- What was the intended series of causal linkages in the GEF ozone portfolio that were expected to generate impacts?
- What were the impacts of the GEF ozone portfolio investments—in technologies to change production and consumption, and in capacity development and institutional strengthening, among others—on consumption of ODS across the CEITs? To what extent have comparison countries achieved reduction in ODS consumption?
- What were the impacts of the GEF ozone portfolio investments on ODS production across the CEITs? To what extent have comparison countries achieved reductions in ODS production?
- What were the important features of the project/country context(s) that interacted with

[1] In doing so, the evaluation acknowledged issues of trade and illegal trade of ODS.

[2] The focus was on private sector follow-on investments and the results of capacity development and technical assistance.

the causal linkages to determine the results achieved?

- How did the project approaches respond to the country context to generate results?
- To what extent have GEF ozone portfolio results been sustained? What are the main risks to sustainability?
- To what extent have results in the comparison country been sustained? What are the main risks to sustainability?
- To what extent have GEF ozone project results been catalyzed by other stakeholders? To what extent has catalysis occurred in the comparison country?
- What are the key lessons from the GEF ozone portfolio investments? What are the important opportunities and challenges for ODS phase-out in CEITs? How do these opportunities and challenges compare with the experiences of the MLF-funded countries? To what extent are these opportunities and challenges ODS specific and can/cannot provide useful lessons learned to other focal areas?

An evaluation matrix was developed to link the questions to particular aspects of the methodology, data collection requirements, and indicators (annex A).[3]

3.2 Evaluation Design

The evaluation design combined three approaches to investigate impact from several perspectives, drawing on quantitative and qualitative data collection methods and analyses: a theory of change, in-depth field case studies to assess the veracity of the theory of change, and in CEITs for a comparison among the countries evaluated as well as an external comparison with a matched sample of MLF-supported countries.

The theory of change approach is an impact evaluation tool that maps out the logical sequence of means-ends linkages underlying a project (or portfolio of projects) and thereby makes explicit both the expected results or impacts of the project, outcomes to impacts necessary for certain states or conditions to exist (impact drivers), assumptions that have to hold true to achieve impact, and threats mitigated in order for impacts to be sustainably achieved over the long term. Figure 3.1 shows a generic theory of change model.

The theory of change design was applied early in the evaluation development because the majority of the projects lacked a logframe as they were developed between 10 and 15 years ago, before logframes were a requirement. A meta-analysis was undertaken of GEF ODS strategies, project documentation, and available evaluations to draft an initial theory of change. Consultations were then held with the GEF Secretariat, Implementing Agency staff, evaluation offices,[4] and national government stakeholders. The function of the consultation was to provide an opportunity for stakeholders to give input at an early stage.

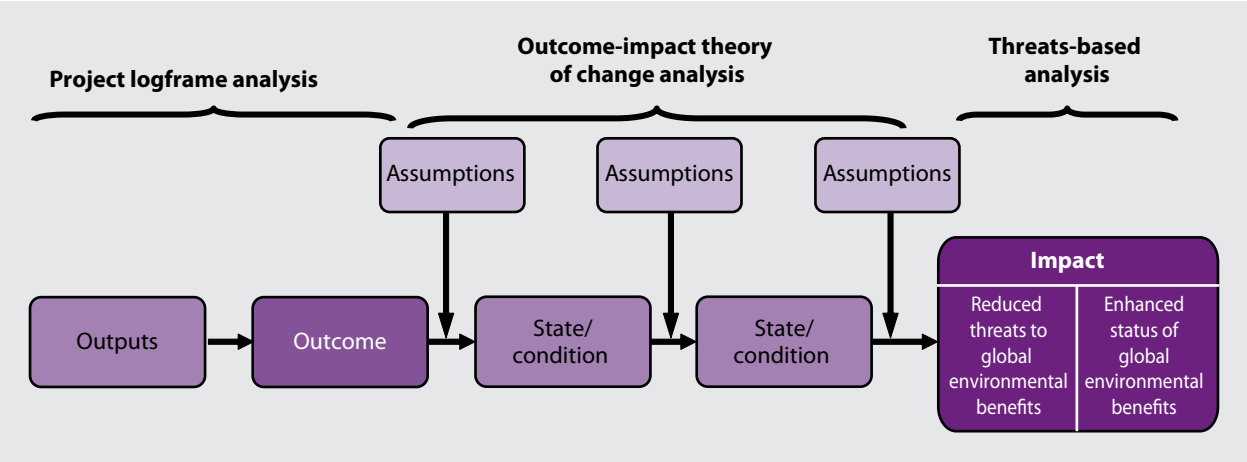
The theory of change was initially used in the desk review of all completed projects with evaluations to review outcomes to impacts with a particular focus on identifying impact drivers and assumptions. **Impact drivers** are critical factors or conditions that are essential for a project to move from outcomes to delivery of impact. **External assump-**

[3] The annexes to this report are available online at the GEF Evaluation Office Web site (www.gefeo.org) and on a CD-ROM.

[4] Comments on the approach paper and theory of change were received from the evaluation offices of UNDP, UNEP, and the United Nations Industrial Development Organization.

Figure 3.1

Generic Theory of Change Model

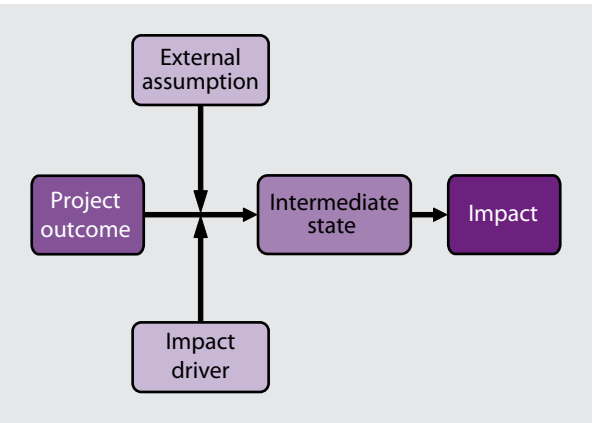


tions are external events that negatively affect the ability of the project to reach impacts (figure 3.2). **Intermediate states** are transitional conditions between project outcomes and impacts in which major barriers to achievement of impacts have been overcome.

The basic principle is that if impact drivers are not present, it is unlikely the project will produce impacts. Furthermore, external assumptions may intervene to prevent impact drivers from producing an impact. In the case of ODS, such external assumptions might be illegal trade or the price competitiveness of ODS alternatives, events that are largely beyond the boundary of the project. Previous impact evaluations conducted by the GEF Evaluation Office found that impact drivers and external assumptions are often implicit; it is thus essential that they be explicitly identified during the impact evaluation process in order to understand why an impact has been produced or not. A significant focus of the desk study and the case study fieldwork was therefore focused on drivers and assumptions.[5]

Figure 3.2

Outcomes to Impacts: Impact Drivers and Assumptions

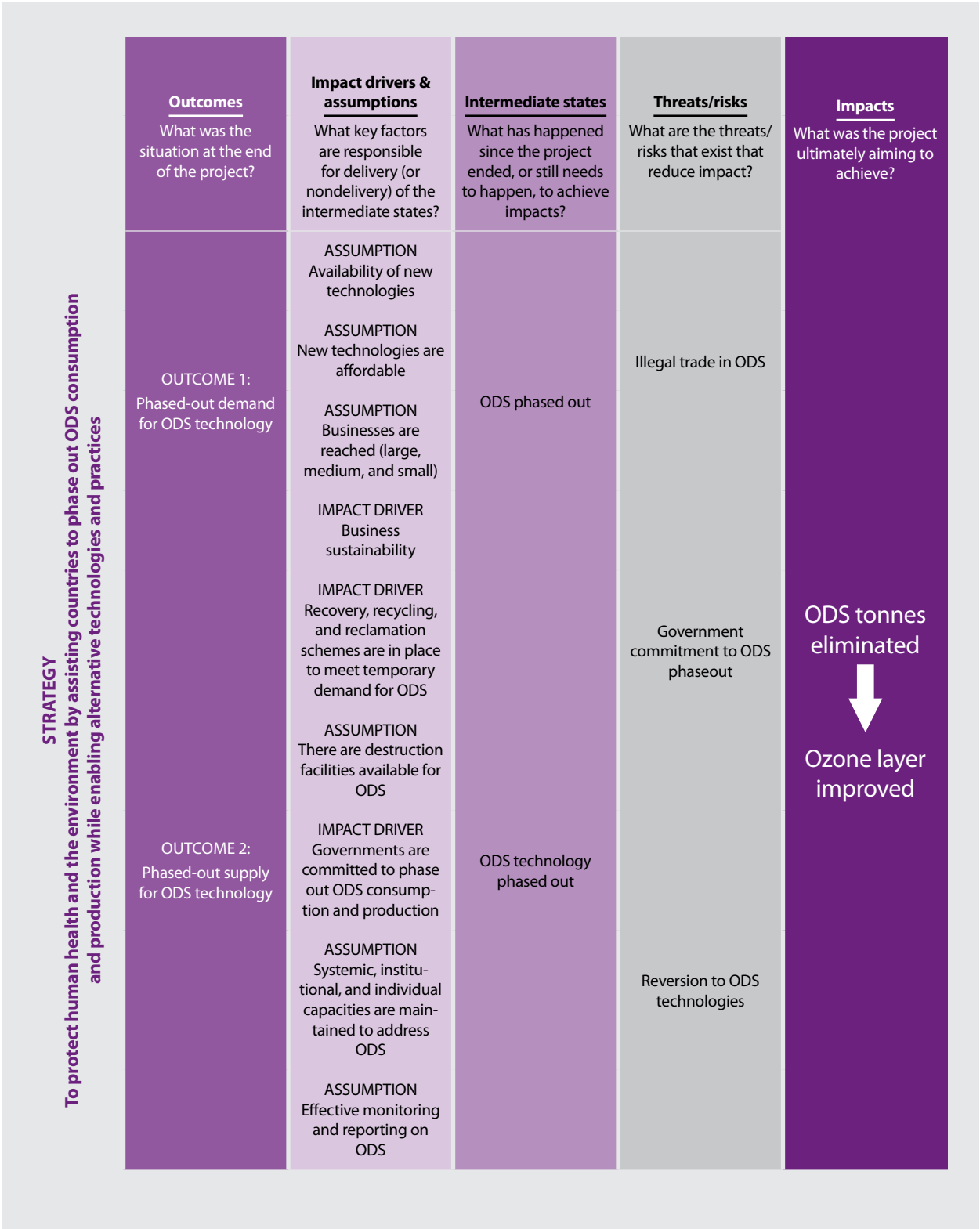


The ODS theory of change covers outcomes describing the position reached at the end of the project, assumptions and impact drivers, intermediate states, threats/risks, and impact(s) (figure 3.3). The theory of change was used to guide the initial desk review of projects and the case study fieldwork.

[5] A more detailed methodological discussion of theory of change and impact drivers is available on the GEF Evaluation Office Web site (www.thegef.org/gef/node/1560).

Figure 3.3

ODS Outcomes-Impacts Theory of Change Before and After Measures



In-depth case studies were conducted in four countries that have received GEF support. A further 10 field case studies were conducted as part of a parallel UNDP-UNEP terminal evaluation of ODS projects, which addressed similar issues but within a shorter time frame. In each case study, the following issues were qualitatively assessed and/or considered:

- Processes that caused (means-end linkages) ODS consumption and/or production phaseout
  - Government policy measures and incentives
  - Capacity development
  - Private sector/business involvement
- Alternative technologies and knowledge dissemination (including awareness)
- Assessment of the theory of change outcome—intermediate states and impact drivers/assumptions and threats that support or thwart impacts
- Identification of gaps and opportunities

In the absence of available control groups for an experimental or quasi-experimental design (see section 3.5), before and after measures of CEITs consumption and production, and of comparable MLF countries drawing on available quantitative panel data on ODS consumption and production (from the UNEP Ozone Secretariat), were used to establish the long-term trends from 1986 (baseline) to the present.

3.3 Evaluation Methodology

The key approach adopted for the evaluation was to mix both qualitative and quantitative methods consistent with the combined designs described above. **Qualitative methods** were used during the evaluation preparation and case studies for the development and testing of the theory of change in the field case studies. The primary aim of conducting a significant amount of qualitative data collection was to thoroughly understand how and why changes in ODS consumption and/or production had occurred and relate this to observable quantitative data that showed what had occurred. **Quantitative methods** were used for the before and after measures and the questionnaire survey analyses. The survey was devised after the completion of the field case studies as a way of validating and confirming key issues arising from the qualitative data collection. The overall approach adopted conformed to current practices in impact evaluation to mix qualitative and quantitative methods (see chapter 7).

A second key approach of the evaluation used to reduce internal and external threats to validity was **triangulation** both within and between country case studies. This triangulation was achieved by covering a consistent range of issues with specific stakeholders, including those in government national ozone units, customs offices, and the private sector; and private operators in refrigeration production/servicing/recycling, foam manufacture, and fire protection systems. All evaluation team members took notes to allow for rapid post-processing and discussion of data collection, which assisted in solidifying key evidence and discarding circumstantial or anecdotal evidence as the case studies progressed.

Qualitative Methods

A detailed external literature review was undertaken covering the non-GEF literature on such issues as the current status of ozone atmospheric science (based on scientific panel submissions to the Montreal Protocol) and the effects of ozone depletion on ecosystem functioning, links to climate change and human health, Montreal Protocol and MLF activities, and existing external evaluation materials on non-GEF ODS activities.

A desk review of all GEF ODS completed projects was conducted prior to the case study fieldwork. At that stage, only the GEF World Bank ODS projects had evaluations and project implementation correspondence available for review. The reviews were structured to identify outputs and outcomes as well as impact drivers and any explicitly detailed or implicit assumptions. This process played an important role in informing the development of the theory of change as well as providing a basis for the case study fieldwork.

The evaluation established a structured database of the external and internal secondary data; this was used in preparation for the fieldwork and also for triangulation with case study primary data sources.[6]

Semi-structured interviews and focus groups with all stakeholders were the primary means of data collection for the case studies. The evaluation prepared interview guides prior to commencing the case study fieldwork (see annex B for the interview guide for government representatives and annex C for the guide for use with business representatives). The interviews were supplemented with secondary data collected from private sector beneficiaries (brochures, records) and direct observation of private sector warehouses and shop floors containing stocks of ODS alternatives and ODS (legal and illegal); spare parts (such as compressors); foaming agents; fire-suppression systems; storage facilities for recovered/reclaimed ODS; production facilities for a range of goods such as refrigerators, soft and rigid foams, and solvent degreasing agents. In many cases, the evaluation team was permitted to take photographs of private sector facilities (see volume 2).

A survey questionnaire was developed in both Russian and English and sent to national ozone units (annex D). It was based on the qualitative data collected through the semi-structured interviews and focus groups and used to verify and validate responses regarding government institutions for ODS management and monitoring, customs, and excise and trade issues.

Quantitative Methods

Quantitative methods were used to conduct internal and external comparisons of consumption and production data obtained from the UNEP Ozone Secretariat database. This database is compiled from the annual reports on ODS imports, production, and exports submitted by Montreal Protocol parties in accordance with Article 7.

The first stage of the quantitative analyses was to collect consumption and production data across several ODS chemicals. This collection focused on CFCs and halon in Annex A Group I, Annex A Group II, and Annex B Group I. The countries in this evaluation accounted for more than 95 percent of the ODS consumption reported by the parties and formed the most complete data set. The reporting years were from 1986 until 2007, with 2007 being the last and most complete year of reporting on ODS consumption.

Parties that do not report consumption annually are in noncompliance with the requirements of the Montreal Protocol. In such cases, or where there are discrepancies in reporting or if a party has exceeded the ODS consumption limit agreed on in the protocol, the UNEP Ozone Secretariat invites the relevant parties to attend a meeting of the Montreal Protocol's Implementation Committee. The committee aims to reach agreement with the party on a resolution and the time that will be required to achieve compliance. Most of the CEITs in this report appeared before this com-

[6] The database was established as part of that used for the GEF Fourth Overall Performance Study.

mittee prior to receiving GEF funding. The number of noncompliance decisions resulting from discussions with the Implementation Committee before and after GEF financial assistance were used as one of the measures to demonstrate the value of the GEF support.

Initial analyses looked at ODS consumption across the 18 CEITs, focusing on such key factors as Implementing Agency, amount of funding each country received, overall cost-effectiveness, and intensity and efficiency of implementation. Although none of the CEITs were EU member states at the time of the GEF projects, nine subsequently acceded to the EU. For the purposes of this evaluation, the CEITs were categorized as those that are now members of the EU (EU CEITs), in contrast with those that are not members of the EU (non-EU CEITs).

Next, analyses were conducted on an external comparison—GEF- versus the MLF-funded Article 5 countries of Brazil, Cameroon, Egypt, and Romania, which received funding under the Montreal Protocol for the reduction of ODS consumption and/or production. Four comparison countries—Kazakhstan, Russia, Ukraine, and Uzbekistan—were selected from the 18 CEITs. These two groups of comparison countries were matched on the basis of ODS consumption, population, and GDP. The external comparison used indicators similar to those used in the internal analysis. The relationship between reported ODS consumption and GDP in the national currency before and after the GEF funding, and for the MLF-financed external comparison sample, was assessed using the Pearson product-moment correlation coefficient. The results of these analyses are reported in chapter 6.

A correlation analysis was used to assess the broad relationship between ODS consumption, GDP, and GEF/MLF funding to determine the extent to which the funding had decoupled GDP from ODS consumption. This analysis was conducted across the four CEIT and four MLF comparison countries and is reported in chapter 6.

3.4 Scope and Sampling

The evaluation focused on projects that were either completed or nearing completion; this enabled consideration of all the national projects across the 18 CEITs that had received GEF funding, as well as of 7 regional projects.[7] The impact evaluation was thus able to take a portfolio-wide approach, as opposed to focusing on only one or two projects, as is the case in most impact evaluations. The similarities across Implementing Agency with regard to project objectives, activities, components, outputs, and goals (expected impacts) also provided a sound basis for the portfolio-wide approach.

The relatively small universe of 18 countries and 26 projects (19 national and 7 regional) made randomized sampling a poor method for identifying the impact evaluation case studies to be conducted, particularly given the need to compare and contrast a broad range of experiences. Instead, selection was based on a number of factors including program funding and size, completion dates, and Implementing Agency to ensure a good mix of case studies.

Four CEITs were selected for in-depth field case studies and a further 10 for "light" field case studies through collaboration with the UNDP-UNEP ODS terminal evaluation process. A further four countries were assessed through desk review and

[7] Some of the more recently approved regional projects focusing on capacity development for methyl bromide and HCFC phaseout could not be fully considered, because they were not near completion.

telephone/email-based interviews and discussions with national ozone units.

3.5 Design and Methodological Limitations

Design Limitations

At the beginning of the scoping process for the evaluation, it had been hoped to combine a theory of change with an experimental or quasi-experimental design approach through the identification of appropriate control or nontreatment groups. In the case of ODS, this would have involved identification of countries of similar economic and social characteristics to the CEITs that had not received funding from the GEF or the MLF and ideally were not parties to the Montreal Protocol. However, no suitable countries existed. As of July 2008, only San Marino and Timor-Leste remained nonparties to the Montreal Protocol; this ruled out experimental or quasi-experimental design. Taking into account the time and resources available for the evaluation, the best alternative was the combination adopted of theory of change with basic before and after measures using internal and external comparisons.

Methodological Limitations

The main limitation encountered during the evaluation was incomplete data sets relating to the consumption of ODS by CEITs and the MLF comparison group countries. Ambiguities within the published data sets (no consumption and nonreporting were both recorded as zero consumption) forced the evaluation to limit analysis to two chemical groups, CFCs and halon, as these had the most complete consumption data sets up to 2007, which was the last full year of data reporting by the parties. As CFCs and halons are some of the most prevalent ODS chemicals, they are good indicators of overall ODS consumption and production phaseout; thus, focusing on these two was not a significant limitation to the evaluation.

Data interpolation was used to generate missing consumption and production figures where gaps existed. For countries that lacked consumption figures for nonconsecutive years, these were interpolated by summing the consumption before and after the missing year and dividing the sum by two. GDP growth rates were obtained from the International Monetary Fund Web site. Further details are provided in chapter 6.

A time-series regression analysis would have been a useful tool in determining the attribution and contribution of GEF funding to ODS phaseout by using a series of ODS consumption data prior to and after the GEF intervention. Two main obstacles prevented such an analysis: incomplete consumption data and the way in which funding was provided. As noted, a complete set of ODS consumption figures was not available for all countries for all years; even after interpolation, consumption data were still indeterminable for certain years. Also, while consumption was reported yearly, funding was provided as a lump sum at the beginning of the GEF intervention and disbursed in several tranches with the intention that countries would use the funding gradually until the eventual phaseout of ODS. Thus, while consumption data were reported annually and were time-series in nature, the key explanatory variable—total GEF funding—was not. This disparity would have made it extremely difficult to properly interpret the causal relationship between GEF funding and ODS consumption. As a result, a time-series regression analysis was not conducted.

While several relevant factors have been considered in this analysis, many others—such as the pricing of substances and various infrastructural and governance indicators—have not, as data

on these variables were not readily accessible. In addition, it was difficult to gather large quantities of data within the limited time allocated to this impact evaluation. The quantitative analysis of the relationship between GEF funding and the level of ODS consumption may be biased due to the omission of such variables.

Data from the GEF database on GEF funding across CEITs and cofinancing were not always consistent with data obtained from the implementation completion reports of the World Bank and UNDP-UNEP project documents. The reports present data on project budget estimates for GEF funding and cofinancing at appraisal, and actual GEF funds spent and cofinancing at project closure. Actual disbursements have been used for external and internal comparisons of ODS phaseout activities in the ODS consumption sector (see chapters 4 and 6).

3.6 Evaluation Implementation and Consultation

The impact evaluation was conducted by an independent consulting company based in Belgium and led by GEF Evaluation Office staff based in Washington, D.C., and Switzerland.[8] GEF operational focal points and the national ozone units in CEITs were involved in planning the execution of the evaluation; in countries where fieldwork was conducted, these persons were closely involved in the planning of the country visits. Evaluation materials, including the following, were developed and submitted to stakeholders in advance of the meetings:

- An approach paper, in English and Russian, describing the impact evaluation's background and aims
- An evaluation matrix (annex A) which set out the interview questions and approach to answer key criteria in the evaluation
- Semi-structured interview guides for government and business representatives (samples of these are in annexes B and C, respectively)
- A survey questionnaire in English and Russian (annex D)

In all, 126 semi-structured interview guides were produced, many in both English and Russian.

Both formal and informal consultation with stakeholders was an integral part of the impact evaluation. Formal consultation began with the circulation of the draft approach paper to GEF Agencies, the MLF Secretariat, and the countries, followed by pre-fieldwork consultations with the Montreal Protocol parties at the Doha meeting in November 2008. Informal consultations were conducted during the write-up of the draft report through March–July 2009, with the evaluation team circulating draft country case study findings for preliminary and informal feedback. The team followed up with countries again at the Montreal Protocol's Open-Ended Working Group Meeting of the Parties in Geneva in July 2009. Such mechanisms ensured that the key evaluation findings were sufficiently cross-checked and areas of agreement and differences on data flagged early.

The draft report was disseminated to stakeholders in English and Russian (chapters 1 and 5 only) in August 2009. Written comments on the draft report were invited at that time. A workshop to discuss the draft report and its conclusions was held in Tashkent, Uzbekistan, September 7–8, 2009. The four countries selected for in-depth fieldwork were requested to attend the meeting,

[8] The consulting team consisted of Russian and English speakers with a combined ODS experience of 60 years.

along with members of the GEF Agencies and the GEF Secretariat. Participants and stakeholders provided comments and recommendations, which were taken into account in producing the final report. Annex E lists the workshop participants; annex F summarizes the feedback received. A timetable of major milestones of the impact evaluation is provided in annex G.

4. GEF ODS Portfolio

4.1 Portfolio Description

Since 1993, the GEF has approved $183.47 million in grant financing for 26 projects on ODS phaseout to 18 CEITs, with approximately $187.6 million in total approved cofinancing provided by governments, the private sector, and other stakeholders.[1] Total approved funding amounted to $371 million. Approximately 60 percent of this amount was directed at ODS phaseout activities in Russia and Ukraine, in acknowledgment of the high levels of ODS consumption and/or production in those countries (figure 4.1).

The GEF Implementing Agencies for the ODS projects were UNDP, UNEP, and the World Bank. UNDP and UNEP jointly implemented most of the projects in the Baltic, Caucasus, and Central Asian regions and received approximately $36.5 million from the GEF for ODS consumption reduction. World Bank–implemented projects received a total of $146.95 million, with the geographical and thematic focus on Russia and those Eastern European countries that had the most significant ODS consumption and production capacity.

About 97 percent of the GEF-funded ODS operations have been delivered through full-size projects totaling $178.12 million; the remaining 3 percent is accounted for by medium-size projects totaling $5.3 million. The use of the full-size project modality reflects the specific characteristics of ODS issues across many of the countries, which require relatively large investments and capacity-development activities. Medium-size projects have been used in some of the smaller countries such as Estonia, Tajikistan, and Turkmenistan and for additional capacity development to prepare for phaseout of HCFCs and methyl bromide.

4.2 Evolution of GEF Funding for ODS

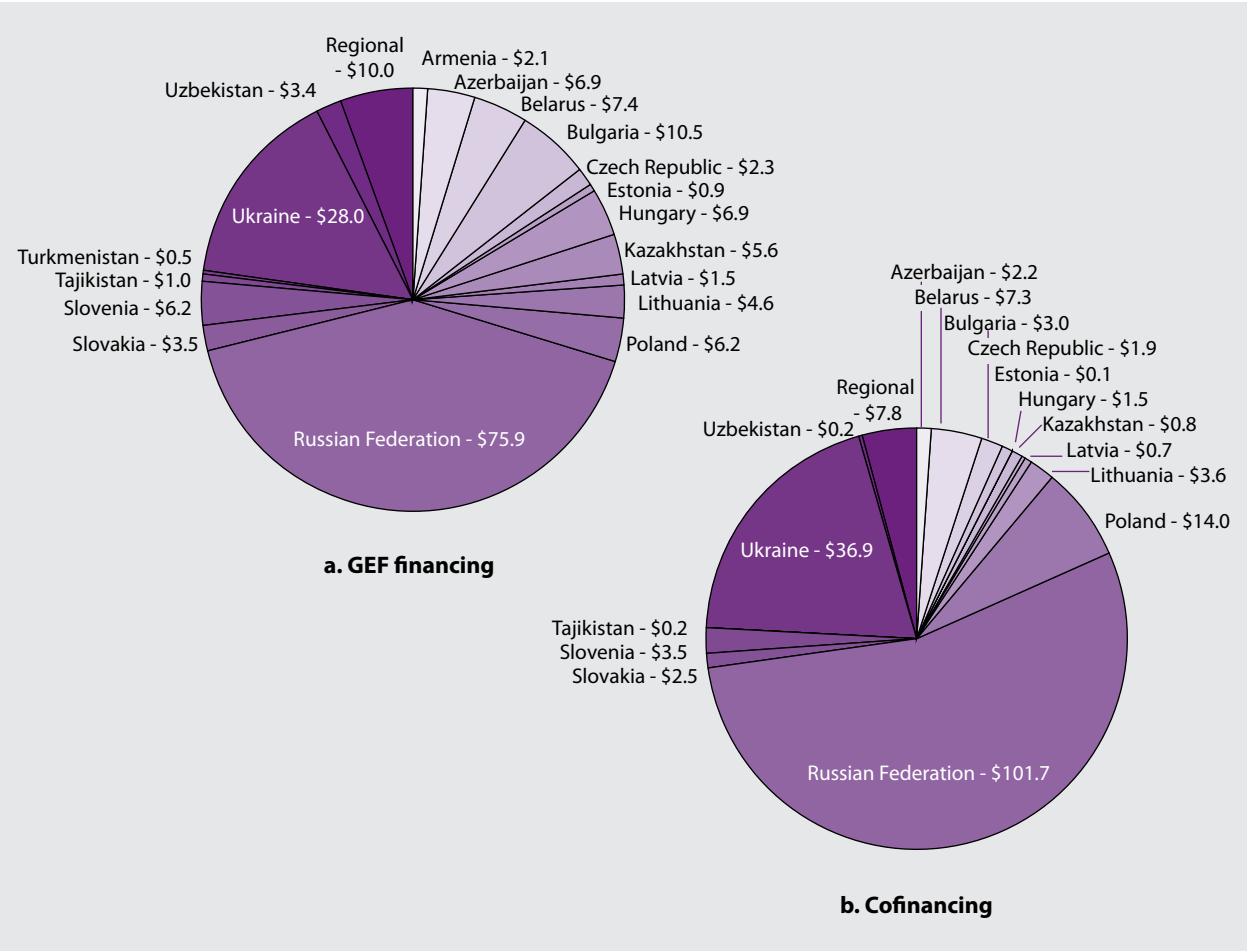
The GEF ODS funding began in the GEF pilot phase (1991–94), with an initial country operation implemented through the World Bank in the Czech Republic and a regional monitoring and research project implemented through UNDP, with a total investment of $4.2 million.

In 1995, the Montreal Protocol's Technology and Economic Assessment Panel established a working group to examine existing ODS uses and quantities in the CEITs and estimate the cost of ODS phaseout. The working group used overall and sector distributions of ODS consumption in CEITs, and the cost-effectiveness threshold values established by the MLF Executive Committee in industrial sectors and subsectors, to arrive at its estimate of $400 million for ODS phaseout. It was

[1] The GEF funding included $18 million from bilateral donors for phaseout of production in Russia.

Figure 4.1

Total Approved GEF Funding and Cofinancing to CEITs (million $)



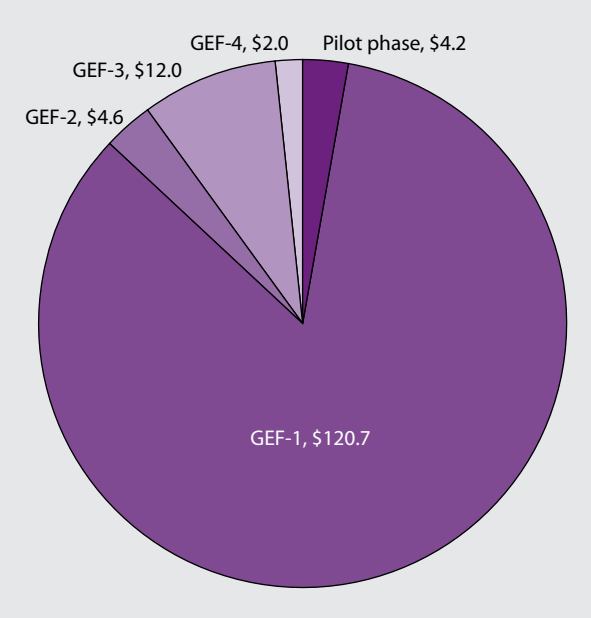
Note: Cofinancing for Armenia and Turkmenistan is less than $0.1 million and thus is not displayed.

assumed that market forces would result in the phaseout of one-third of 1994 consumption levels, and that phaseout of the remaining two-thirds ($265 million) would be financed by international funds (UNEP TEAP Ad-Hoc Working Group on CEIT Aspects 1995).

Consequently, the GEF-1 (1995–98) replenishment period saw a considerable growth in ODS funding for projects across Eastern Europe and Russia, mainly implemented through the World Bank, with a total approved investment of about $120.7 million. In GEF-2 (1998–2002), there was a marked decrease in ODS funding, as major CEIT initiatives were already under way or completed. UNDP-UNEP began to implement projects in the Baltic, Caucasus, and Central Asian regions during this period, with a total investment of $44.57 million. In GEF-3 (2002–06) and GEF-4 (2006–10), ODS projects received $12 million and $2 million, respectively. The decline in funding over time reflects the completion of major operations to phase out ODS consumption, with a relatively modest amount of new funding approved to assist CEITs in HCFC phaseout (figure 4.2).

Figure 4.2

Approved GEF Funding for ODS by Replenishment Period (million $)



Based on an assessment of those completed projects with evaluations containing data on actual expenditures, the total actual GEF funding provided for ODS projects was $138 million—approximately 75 percent of the initial budget estimate of $183.47 million. The actual cofinancing of $76 million was 40 percent of the $187 million estimated at project approval. Table 4.1 presents estimated and actual GEF funding and cofinancing for ODS projects in CEITs from 1993 onwards.

In most countries, the approved cofinancing matched the actual expenditures one. The cofinancing was overestimated in Russia by 76 percent and Ukraine by about 90 percent. The approved GEF grants were close to actual costs in all CEITs, except in Russia where savings resulted from cancellation of several subprojects and favorable exchange rate movements. In Slovakia, $0.84 million was not disbursed due to insolvency of the company.

4.3 Design and Implementation

In providing assistance to the CEITs, the GEF cooperated closely with the Implementation Committee of the Montreal Protocol, making project financing dependent on approval by the committee. Furthermore, under the 1995 GEF Operational Strategy, ratification of the London Amendment of the Montreal Protocol demanding phaseout of all major ODS was a precondition for receiving GEF assistance. The dates of CEIT ratification of the Montreal Protocol and its amendments are shown in table 4.2.

The Implementation Committee negotiated specific benchmarks with each CEIT government; these were incorporated in action plans and approved by the parties in their decisions to secure the earliest compliance of CEITs with the Montreal Protocol. Some of these decisions contained specific recommendations seeking assistance from the GEF. The parties made 38 decisions regarding 15 CEITs. Many of these decisions suggested that sanctions could be applied in the event that the CEIT did not comply with the agreed course of action. The Implementation Committee followed up on the performance of each CEIT with regard to its decision at its regular meetings. Even though many of the CEITs were late in complying with the dates and quantity requirements specified in these decisions, sanctions were never applied by the parties to any of the CEITs.

Each CEIT was required to produce a country program for ODS phaseout.[2] The country programs included baseline data for ODS production and consumption, analyses of industrial and domestic uses of ODS, and the availability and suitability of alternative chemicals and technologies. Based on

[2] A similar precondition applied to those countries receiving support from the MLF.

Table 4.1

Approved and Actual GEF Funding and Cofinancing for the ODS Consumption Sector in CEITs (million $)

		GEF grant		Cofinancing	
CEIT	Implementing Agency	Estimated	Actual	Estimated	Actual
Armenia	UNDP-UNEP	2.087	2.087	0.000	0.077
Azerbaijan	UNDP-UNEP	6.867	7.045	2.226	2.226
Belarus	World Bank	7.400	6.790	7.300	7.990
Bulgaria	World Bank	10.500	9.644	3.000	3.800
Czech Republic	World Bank	2.300	2.831	1.848	1.179
Estonia	UNDP-UNEP	0.919	0.750	0.045	0.045
Hungary	World Bank	6.900	6.498	1.493	1.573
Kazakhstan	UNDP-UNEP	5.603	5.433	0.760	0.748
Latvia	UNDP-UNEP	1.468	1.345	0.659	0.000
Lithuania	UNDP-UNEP	4.645	4.692	3.595	3.595
Poland	World Bank	6.214	5.882	13.953	13.456
Russian Federation	World Bank	75.900	44.580	101.735	24.300
Slovakia	World Bank	3.500	2.660	2.453	3.290
Slovenia	World Bank	6.200	5.884	3.518	2.951
Tajikistan	UNDP-UNEP	0.989	0.817	0.195	0.194
Turkmenistan	UNDP-UNEP	0.515	0.361	0.023	0.022
Ukraine	World Bank	28.040	21.247	36.930	3.974
Uzbekistan	UNDP-UNEP	3.412	3.170	0.153	0.153
Regional	UNDP-UNEP	10.013	6.533	7.803	6.803
Total		**183.472**	**138.249**	**187.689**	**76.376**

these assessments, relevant subprojects specific to certain sectors such as refrigeration or fire suppression to be funded under the GEF project were proposed in the country programs. For the majority of CEITs, country programs related strictly to consumption, as only four CEITs (Czech Republic, Poland, Russia, and Ukraine) produced ODS. In general, the project criteria applied in GEF CEIT projects mirrored those of the MLF.

GEF funding to individual CEITs was determined on the basis of each country's level of ODS consumption and the specific priorities identified in the respective country program, government commitment, cofinancing, and other factors, such as political and economic development priorities. The GEF projects in CEITs were designed as umbrella projects, consisting of several subprojects or components which were more or less stand-alone. These subprojects were developed jointly by the country national ozone units and the GEF Implementing Agencies. The national ozone units were part of the institutional framework that promoted legislation, including an ODS import licensing system, and reinforced the legislation through interaction with and training of customs officers. The units were also responsible for collecting and reporting on national ODS consumption data.

The design and implementation focus of the ODS projects differed somewhat by Implementing Agency, as did their project management method and mechanisms. The World Bank

Table 4.2

Status of Ratification of the ODS Treaties and Amendments by CEITs, as of August 2009

CEIT	Vienna Convention	Montreal Protocol	London Amendment	Copenhagen Amendment	Montreal Amendment	Beijing Amendment
Azerbaijan	June 1996	June 1996	June 1996	June 1996	September 2000	
Belarus	June 1986	October 1988	June 1996	March 2007	March 2007	March 2007
Bulgaria	November 1990	November 1990	April 1999	April 1999	November 1999	April 2002
Czech Rep.	January 1993	January 1993	December 1996	December 1996	November 1999	May 2001
Estonia	October 1996	October 1996	April 1999	April 1999	April 2003	April 2003
Hungary	May 1988	April 1989	November 1993	May 1994	July 1999	April 2002
Kazakhstan	August 1998	August 1998	July 2001			
Latvia	April 1995	April 1995	November 1998	November 1998	June 2002	July 2004
Lithuania	January 1995	January 1995	February 1998	February 1998	March 2004	March 2004
Poland	July 1990	July 1990	October 1996	October 1996	December 1999	April 2006
Russian Fed.	June 1986	November 1988	January 1992	December 2005	December 2005	December 2005
Slovakia	May 1993	May 1993	April 1994	January 1998	November 1999	May 2002
Slovenia	July 1992	July 1992	December 1992	November 1998	November 1999	January 2003
Tajikistan	May 1996	January 1998	January 1998	May 2009	May 2009	May 2009
Turkmenistan	November 1993	November 1993	March 1994	March 2008	March 2008	March 2008
Ukraine	June 1986	September 1988	February 1997	April 2002	May 2007	May 2007
Uzbekistan	May 1993	May 1993	June 1998	June 1998	June 1998	June 1998

primarily focused on investment subprojects to assist the private sector in ODS phaseout. These subprojects tended to address particular sectors, such as refrigeration, aerosols, and/or foam, in the emerging private sector of the former Soviet Union. Less attention was paid (in terms of financing) to capacity development, such as training for customs officers. In UNDP-UNEP CEIT projects, UNDP, working through the United Nations Office for Project Services (UNOPS), implemented investment subprojects aimed at the private sector; UNEP provided capacity development assistance to government and the private sector, focusing on country program preparation, institutional strengthening, awareness-raising, and training activities.

Because the World Bank did not have its own procurement office in each CEIT, it relied on national project implementation units which were established and staffed in each CEIT to handle project supervision, procurement, administration, and financial management. The unit staff was made up of national consultants and consulting companies; they participated in a rigorous initial training program to ensure their familiarity with Bank financial and procurement rules. Project implementation units were, in some cases, capable of developing new subprojects during implementation, improving the responsiveness of the projects to changing local socioeconomic and political contexts. The units were temporary institutions and were dissolved at project closure. The World Bank also worked closely with national banks to channel financial resources to private sector beneficiaries to facilitate funding disbursement.

UNDP relied on UNOPS for procurement and on international consultants for project manage-

ment. UNDP's country offices managed interactions with government and served as financial institutions, supporting UNDP investment activities and UNEP's institutional strengthening and training components.

UNEP was a lead agency in country program preparation and was responsible for establishing the national ozone units which, in many cases, were pivotal in the implementation of the national ODS phaseout programs.

5. Summaries of Case Study Country Reports

Four CEITs were selected for in-depth case study analysis: Kazakhstan, Russia, Ukraine, and Uzbekistan. The results of these case studies are summarized in this chapter. The full country reports are included in volume 2 of this report, along with the country reports for the other 14 CEITs, which were prepared through interviews and desk reviews.

5.1 Kazakhstan

Background

Kazakhstan became independent of the Soviet Union in 1991. It experienced significant economic growth, partly due to its large reserves of oil, gas, and minerals. In 1997, ODS were used for refrigeration (61 percent of total ODS use in the country), foam (22 percent), fire protection (16 percent), and solvents (1 percent). Kazakhstan did not produce ODS, but imported them from Russia.

In order to comply with the Montreal Protocol, Kazakhstan was supposed to phase out the imports of halons by January 1994, and to phase out its imports of CFCs and two other types of ODS by January 1996. However, these imports continued after the phaseout date, amounting in 1996 to 878 ODP tonnes of halons, 826 ODP tonnes of CFCs, and 33 ODP tonnes of two other types of ODS.

In 2001, the Montreal Protocol adopted a decision by which Kazakhstan made commitments to establish a national system for licensing imports and exports of ODS, to ban imports of ODS-using equipment, and to phase out imports of ODS by the following dates: carbon tetrachloride and methyl chloroform by 2002, halons by 2003, and CFCs and methyl bromide by 2004.[1] In 2005, the Montreal Protocol noted with concern that Kazakhstan had not implemented the ban on ODS-using equipment, and that CFC consumption had occurred in 2004.[2] Kazakhstan was asked to submit a full national plan for addressing ODS.

Inputs

The GEF provided about $5.4 million to assist Kazakhstan in phasing out 679 ODP tonnes of ODS in order to comply with Montreal Protocol requirements. This funding was supplemented by $110,000 from the government and about $638,839 from businesses. The project period ran from 2000 to 2005, with one extension. UNDP and UNEP were the Implementing Agencies.

[1] Decision XIII/19 on Compliance with the Montreal Protocol by Kazakhstan.

[2] Decision XVII/35 on Potential Noncompliance in 2004 by Kazakhstan.

The project was developed and initially coordinated by a national ozone unit in the Environmental Ministry. Later, a national ozone office (equivalent to a national ozone unit) was set up in the Climate Change Coordination Center, which implemented ozone projects. The center is funded through commercial contracts with the Environmental Ministry and clients and by grants from international donors. It competes with another institute for funds. Consequently, the institutional strengthening funds provided by the GEF were important for ozone phaseout work. The national ozone unit has political support and is well connected to other departments and bodies.

The GEF project focused on CFCs and halons, and carried out the following activities: provided training and equipment for servicing refrigeration appliances and reusing existing CFCs; eliminated the use of CFCs in the production of foam and liquid oxygen and nitrogen; collected and reused halons; and strengthened government capacity to manage ODS phaseout, including the training of customs officers.

Impact Driver 1: Government Commitment

Institutions and Legislation

Various legislative measures were adopted to reduce and phase out ODS, including a requirement for businesses to obtain licenses to import/export ODS and ODS-containing products, and licenses to assemble or repair ODS-containing equipment; and a ban on imports of most types of ODS and ODS-containing products.[3] Disposal of refrigerators in landfill sites was banned, and ODS in cooling circuits (but not in foam) had to be collected. Businesses that used ODS were required to pay "ecological insurance," which aimed to deter the import and use of ODS refrigerants. Businesses were also required to submit annual reports on the type and quantity of ODS they used or imported; environmental inspectors, however, did not enforce this requirement.

From 2004 on, the national ozone unit maintained a database of ODS reports, but these data were not available. In general, the legislative framework has not provided sufficient support to maintain ODS phaseout. At the time of the evaluation, Kazakhstan had not yet ratified three amendments to the Montreal Protocol,[4] although the national ozone unit prepared documentation in 2005 for the ratification of two amendments. Recently, the requirement for businesses to have a permit for working with ODS was suspended, because the government felt it discouraged entrepreneurism during the current economic crisis.

Customs and Border Security

There are 168 border checkpoints and about 5,000 customs officers. The GEF project provided 100 refrigerant identification machines. They were simple to use, but had some impractical features. Only one laboratory was able to verify the type of ODS, but it lacked key equipment. In 2003, 61 customs officers (about 1 percent of the total) were trained in ODS issues. Some legislation relating to customs was adopted, guidelines were produced, and several cases of illegal imports were intercepted. The customs officers reported that there was no legislation in place to prevent the entry of illegal ODS, even though imports were banned.

[3] A decree adopted in 2005 banned the import of CFCs, halons, carbon tetrachloride, methyl chloroform, and methyl bromide.

[4] The Copenhagen Amendment of 1992, the Montreal Amendment of 1997, and the Beijing Amendment of 1999.

Awareness of Ozone Depletion

The national ozone unit carried out some activities aimed to build public and industry support for policies on ozone protection. Workshops were reported by newspapers, radio, and TV. Contests were held for posters and essays on ozone issues. A brochure, t-shirts, caps, and pens were distributed. The impact of these awareness activities cannot be evaluated quantitatively, because—as in many other countries—a baseline to measure impact was not developed.

Impact Driver 2: Activities in Refrigeration and Fire Protection Sectors

Training of Refrigerant Technicians

To encourage the reuse of existing CFCs, the project provided training and equipment to technicians who service and repair refrigeration equipment. About 60 percent of technicians (3,365 of a total of about 5,600) were given comprehensive training in 2002–07, and small numbers subsequently. Trainees who passed the course received a certificate and a manual. Good practice guidelines were also published. However, about 30 percent (1,800) of the country's technicians have not been trained. Because the servicing of air conditioning units in vehicles used 9 percent of total CFC imports in 1998 (110 ODP tonnes), the project trained 800 vehicle technicians. However, because restrictions on ODS emissions were not enforced, only one garage collected ODS from air conditioning units in Astana.

Equipment for Capturing Refrigerants

The GEF project supplied 754 machines for capturing CFC refrigerants, 50 manual pumps/bags, and other items. The equipment was distributed to businesses that attended the training courses. The businesses valued this equipment because it avoided the cost of purchasing new CFCs. Some reported difficulties in obtaining spare parts. The equipment was used during the project, but for diverse reasons was not used much afterwards.

Fire Protection Sector

The GEF project provided equipment to the State Fire Department (SFD) for collecting and storing halon for reuse until halon-free systems could be installed.[5] Two experts were trained to use the equipment, but they left and were not replaced. The equipment probably was not used after 2003. SFD published a book on halon reduction methods and kept a database on halon users in 2002–06; about 85 tonnes of halon were collected. However, SFD is not financed by the central budget and did not have funds to continue this work.

ODS Capture and Destruction

About 700 businesses that received equipment were to report on the amounts of ODS captured, but only about 30 percent submitted reports. Several factors undermined ODS collection/disposal efforts: for example, there is no mandatory reporting of data on ODS collection; also, because legislation did not prohibit ODS emissions, technicians could simply release unwanted ODS to the air. Nevertheless, some businesses voluntarily collected and stored unwanted ODS, and were frustrated by the lack of a safe disposal method. Kazakhstan has no facilities for destroying ODS, and, for cost reasons, ODS are generally not taken to other countries for destruction.

Impact Driver 3: Sustainability of Businesses That Adopted Alternatives

The GEF project assisted with the purchase and installation of ODS-free equipment in a number of businesses.

[5] The budget for halon recovery equipment was $163,231.

- In the past, 145 ODP tonnes of CFCs were used for blowing rigid and flexible foam materials used for insulation, furniture, and other applications. The GEF provided $1.2 million for alternative equipment, trials, and training for about 33 **foam-making** businesses. Workers reported fewer breathing problems with the alternative systems, and foam quality improved in some areas. However, after the project, several companies switched from the chosen alternative (water) to HCFCs, aiming to improve insulation quality. Adoption of HCFCs contradicted the business/project letters of commitment, which stated that "only zero-ODP technology will be used." In the flexible foam sector, most businesses closed down because they could not compete with cheaper foam products made in Russia.
- The GEF project provided $99,000 to eliminate 6 ODP tonnes of CFC in a business that used **CFC as a solvent** when making liquid oxygen and nitrogen used in the manufacture of chlorinated products. Equipment was installed, but it was not operational because it was not certified. Certification would cost about $150,000–180,000.
- The GEF evaluation interviewed five businesses that **service refrigeration equipment**, a sector to which the GEF provided $2.5 million for training and equipment. Most businesses valued the training and found that the equipment reduced their expenditure on CFCs. Spare parts could usually be obtained. In several areas, the equipment was barely used because it was provided after the majority of CFCs had been phased out.

Threats to ODS Phaseout

Illegal Trade

Some businesses reported that CFCs imported from Russia and China were available locally at a low price. Few customs officers were trained in ODS legislation and detection, and they lacked suitable detection equipment. The national ozone unit had no plans to address this situation.

Government Commitment

Legislation, enforcement, and plans were lacking in several areas. For example, the legislation does not require the collection and storage of halon, and there was no halon management plan. Several amendments to the Montreal Protocol have not yet been ratified. Imports of methyl bromide have restarted recently, despite a government commitment to phase out this ODS by 2004. The national ozone unit depended entirely on funding from international donors and contracts, indicating a lack of government commitment to ozone layer protection.

Refrigeration Sector

About 30 percent of refrigerant technicians were not trained and certified. About half of the refrigeration and air conditioning equipment is currently estimated to use HCFCs. The suspension, due to the economic crisis, of registration requirements for businesses using ODS is likely to weaken the government's ability to track and control ODS use.

Implementing Agency

UNDP and UNEP were the joint Implementing Agencies for the GEF project. The GEF required feasibility studies when projects were developed, including checks on businesses' financial viability. But UNDP, UNOPS, and UNEP did not adequately examine businesses' needs and circumstances, with the result that some equipment provided by the project has not been used or was used only for a short time. Some project activities were subject to long delays. For example, the continuation of an institutional strengthening project

was approved by the GEF in April 2007, but UNEP did not release funds until 2.5 years later.

Impact on ODS Phaseout

The project aimed to phase out 679 ODP tonnes in four years; it succeeded in phasing out 564 ODP tonnes, so 83 percent of the target was achieved. Kazakhstan met its phaseout commitments on time for halon, methyl chloroform, and carbon tetrachloride, and was one year late for CFCs. Although the country initially achieved its commitment to phase out methyl bromide imports by January 1, 2004, imports have recently restarted. Three amendments of the Montreal Protocol remain unratified.

5.2 Russian Federation

Background

The Russian economy underwent substantial changes during the 1990s as it moved from a centrally planned economy toward a free market system. In 1992 Russia consumed about 49,000 ODP tonnes in aerosols (46 percent of total), refrigeration (27 percent), fire suppression (14 percent), foam (11 percent), and solvents (2 percent). It produced 74,000 ODP tonnes of ODS, about 10 percent of global ODS production.

In order to comply with the Montreal Protocol, Russia was supposed to phase out the production and consumption of halon by January 1994, and of CFCs, methyl chloroform, and carbon tetrachloride by January 1996. The phaseout was achieved on time for methyl chloroform but not for the other ODS. Consumption in 1996 was 926 ODP tonnes of halon, 12,359 ODP tonnes of CFCs, and 542 ODP tonnes of carbon tetrachloride.

From 1995 to 2002, the Montreal Protocol adopted six decisions expressing concern about Russia's failure to meet protocol requirements, and urging action.[6] In 1998, Russia made commitments to phase out the production and consumption of halon and CFCs by June 1, 2000, and to phase out consumption of carbon tetrachloride and methyl chloroform by the same date.

Inputs

The GEF contributed $8.5 million toward a special initiative project financed by international donors to phase out ODS production. It also provided $48.1 million to phase out ODS consumption; cofinancing of about $24 million was provided by businesses. The ODS project period ran from 1994 to 2005. The projects were managed by a project implementation unit which operated from 1995 to 2004. The unit had four staff members and three consultants, and worked closely with World Bank personnel, the Ministry of Natural Resources, and other relevant bodies.

The GEF project initially focused on aerosols and refrigeration, and was later expanded to refrigeration servicing, medical devices, foam, solvents, and fire protection. The project helped businesses phase out ODS, strengthened institutional capacity for regulatory measures and other activities to support the phaseout, and established a project implementation unit to manage/implement the phaseout.

Impact Driver 1: Government Commitment

Institutions and Legislation

In 1992, the government formed an Interagency Commission for Ozone Layer Protection, attached to the Ministry of Natural Resources, which helped prepare regulations and national ODS phaseout plans. From 1995 to 2001, various legislative measures were adopted, including a national program

[6] Decisions VII/18, VIII/25, IX/31, X/26, XIII/17, and XIV/35 of the Montreal Protocol.

to promote the production of ODS-free alternatives; a system for licensing the imports/exports of ODS and ODS-containing products; quantitative limits on ODS production, followed by a ban (except for authorized exemptions); a ban on new ODS production facilities; and restrictions on ODS production and consumption. Responsibility for environmental policy was spread among various bodies, and the ministry was frequently reorganized.

Customs and Border Security

There are 126 regional customs officers and 690 border checkpoints. Some training programs were put in place to familiarize customs officers with ODS issues, but personnel changes and the lack of ODS detection equipment mitigated their effectiveness.

Awareness of Ozone Depletion

The project implementation unit organized publications and media coverage. Businesses were informed of the need to phase out ODS by various sources. There was no special program conducted by the Ministry of Natural Resources to raise public awareness of ozone-related issues.

Impact Driver 2: Activities in Refrigeration and Fire Protection Sectors

Training of Refrigerant Technicians

In 2002, trainers from 24 regional refrigeration servicing centers were trained. Businesses then organized the training of technicians in their region, using the project's training materials. More than 600 technicians were trained, but this was a small fraction of the total number of technicians. Legislation did not require certification, with the result that ODS were poorly handled by many untrained technicians. Special training was provided in businesses that installed flammable ODS substitutes; this was supervised by local safety authorities.

Equipment for Capturing Refrigerants

The GEF project supplied refrigeration servicing centers in about 24 regions with equipment for recovery and reclaiming of refrigerants so that CFCs could be reused. While portable recovery machines were widely used, the refrigerant recycling machines were difficult to transport and were little used. Data on the quantity of refrigerant recovered were collected by the project implementation unit from 1998 to 2004, but no statistics were available. Overall, the project in the refrigeration servicing industry was not implemented in a systematic manner and not based on a refrigerant management plan.

Fire Protection Sector

The existing systems that were designed to use halon could not easily use substitutes, resulting in a demand for halon's capture and reuse. Several businesses acquired their own halon capture equipment, and recovered a total of more than 400 tonnes of halon in the period 2000–08.

Impact Driver 3: Sustainability of Businesses That Adopted Alternatives

GEF project funds assisted with the purchase and installation of ODS-free equipment in 12 businesses. The GEF evaluation visited a selection of these: two aerosol producers, one foam producer, two former ODS production facilities, a halon recycling company, a chemical research center, and a refrigerator producer, as well as two refrigeration servicing centers. In some cases, the alternative technologies were selected without full discussion with the businesses and with limited examination of any business implications. The companies involved in the project became almost or entirely ODS-free. The adoption of alternatives typically caused disruption and changes in production equipment and working practices, but training helped with the adaptation. Some have

expanded their operations and increased their number of employees as a result of the project, while others have become more financially stable.

- In the **aerosol products** sector, the GEF funded $10.9 million to eliminate 2,317 ODP tonnes of CFCs with alternative substances (hydrocarbons or carbon dioxide) in two businesses that manufacture products in aerosol spray cans. One business had no complaints with the equipment supplied, except that the hydrocarbon storage had to be upgraded. Another business received substantial upgrading of its facilities. Alternative CFC-free equipment was also provided to a pharmaceutical company making medical skin treatment aerosol products. However, this company is still making CFC-based metered-dose inhaler products. A CFC-free metered-dose inhalant is undergoing certification in the Ministry of Health.
- The GEF provided funds of $1 million to a business for the adoption of alternatives for 39 ODP tonnes of CFC in the **manufacture of foams** for building insulation. The transition to the new technology was not easy, and there were no training materials provided. There was a significant initial cost for safety-related equipment and plant modifications, but the operating costs of the alternative were significantly lower than CFCs. The business later bought more of the same equipment to increase its production and product range.
- In 1993, about 12 manufacturers in Russia produced about 3.5 million refrigerators per year. Economic transformations led to the production of less than 1.2 million refrigerators in 1996. The GEF project provided funds of $0.6 million to one domestic **refrigerator producer** to phase out 115 ODP tonnes of CFCs. The company established strong business ties with another company in Belarus that received GEF assistance, increasing product range and financial security.
- The **refrigeration service centers** that received equipment for capturing CFCs reported that the lighter, portable machines were valued because they avoided the need to buy refrigerant. Equipment that fitted existing CFC refrigerators with a different refrigerant was not used because the cost was too high for clients. Businesses reported that CFC-dependent refrigerator components were still being imported, which increased the demand for CFCs. Repairing a domestic refrigerator by installing a CFC compressor (available from Belarus) was about half the cost of buying a new refrigerator.
- Funds from the special initiative were used to pay compensation to an **ODS producer** for shutting down the production of 6,124 tonnes of CFCs and eliminating ODS production capacity. The company considered the payment appropriate for shutting down production, but noted that operating costs increased in the facility due to an imbalance in the production of various chemicals.

Threats to ODS Phaseout

Illegal Trade

Businesses reported that CFCs were readily available on the local market; the labels indicated China might be the source. There is a risk that illegal trade will increase due to a lack of comprehensive and effective border controls and policies. Customs officers generally were not trained in ODS issues and lacked detection equipment.

Government Commitment

The Ministry of Natural Resources and Ecology is currently focused on the development of financial returns related to mineral resources, leaving other environmental issues such as ozone protec-

tion at risk because they receive less staff time. The project implementation unit was abolished in 2004 when the GEF project ended. Data on ODS are not collected in a systematic way. Legislation is lacking in key areas, such as a ban on releasing ODS from equipment. Up-to-date manuals and guidelines on alternatives and good practices have not been systematically disseminated. ODS phaseout plans have not been updated to support the adoption of ODS-free alternatives in medical aerosols, solvents, fire protection, and sectors that use HCFCs. World Bank personnel advised that $3 million remained in the special initiative project account, which could be disbursed if well-planned proposals were put forward by the Ministry of Natural Resources and Ecology.

Continued CFC Consumption

Russia did not complete the phaseout of CFC consumption in two sectors (medical aerosols and solvents in aerospace) and annually requests special exemptions from the Montreal Protocol. These sectors need to take action to adopt suitable alternatives. Recent meetings between the aerospace sector and experts from the Montreal Protocol's technical panel may lead to some investigation of alternatives, but comprehensive plans need to be developed and implemented.

Halons

National experts estimated that 5,000–11,000 tonnes of halon were still installed in firefighting equipment, creating a strong demand for imports of used halon. Halon emissions will continue without legislation and a national plan to ensure that alternatives are adopted.

Implementing Agency

The Wold Bank was the Implementing Agency for the GEF projects in Russia. Institutional strengthening was not fully achieved, with the result that legislation is absent in some areas, as are some sectorwide plans. The World Bank's economic viability test for businesses may have been too stringent in some sectors, and some businesses were not adequately consulted with about the choice of alternative technology. Calculation of funding needs was based on unrealistic figures in several cases. For example, the funds for two aerosol businesses were based on a maximum capacity of 20 million aerosols per year, although their production level was 4.3 and 6 million, respectively, in 1996. GEF funds were used for substantial upgrades at a factory site (including new buildings to avoid production downtime, road paving, water and power connections), although general upgrading is not eligible for funding under the Montreal Protocol and MLF guidelines.

Impact on ODS Phaseout

Russia phased out the production and consumption of methyl chloroform before the committed date, but was six months late in meeting the target for halon. Production and consumption of carbon tetrachloride (for non-exempt uses) occurred after the phaseout target, but appears to have been zero since 2003. Production and consumption of CFCs was mainly phased out in 2000, but some continued at low level. The closure of most ODS production by Russia was considered to have reduced the global illegal ODS trade at that time. Currently, CFCs are still produced/consumed for two uses (medical aerosols and aerospace), and Russia continues to rely on the annual approval of special exemptions by the Montreal Protocol for these.

5.3 Ukraine

Background

Ukraine became independent of the Soviet Union in 1991, resulting in many political and economic

changes. Economic expansion occurred in 2000–07 until the recent global economic crisis. In the early 1990s, Ukraine used ODS in refrigeration (about 51 percent of total ODS), aerosols (22 percent), solvents (14 percent), and foam (13 percent).

To comply with the Montreal Protocol, Ukraine was supposed to phase out the consumption of halons by January 1994, and of CFCs and two other types of ODS by January 1996. These dates were not achieved. Consumption in 1996 increased to 1,402 ODP tonnes of CFCs, 64 ODP tonnes of halons, and 8 ODP tonnes of methyl chloroform and carbon tetrachloride. In 1998, its production of carbon tetrachloride increased to 2,820 ODP tonnes. The Montreal Protocol adopted decisions in 1995 and 1998 which requested Ukraine to take relevant action.[7] Ukraine made commitments to phase out the consumption of CFCs, halons, methyl chloroform, and carbon tetrachloride by 2002. The protocol meeting specifically rejected Ukraine's request to continue its imports of CFCs until 2010 for servicing refrigeration equipment.

Inputs

The GEF provided $23.2 million to assist Ukraine in phasing out 1,464 ODP tonnes of ODS and to comply with the Montreal Protocol's requirements. GEF funding was supplemented by cofinancing of about $4 million from businesses. The project ran from 1998 to 2004.

The project infrastructure was slow to be established. A project implementation unit was set up and operated under the Inspectorate of the Ministry of Environmental Protection. It took some time to develop suitable local expertise for handling procurement, finance, and management. World Bank staff provided overall supervision. The project faced a number of administrative barriers, such as frequent changes in ministry personnel and the slow clearance of documents by government departments including the treasury. There were lengthy delays in customs clearance for equipment purchased by the project.

The project installed non-ODS technologies in about eight businesses that used ODS, provided training and established several service centers for reusing CFCs, set up a center for storing and reusing halon, and developed a national legislative framework to support ODS phaseout.

Impact Driver 1: Government Commitment

Institutions and Legislation

From 1998 to 2004, the government adopted a number of legislative measures relating to ODS, which included a system for licensing the import/export of ODS and ODS-containing products, banning ODS imports/exports except for exempted uses, a program for the production of fire-extinguishing equipment based on ODS-free substances, and a program for ending the production and use of ODS in Ukraine. Import permits and licenses were checked by regional ecological inspectors and customs officers. However, the roles and responsibilities of the Ministry of Environmental Protection and its Inspectorate were poorly defined with respect to ODS, which resulted in duplicative effort and uncompleted tasks in some areas. In the second quarter of 2009, an ozone unit was established in the ministry, and four positions within the ministry's Department of Air Protection and Climate were filled. Responsibilities related to ODS were transferred to the department's newly organized branch on ozone and greenhouse gases.

Customs and Border Security

The involvement of customs officers in ODS activities is an important cornerstone of any

[7] Decisions VII/19 and X/27 on Compliance with the Montreal Protocol by Ukraine.

national policy on ODS. There are about 180 border checkpoints. The GEF project did not provide ODS detection equipment and training. The Inspectorate of the Ministry of Environmental Protection took the initiative to hold joint annual training courses on ODS issues with customs officers and ecological inspectors. They used UNEP's publicly available documents on illegal trade, and administered a questionnaire to determine if officers followed the legislative and licensing requirements. No cases of illegal trade were reported, and the GEF evaluation was unable to obtain statistics on the percentage of customs officers trained.

Awareness of Ozone Depletion

No widespread awareness campaign was conducted, but the project implementation unit mounted a modest public information program. The unit informed the businesses that were involved in the project about ODS problems and alternatives, and expected them to pass on this information to other ODS-using businesses that did not participate in the project. Again, impact cannot be evaluated quantitatively because no baseline measure had been developed.

Impact Driver 2: Activities in Refrigeration and Fire Protection Sectors

Training of Refrigerant Technicians

The GEF project aimed to eliminate about 500 tonnes of CFC imports by enabling technicians to capture and reuse existing CFCs when they serviced or repaired refrigeration equipment. Two training centers were established with qualified instructors, equipment, and manuals. More than 300 technicians (a modest percentage of the total) were trained in six regional servicing centers. The training is now paid for by the technicians. National legislation does not require qualifications, so there is no incentive to undertake training.

Equipment for Capturing Refrigerants

The project distributed a large number of machines for capturing ODS to regional refrigeration servicing centers which were connected to many smaller outlets.

Fire Protection Sector

GEF funds of $493,900 assisted in the establishment of a halon collection and cleaning facility at an institute. Halon was collected using a specially equipped truck, and purified halon was returned to the users. The GEF also provided $275,000 to establish a halon information center at the national fire safety research center. It aimed to compile data, draw up a halon management plan, review international codes and standards, and promote the introduction of ODS alternatives. About 17 harmonized standards were finalized, while about 6 remain to be developed. Also, an estimated 1,511 ODP tonnes of halon is still installed in equipment. Much of this is in the fire-suppression systems of about 16 gas pumping stations located on gas pipelines.

ODS Capture and Destruction

In the period 2005–08, almost 8 tonnes of halon was captured. Although data on captured and recycled CFCs were collected regularly and reported to the project implementation unit during the period when it existed, the GEF evaluation was unable to obtain reports on CFC quantities. ODS destruction facilities do not exist in Ukraine.

Impact Driver 3: Sustainability of Businesses That Adopted Alternatives

The GEF evaluation visited three businesses: a refrigerator manufacturer, an aerosol manufacturer, and a refrigeration servicing center. In all, the GEF project helped nine businesses adopt alternative technologies; other companies that applied for funds failed to provide necessary information

or did not pass the financial viability test required by the World Bank. Because the transition at two businesses was particularly complex, the project implementation unit designated a procurement expert to facilitate the implementation process; this measure proved effective.

- GEF funds of $9.8 million were provided to a domestic **refrigerator manufacturer** (Nord) to eliminate about 500 ODP tonnes of CFCs. The company was actively involved in the choice of technology and selection of suppliers. The adoption of non-ODS technology required additional work on new materials, compatibility, and other aspects; also, suppliers of new parts often charged more. However, Nord was satisfied with the transition and experienced strong growth in production until the global economic crisis in 2008.
- The GEF provided about $3.1 million for eliminating about 500 ODP tonnes of CFCs in Ukranian Aerosols, a company **producing aerosol products** for households and vehicles. Propane alternatives were adopted and, in contravention of GEF guidelines, HCFC ODS were also adopted. Equipment installation took more than a year, during which time the manufacturer was not able to operate. However, the business recovered later. Despite various deficiencies, the company concluded that the project had had a positive impact on its operations.
- The machines for capturing ODS were valued by **refrigeration servicing businesses** because they were portable and generated additional income, which improved profitability. When businesses noticed these benefits, they often purchased additional machines.

Threats to ODS Phaseout

Illegal Trade

The risk of illegal trade appeared high. Customs officers did not have ODS detection equipment, and the extent of their training was not clear. CFCs were still on the market in Ukraine, and a demand for CFCs existed, particularly for industrial refrigeration equipment.

Government Commitment

The most recent legislation on ODS was adopted in 2004, although there remain many areas where additional controls and updates are needed to strengthen existing regulations. At the time of this evaluation, there were no staff in the ozone office in the Environmental Ministry (all four staff posts were vacant). The roles of the ministry and the inspectorate were not clearly defined. There were no plans to adopt alternatives for most of the remaining installations that use halons, and the halon management plan was not fully implemented. HCFCs have been adopted as interim CFC substitutes to a significant extent in some sectors, and this problem remained to be addressed.

Methyl Bromide and Carbon Tetrachloride

The ministry believed that about 100 tonnes of methyl bromide is in stock and that about 8–10 tonnes are used each year for stored grain. The quantity of methyl bromide used for quarantine (which is exempt from the Montreal Protocol's phaseout requirements) and for normal purposes needs to be clarified. The GEF allocated $4.7 million in 2005 to assist Ukraine in phasing out methyl bromide and carbon tetrachloride. However, the project was in abeyance due to the complex political process in Ukraine.

Implementing Agency

The World Bank was the Implementing Agency for the GEF project in Ukraine. Initially, there were frequent changes in Bank staff, which complicated communications and slowed activities. The presence of Russian-speaking staff in the Bank was an asset. The initial disbursement of funds for insti-

tutional strengthening was delayed, and the start-up of the project implementation unit did not go smoothly. Equipment supplied to the refrigeration servicing sector was selected by international consultants based on a bidding process, and sector businesses reported that they had not been consulted at that stage.

Impact on ODS Phaseout

Ukraine achieved its commitments of phasing out consumption of halons, methyl chloroform, and carbon tetrachloride before 2002. However, imports of CFCs continued until 2005 for medical aerosols as a special exemption authorized by the Montreal Protocol. The GEF project assisted in the phaseout of 800–1,400 ODP tonnes, based on the historical consumption reported from 1997 to 2001.

5.4 Uzbekistan

Background

Uzbekistan became independent of the Soviet Union in 1991. It used CFCs and, to a lesser extent, other common types of ODS. In the mid-1990s, there was a significant domestic demand for CFCs for refrigeration and air conditioning equipment as a result of company privatization and expanded economic activity. Uzbekistan did not produce ODS, but imported them mainly from Russia.

To comply with the Montreal Protocol, Uzbekistan was supposed to phase out its imports of halons by January 1994, and its imports of CFCs and two other types of ODS by January 1996. The phaseout was achieved on time for halons, but imports of CFCs and other ODS continued after the phaseout date; imports in 1996 amounted to 260 ODP tonnes of CFCs and 12 ODP tonnes of two other types of ODS. The Montreal Protocol in 1998 adopted a decision by which Uzbekistan made commitments to adopt national legislation to control the imports of ODS chemicals and equipment using ODS, and to complete the required phaseout of ODS imports by 2002.[8]

Inputs

The GEF provided about $3.2 million to help Uzbekistan phase out 142 ODP tonnes of ODS in the refrigeration sector and comply with the Montreal Protocol's requirements. This funding was supplemented by $31,000 from the government and $121,830 (in-kind) from a refrigerator factory. The GEF project period ran from 1998 to 2007. UNDP and UNEP were the joint Implementing Agencies.

The State Committee for Nature Protection was responsible for preparing and implementing subprojects, in cooperation with international consultants designated by the Implementing Agencies, as well as for monitoring and reporting on their progress. A national ozone unit was set up in 2001, almost two years after the subprojects had begun. The unit was funded by the state budget, revenue from ODS license fees, and international sources such as the GEF. The State Committee for Nature Protection also had inspection staff in 15 regional offices around the country which issued compliance certificates to businesses for ODS-related activities and received ODS tax payments.

The GEF project focused on CFCs in the refrigeration sector. It provided training and equipment for refrigeration servicing technicians so they could reuse existing CFCs; eliminated the use of CFCs in the manufacture of domestic refrigerators by providing alternative equipment; and strengthened government capacity to manage ODS phaseout, including training customs officers to combat illegal trade in ODS.

[8] Decision X/28 on Compliance with the Montreal Protocol by Uzbekistan.

Impact Driver 1: Government Commitment

Institutions and Legislation

Several legislative measures were adopted to reduce and phase out ODS, including implementation of a system controlling the type and quantity of ODS imported/exported; customs controls; a ban on imports of most CFCs and of refrigeration and air conditioning equipment containing CFCs; a tax on ODS imports and ODS-containing products; obligatory certification of goods such as refrigerators, air conditioners, and heat pumps; qualification requirements; and requirements for businesses to report annually on the type and quantity of ODS imported, used, and stored. The national ozone unit maintained a database of information reported by businesses. Environmental inspectors inspected businesses, verified reports, and followed up on suspected infringements.

Customs and Border Security

The national ozone unit established a range of activities in coordination with the State Committee for Nature Protection and the State Customs Committee to combat illegal trade in ODS. The GEF project supplied the latter committee with 19 refrigerant identification machines to detect illegal refrigerants. In 2002–07, the GEF project trained 30 officials as trainers, and trained more than 320 customs officers and inspectors. The officers learned about ODS issues, the legislation, and how to identify different types of ODS and inspect documentation. They took an examination at the end of the course. Training was supported by manuals on controlling the import and export of ODS products and equipment. Customs officers have continued to check the imported refrigerators for ODS and to test refrigerant compressors as necessary. Fines for smuggling ODS are small, but drivers who commit offenses face extremely long administrative delays on future trips, and this acts as a significant deterrent for smugglers.

Awareness of Ozone Depletion

In 2001–03, the national ozone unit carried out various activities aimed at building public support for legislation and policies on ozone layer protection, including placement of 25 articles in the mass media, participation in 33 radio and TV shows, 41 lectures, distribution of 4,400 books for children and 14,000 calendars, a postage stamp, a play, and an annual ecological festival. Here too, the impact of awareness activities could not be evaluated quantitatively because no baseline measure had been developed.

Impact Driver 2: Activities in Refrigeration and Fire Protection Sectors

Training of Refrigerant Technicians

The GEF project aimed to capture and reuse existing CFCs, following the ban on imports of new CFCs, by providing training and some equipment to technicians who service and repair refrigeration equipment. About 75 percent of technicians (1,648 personnel) were given comprehensive theoretical and practical training in 2001–07. The training was assessed as satisfactory by employers and the GEF evaluation. Quality control practices included expert supervision of trainers during the early stages (an issue that was not addressed in other countries) and a requirement for technicians to pass an examination. Technicians were encouraged to update their knowledge every three to four years. The national ozone unit has drafted legislation aimed at addressing the problem of an estimated 450–500 unregistered technicians, and for adopting regulatory standards and codes of practice for handling refrigerants; the legislation's adoption, however, is expected to take several years.

Equipment for Capturing Refrigerants

The GEF project supplied 300 manual pumps, 430 machines for capturing refrigerants such

as CFCs, and a range of other equipment. This equipment was distributed to 100 businesses, both small and large, focusing on the most populated areas. The national ozone unit maintained a database on equipment (location, functionality, and amount of ODS captured), and redistributed the equipment in cases where it was not being used effectively. The unit and businesses reported that the equipment was generally reliable, but new filters were needed frequently (every 75 hours of operation), and filters were in short supply.

ODS Capture and Destruction

Businesses that received equipment were contractually obligated to report on the amounts of ODS captured and decontaminated. About 117 tonnes of CFCs were collected from equipment, mainly in the project's first three years. The national ozone unit, noting that some businesses collected more ODS than others, reallocated the equipment to more efficient businesses in order to increase ODS collection. Legislation adopted in 2000 banned the disposal of refrigerators in landfills and required ODS in cooling circuits (but not in foam) to be collected by metal recycling facilities. Uzbekistan does not have facilities for the destruction of unwanted ODS, except for small-scale equipment which is costly and slow. As a result, servicing technicians often store unwanted ODS, where it can slowly leak, emitting ODS into the atmosphere.

Impact Driver 3: Sustainability of Businesses That Adopted Alternatives

The evaluation assessed the sustainability of adopted alternatives in one refrigeration manufacturer and five refrigeration companies in the servicing sector.

- Uzbekistan has one **manufacturer of domestic refrigerators** (SINO), a state enterprise that is regarded as strategically important. In the early 1990s, SINO made about 210,000 refrigerators per year; following Soviet market collapse in the mid-1990s, SINO's production fell to less than 28,000 refrigerators per year. The GEF provided financing of $1.5 million for equipment that used ODS alternatives for refrigerator manufacture, with the aim of eliminating 35 ODP tonnes of CFCs. SINO provided cofinancing of about $3.0–3.5 million. Although SINO was satisfied with the equipment, the project took 15 months longer than planned.
- In the **refrigeration servicing** sector, the evaluation interviewed five businesses, including large and small refrigeration service and repair operations, and a refrigerated railway wagon refurbishment workshop. The businesses valued the training of technicians, because it improved their skill and volume of work. One business reported that some equipment was unsuitable; two mentioned difficulties in obtaining filters or spare parts. Other businesses found the equipment useful, and two reported that it helped their profitability.

Threats to ODS Phaseout

Illegal Trade

Government officers have detected numerous cases of illegal ODS imports since 2002. A business owner informed the GEF evaluation of the high risk of illegal trade, noting that the black market price of CFC-12 is cheaper than alternative refrigerants. In 2008, the national ozone unit formally requested an increase in its customs staff. The penalties for illegal imports are relatively small at present.

Government Commitment

The government is fully committed to eliminating the use of all ODS, and much has been accomplished. Additional legislation and action are needed in some areas, such as measures to address

HCFC imports and to promote the adoption of environmentally friendly alternatives. The adoption of new legislation tends to be a slow process.

Halons

In 2000, Uzbekistan banned all imports of halons, except for authorized exemptions. Halon is used in fire extinguisher systems in about 22 aircraft, and some used halons are imported for refilling.[9] However, the national plan for ODS did not address the use of halon. There was no evidence of a halon management plan.

Methyl Bromide

This pesticide is imported and used for quarantine treatments, a usage exempted from the Montreal Protocol's phaseout requirements. There was no evidence of strict tracking and accountability procedures to ensure that any methyl bromide imported for quarantine is not diverted to other uses.

Implementing Agency

UNDP and UNEP were the joint Implementing Agencies for the GEF project. UNDP did not follow MLF guidelines in drafting the SINO factory project budget, because funding was calculated on a production run of 250,000 refrigerators per year, rather than actual production, which has averaged 4,760 refrigerators annually since 2003. As a result, the funding level was about 10 times higher than permitted under MLF guidelines. The SINO project was also slow to make progress, so the national ozone unit made 18 visits to the factory to provide assistance and supervision that UNOPS failed to provide. There was a lack of clarity in operational procedures and other long delays by Implementing Agencies, such as a 17-month delay from the signing of the project until release of the first payment. UNEP was late in delivering training manuals and in paying for training. A more recent delay occurred when the GEF approved a continuation of an institutional strengthening project in April 2007, but as of May 2009 the national ozone unit had not received the funds.

Impact on ODS Phaseout

Uzbekistan's project achieved the objective of phasing out 142 ODP tonnes of ODS. The government has reported zero imports (consumption) of all relevant ODS since 2002. Uzbekistan also met the targets and additional commitments set by the Montreal Protocol decision in 1998.[10]

[9] Imports of used ODS are not included in the Montreal Protocol's calculations of annual ODS consumption.

[10] Decision X/28 on Compliance with the Montreal Protocol by Uzbekistan.

6. Comparison of Agency and Donor Performance

6.1 Scope and Objectives

The GEF project to phase out ODS in 18 CEITs was implemented through the World Bank and UNDP-UNEP. Although the approaches of the Implementing Agencies were similar, the evaluation looked to determine Agency differences in achievements in ODS reduction and phaseout across the CEITs by examining such parameters as total expenditure, quantity phased out, amount of time for phaseout, and cost-effectiveness.

The evaluation also compared GEF funding of ODS phaseout in CEITs with the same activity funded by the Multilateral Fund and implemented through the World Bank and UNDP-UNEP in developing countries. In this regard, four CEITs were selected for in-depth evaluation: Kazakhstan, Russia, Ukraine, and Uzbekistan. These CEITs were compared with selected developing countries with similar GDP, ODS consumption, and per capita income: Egypt, Brazil, Cameroon, and Romania, respectively.

The relationship between GDP and reported ODS consumption was also examined to determine to what extent the GEF and MLF financial assistance had affected ODS consumption and whether this assistance could effectively decouple ODS consumption from GDP. Positive findings from this examination of decoupling would have useful implications for funding interventions in other portfolios such as persistent organic pollutants and climate change.

This chapter reports on the work that compared

- the performance of the Implementing Agencies (the World Bank and UNDP-UNEP) in their activities that led to the phaseout of ODS in 18 CEITs,
- the performance of the donor agencies (the GEF and the MLF) in their work to phase out ODS in the four selected CEITs (for the GEF) and the four selected developing countries (for the MLF).

The criteria used for these two sets of comparisons were as follows:

- Total expenditure
- Amount of ODS phased out
- Time required to phase out ODS
- Cost-effectiveness
- Efficiency of expenditure

The chapter next looks at the correlation between GDP and ODS consumption in four selected CEITs (GEF-funded countries) and four selected developing countries (MLF-funded countries) to examine the value of the GEF and MLF finance in promoting CEIT and developing country compliance with the Montreal Protocol, and the value of the GEF and MLF finance in decoupling ODS consumption from GDP.

Finally, the chapter reports on work that examined the impact of the funding on improving compliance of CEITs with the requirements of the Montreal Protocol, as measured by the reduction in annual appearances by CEITs before the Montreal Protocol's Implementation Committee. Almost 84 percent of the CEITs in the GEF portfolio had experienced difficulty with compliance, and one of the aims of the GEF finance was to assist the CEITs in bringing their ODS consumption in line with protocol requirements. Compliance was thus an important measure of success for the GEF.

Further details on the material covered in the following sections is available in volume 2 of this report.

6.2 Phaseout of Production

Although production is part of the consumption equation used in the Montreal Protocol (consumption = production + imports – exports), the GEF evaluation examined production separately as a component of ODS reduction and phaseout. Halting production was the equivalent of "turning off the tap," and hence a fundamental and important step in eliminating ODS.

Three CEITs produced ODS: the Czech Republic, Russia, and Ukraine. Phaseout of ODS production in these CEITs was implemented through the World Bank, meaning that no comparison of Implementing Agency performance was possible:

- The Czech Republic used the GEF finance to phase out CFCs and fund a study to determine the commercial potential for production of non-CFC substances after CFC production had been closed down.[1]
- Russia halted production of CFCs and halon with financial assistance from a World Bank special initiative; production was halted prior to the start of the GEF project in 1998.
- Ukraine requested funds to halt the production of methyl bromide, but these funds were not approved by the World Bank. The production site, which has not been used since 2002, has fallen into disrepair and is unlikely to be used in the future.

6.3 Phaseout of Consumption

Annex H (available on the GEF Evaluation Office Web site as well as on CD-ROM) shows the total GEF finance provided to the Implementing Agencies in each of the 18 CEITs, the time required to phase out the ODS, and other key statistics. These data were analyzed to compare the performance of UNDP-UNEP with that of the World Bank. The results of this analysis follow.

Comparison of the World Bank and UNDP-UNEP

For each country and Implementing Agency, the quantity of ODS to be phased out at project start was the same as the maximum amount to be phased out, except in Latvia and Russia. After the project's start, Latvia imported ODS, and Russia produced and stockpiled ODS, which resulted in more ODS consumption than at project start. For these analyses, the maximum reported ODS consumption was used as the target to be phased out, even if it occurred after the project's start.

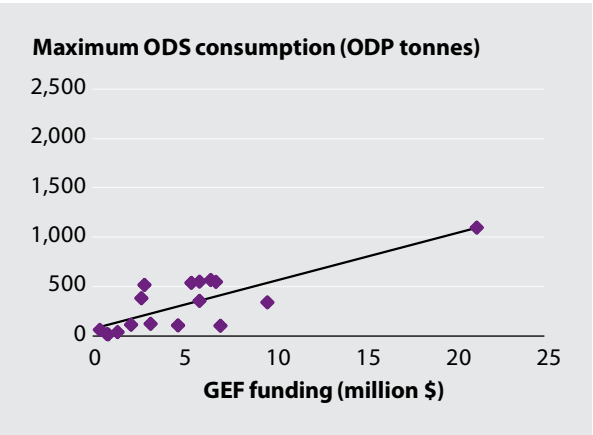
Figure 6.1 shows the correlation of GEF funding in each of 17 countries (excluding Russia)[2] that was

[1] The GEF paid $212,000 (actual expenditure) to phase out about 2,000 ODP tonnes of CFCs.

[2] The amount phased out by Russia (25,000 ODP tonnes) was so much larger than that phased out by the other countries (most were less than 600 ODP tonnes) that it would have skewed the graph unreasonably. Thus, Russia was treated as a special case for funding and quantity targeted for phaseout.

Figure 6.1

Allocation of GEF Funding to 17 CEITs by Amount of ODS to Be Phased Out



Note: Data do not include the Russian Federation.

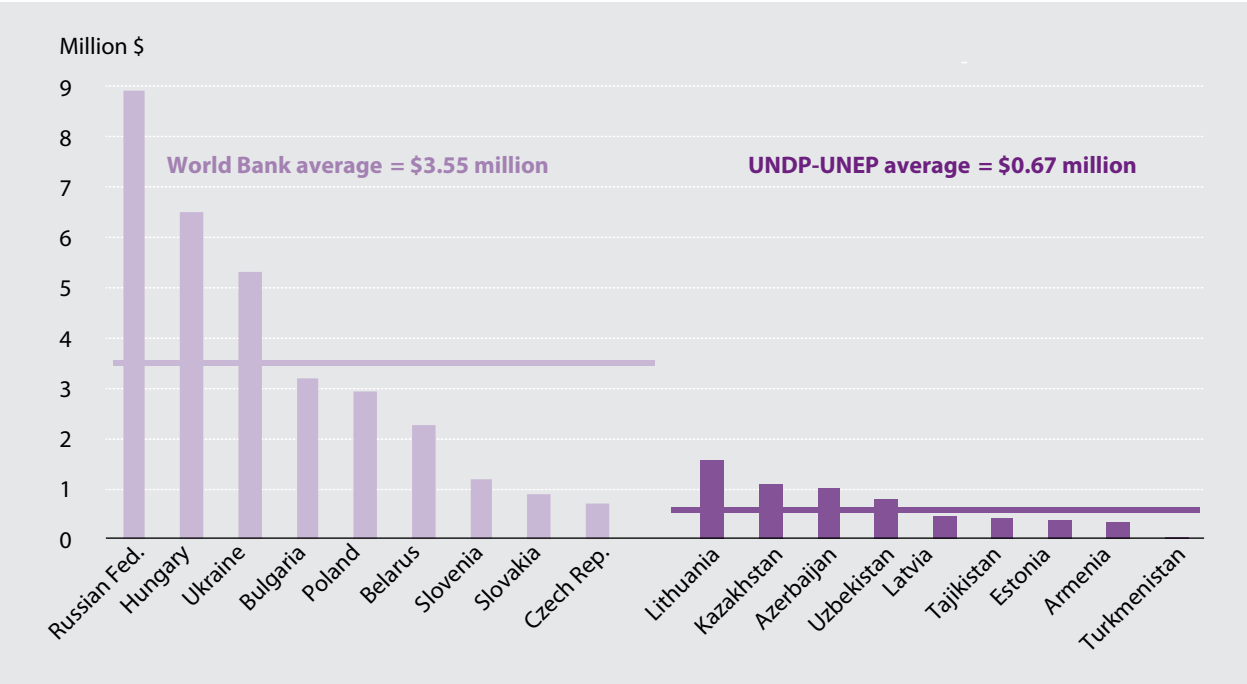
required to implement alternatives to reduce and phase out that country's ODS. The overall Pearson product-moment correlation coefficient for ODS versus funding was 0.81.

The World Bank and UNDP-UNEP received $106 million and $25.69 million, respectively, for projects in nine CEITs each, making the per country average expenditure for each Agency $11.78 million and $2.85 million, respectively. As the Implementing Agency in Russia and Ukraine, the World Bank was allocated about 55 percent of total GEF funding to eliminate significantly larger ODS consumption than in the other CEITs. At that time, Russia was one of the largest consumers and producers of CFCs in the world. The difference in expenditures between the Implementing Agencies was thus attributable to the larger size of the phase-out projects that were being implemented through the World Bank as compared to UNDP-UNEP.

The annual project expenditure in CEITs where UNDP and UNEP were the joint Implementing Agencies was $0.67 million, compared to $3.55 million in CEITs where the World Bank was the Implementing Agency (figure 6.2).

Figure 6.2

Annual Expenditure by the World Bank and UNDP-UNEP



Comparison of the GEF and the MLF

MLF expenditures to phase out ODS in Brazil, Cameroon, Egypt, and Romania averaged $30.75 million per country, compared to $18.60 million expended by the GEF in Kazakhstan, Russia, Ukraine, and Uzbekistan (figure 6.3). Although the quantity of ODS that was phased out was similar between the GEF and MLF countries, GEF expenditures averaged 40 percent less than MLF expenditures.

6.4 Amount Phased Out

Comparison of the World Bank and UNDP-UNEP

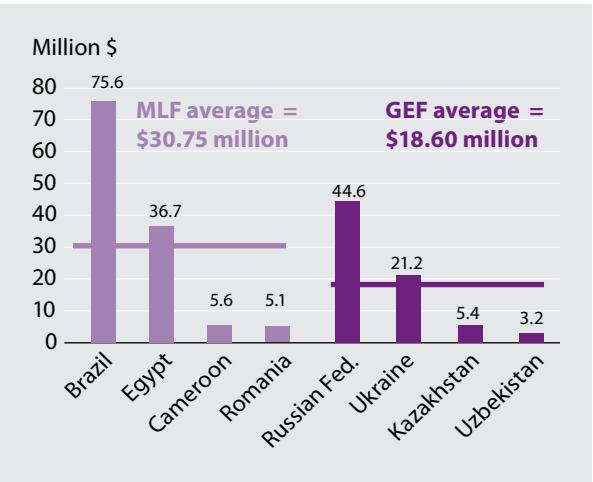
The quantities of ODS phased out in CEITs by the World Bank and UNDP-UNEP are shown in figure 6.4. The average amount phased out by the World Bank in nine CEITs was 3,326 ODP tonnes. The average amount phased out by UNDP-UNEP in nine CEITs was 121 ODP tonnes.

In general, the World Bank implemented projects that phased out large quantities of ODS; this was especially true in Russia (25,584 ODP tonnes) and Ukraine (11,000 ODP tonnes). The World Bank project portfolio in Russia included investment projects to convert five aerosol businesses that consumed about 9,800 ODP tonnes, which was about 40 percent of the World Bank's ODS portfolio. Similarly, three large projects in Ukraine (two in aerosol and one in refrigeration manufacturing) led to the phaseout of about 1,000 ODP tonnes of ODS.

In contrast, UNDP-UNEP targeted low-volume-ODS-consuming CEITs with ODS used mainly in the refrigeration servicing sector. In Kazakhstan, for example, about 60 percent of the ODS to be phased out was in the refrigeration sector, 23 percent in the solvent sector, and the remainder in foam and halon. There was a similar dominance of the refrigeration servicing sector in the other CEITs in the UNDP-UNEP portfolio.

Figure 6.3

ODS Phaseout Funding by MLF and the GEF in Selected Comparable Countries



Comparison of the GEF and the MLF

The quantities of ODS phased out in each of the selected MLF countries was generally larger than the amounts phased out in the selected GEF-funded countries, with the exception of Russia (figure 6.5) which alone phased out about 50 percent more ODS consumption than the total of the four MLF-funded countries.

There were more subprojects in each of the selected MLF-funded countries than in the GEF counterpart countries (figure 6.5). This was particularly evident in Russia, where Implementing Agencies developed 39 subprojects to phase out more than 25,500 ODP tonnes of ODS. In contrast, the Implementing Agencies in Brazil developed about seven times as many subprojects (263) to phase out about half the quantity of ODS that was phased out in Russia.

The large number of MLF subprojects in Brazil was in response to the large number of small- and medium-size businesses in the foam and commercial refrigeration sectors. These businesses

Figure 6.4

ODS Consumption in CEITs Phased Out by the World Bank and UNDP-UNEP

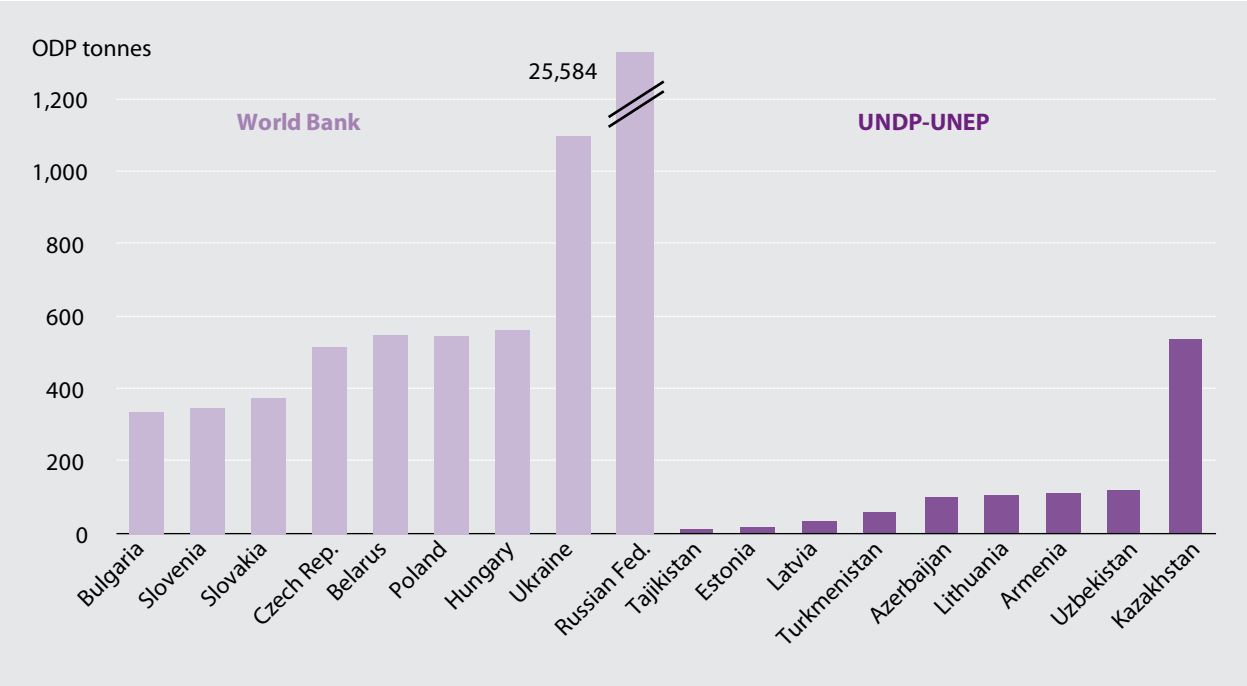
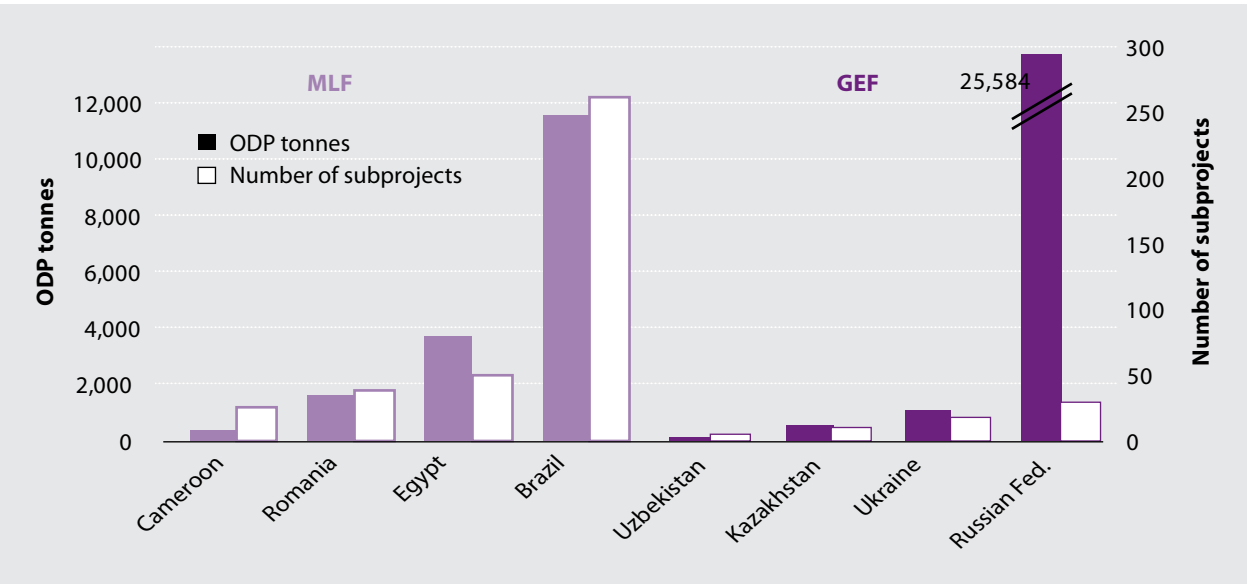


Figure 6.5

Quantity of ODS Phased Out and Number of Subprojects Conducted by the MLF and the GEF



proliferated in response to business opportunities in a free-market economy. In contrast, Russia had a centralized economy at the time of the GEF project, in which the government directed the economic activities of relatively few large industrial companies.

6.5 Time Needed to Phase Out ODS

Comparison of the World Bank and UNDP-UNEP

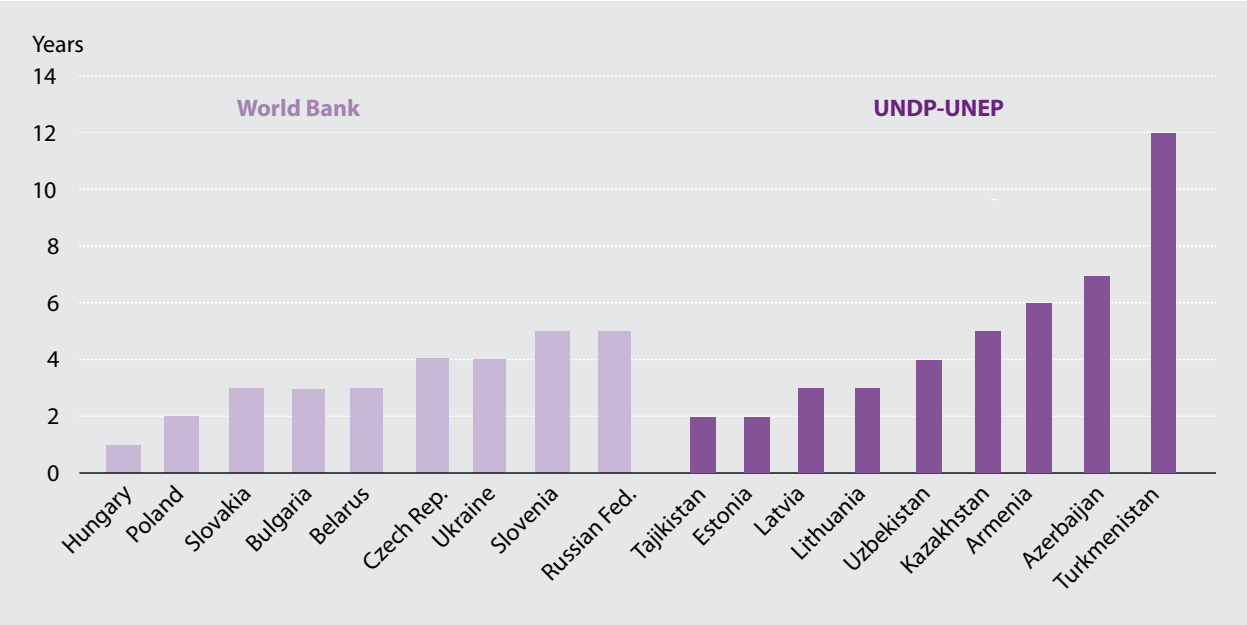
For each CEIT and Implementing Agency, the time from the start of the GEF finance until the year the country officially reported zero consumption of ODS was used to calculate the number of years that was required to phase out ODS. The average time for ODS to be phased out in CEITs where the World Bank was the Implementing Agency was 3.3 years, compared to 4.9 years for UNDP-UNEP projects (figure 6.6). When Armenia and Turkmenistan are excluded (see below), the average time for UNDP-UNEP is reduced to 3.7 years, which is similar to the average time for the World Bank.

It is reasonable to exclude Armenia and Turkmenistan from the calculation of the average as the parties to the Montreal Protocol accepted a change in categorization from developed to developing country for both countries at their requests. This change of categorization effectively extended their time to phase out ODS to January 1, 2010. The other CEITs were required to phase out their ODS much earlier than 2010 to remain compliant with the Montreal Protocol.

The World Bank commenced operations in 1994 and UNDP-UNEP in 1998; consequently, the phaseout of ODS occurred four years earlier in World Bank projects than in UNDP-UNEP projects. The Bank's early experience gained on the phaseout of ODS in these countries was shared in regional workshops that were initiated by the World Bank in the Czech Republic, Hungary, Poland, Russia, and Slovenia from 1997 to 1999.

Figure 6.6

Years Needed to Phase out ODS in CEITs with the World Bank or UNDP-UNEP as the Implementing Agency



Comparison of the GEF and the MLF

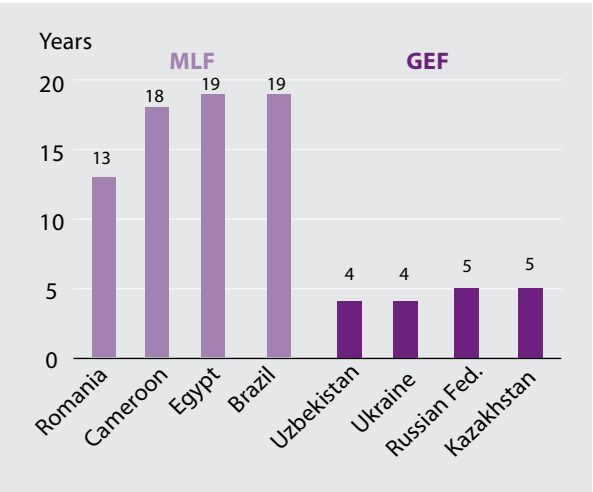
Implementing Agencies in selected countries where the MLF was the donor agency required an average of 17.3 years to phase out ODS in those countries; this was significantly longer than the average time of 4.5 years in the counterpart countries where the GEF was the donor agency (figure 6.7).

The longer phaseout time in the MLF-funded projects was due to developing countries being permitted 10 years longer to phase out ODS than developed countries. This 10-year (or longer) grace period acknowledges that the socio-economic infrastructure in developing countries is not as well developed as in developed countries, warranting the additional response time for technology transfer to replace ODS with alternatives.

On the other hand, the data also demonstrate that the four selected developing countries, with levels of ODS consumption and GDPs similar to the four selected CEITs, could have eliminated ODS in a similar time as the CEITs. Faster replacement of ODS technology with non-ODS would benefit both the ozone layer and mitigate climate change (see chapter 7).

Figure 6.7

Years Needed to Phase Out ODS in Selected Countries Where the MLF or the GEF Was the Donor Agency



6.6 Cost-Effectiveness

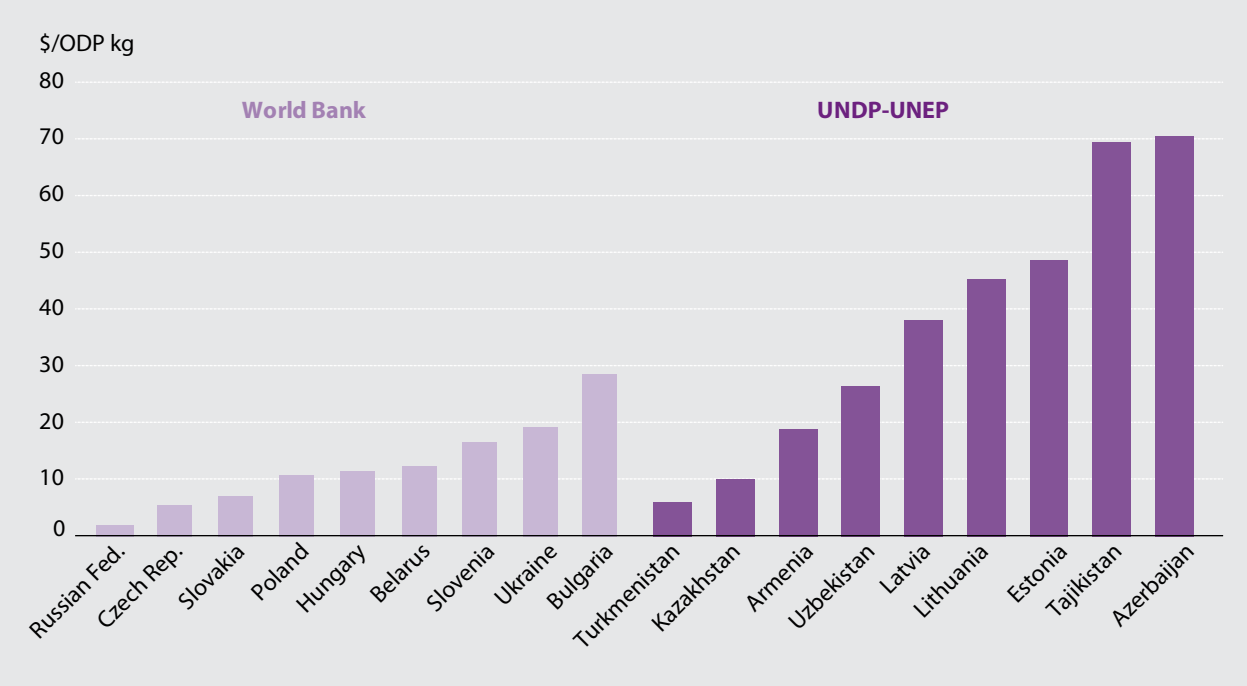
Comparison of the World Bank and UNDP-UNEP

The cost-effectiveness of the phaseout of ODS in CEITs by the World Bank and UNDP-UNEP was calculated for each Agency by dividing their expenditure on subprojects in each CEIT by the quantity of ODS phased out. The average cost-effectiveness for the World Bank was $12.58 for each ODP kilogram phased out; average cost-effectiveness for UNDP-UNEP was $37.06 for each ODP kilogram phased out (figure 6.8). The World Bank was therefore about three times more cost-effective than UNDP-UNEP in phasing out ODS in CEITs.

The difference in the average cost-effectiveness between the Agencies was mainly due to the different ODS sectors involved and the difference in cost per ODP kilogram of each sector. For example, in Russia, the World Bank phased out 88.4 percent of its total ODS target by implementing five subprojects in the aerosol sector at an average cost-effectiveness of $3.38/ODP kilogram. The share of funding for these five aerosol projects constituted 56.7 percent of the Bank's total investment in subprojects in Russia. This sector was characterized by large and concentrated quantities of ODS—9,500 ODP tonnes in five businesses. In contrast, UNDP-UNEP phased out 37 percent of their total ODS target by addressing the refrigeration servicing sector, which had an average cost-effectiveness of $34.60/ODP kilogram. The refrigeration servicing sector was characterized by small and diffuse quantities of ODS—50 ODP tonnes in 500 businesses. Large and concentrated quantities of ODS were less costly to replace with alternative technology than small and diffuse quantities.

Figure 6.8

Cost-Effectiveness of ODS Phaseout in CEITs with the World Bank or UNDP-UNEP as the Implementing Agency



Comparison of the GEF and the MLF

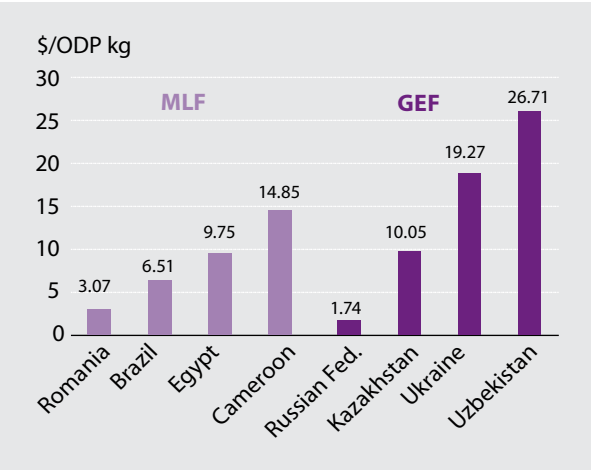
The cost-effectiveness of ODS phaseout in selected countries by the GEF and the MLF was calculated for each donor agency by dividing its expenditure in each country by the quantity of ODS phased out in each country. The average cost-effectiveness for the GEF was $14.45 for each ODP kilogram phased out; that for the MLF was $8.55 for each ODP kilogram phased out (figure 6.9). The MLF was therefore about twice as cost-effective as the GEF in phasing out ODS.

The variation in the two donor agencies' average cost-effectiveness was due to a difference in their application of incremental costs and a difference in their overall approach to phasing out ODS in CEITs and developing countries.

The MLF's Implementing Agencies used cost-effectiveness thresholds for specific activities within each ODS sector (as dollars per ODP kilogram) as one of the criteria that determined the size of the project investment. In contrast, the GEF Implementing Agencies were not always

Figure 6.9

Cost-Effectiveness of ODS Phaseout in Selected Countries Where the MLF or the GEF Was the Donor Agency



constrained by cost-effectiveness thresholds, which they sometimes exceeded, and included costs that the MLF would not have considered incremental. Examples are provided in volume 2 of this report; two are cited here by way of illustrating the differences between the donor agencies.

- In Uzbekistan, UNDP-UNEP did not adhere to MLF guidelines with regard to the SINO refrigerator manufacturing facility, because the size of the GEF investment was calculated based on the historical production of 250,000 refrigerators per year rather than actual production at the time. As a result, the funding level was about 10 times higher than permitted under MLF guidelines.
- Similarly, the investment cost at the Harmonia aerosol production facility in Moscow was based on a maximum production capacity of 20 million cans per year, which was four to five times the annual production at the time of project formulation. In addition, the GEF financed infrastructural changes that included new buildings, constructed and asphalted a new road and courtyard, connected water and power to the site, and purchased four railway wagons. Such infrastructural changes are not considered incremental costs by the MLF.

In terms of overall approach, the GEF funded individual subprojects, while provided funding at the country level through multiyear performance agreements. These agreements combine the MLF funding commitment with the country's commitment to achieve an annual phaseout target that equals or exceeds its obligations under the Montreal Protocol. The agreements proved to be particularly efficient and cost-effective in addressing ODS phaseout in the refrigeration servicing sector.

6.7 Efficiency of Expenditure to Phase Out ODS

Comparison of the World Bank and UNDP-UNEP

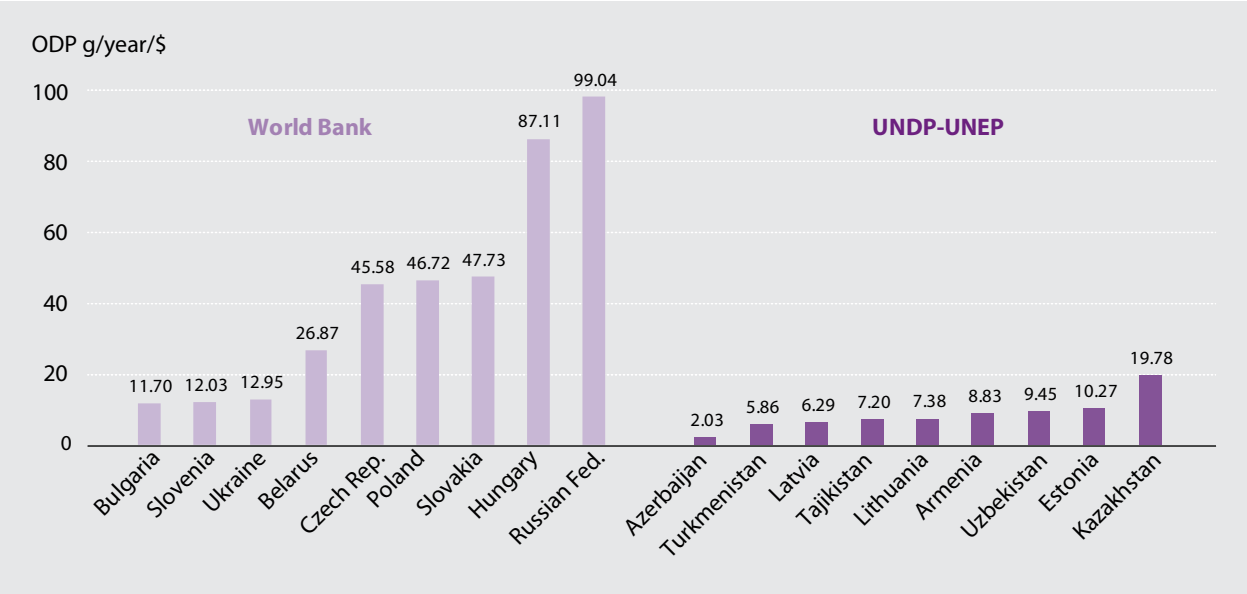
The efficiency of expenditure to phase out ODS in selected countries by the World Bank and UNDP-UNEP was calculated for each Implementing Agency by dividing the quantity of ODS phased out by the number of years that was required for consumption to be reported as zero after the start of the project and by the expenditure of each Implementing Agency. The World Bank's efficiency of expenditure thus derived averaged 43.30 ODP gram per year per dollar of expenditure across the nine CEITs; UNDP-UNEP averaged 8.56 ODP gram per year per dollar of expenditure across their nine CEITs (figure 6.10). UNDP-UNEP were therefore five to six times less efficient at implementing the projects in the CEITs than the World Bank.

The difference in the average efficiency of expenditure between the Agencies was mainly due to the different ODS sectors involved, the difference in cost per ODP kilogram of each sector, and the time required to phase out the ODS in the CEITs.

For example, in the Russian project, the World Bank phased out 88.4 percent of its total ODS target by implementing five subprojects in the aerosol sector at an average cost-effectiveness of $3.38/ODP kilogram. Funding for these five projects constituted 56.7 percent of the Bank's total investment in subprojects in Russia. The sector, as noted earlier, was characterized by large, concentrated quantities of ODS. In contrast, UNDP-UNEP phased out 37 percent of their total ODS target by addressing the refrigeration servicing sector, which had an average cost-effectiveness of $34.60/ODP kilogram and which was characterized by small and diffuse quantities of ODS.

Figure 6.10

Efficiency of Expenditure in Phasing Out ODS by the World Bank and UNDP-UNEP



Again, large and concentrated quantities of ODS were less costly to replace with alternative technology than small, diffuse quantities.

Another reason for UNDP-UNEP's lower average efficiency of expenditure was because they were responsible for the implementation of projects in Armenia and Turkmenistan, which took longer to phase out ODS than the other seven CEITs in the portfolio. As mentioned earlier, these countries changed their categorization from developed to developing countries, extending their phaseout deadline to January 1, 2010. Moreover, prior to the recategorization, both CEITs faced administrative difficulties which detracted from their work in phasing out ODS (for further detail, see volume 2).

Comparison of the GEF and the MLF

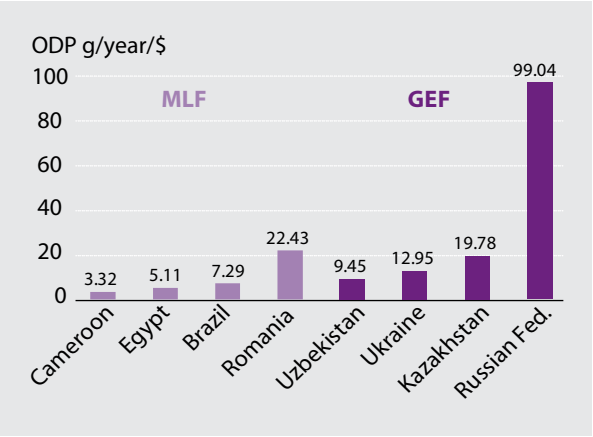
The efficiency of expenditure in ODS phaseout in selected countries by the MLF and the GEF was calculated for each donor agency by dividing the quantity phased out in each selected country by the number of years required for ODS consumption to be reported as zero after project start and the total expenditure in each country that was required to phase out ODS. For the MLF countries, the number of years for ODS consumption to be reported as zero was calculated from the beginning of MLF funding in a given country until phaseout, which was assumed to be January 1, 2010.

The MLF efficiency of expenditure averaged 9.54 ODP gram per year per dollar of expenditure across the four selected developing countries; the GEF rate averaged 35.31 ODP gram per year per dollar of expenditure across the four selected CEITs (figure 6.11). The MLF was therefore three to four times less efficient at implementing the projects per year in the four selected developing countries than the GEF in its four selected CEITs. This lower rate of efficiency of expenditure is attributable to the longer phaseout time in MLF-funded countries.

Another reason for the disparity between the two efficiency rates is that the GEF funding was measured against a larger amount of ODS, the

Figure 6.11

Efficiency of Project Implementation by the MLF and the GEF



phasing out of which was not entirely attributable to the GEF. In Russia and Ukraine, some ODS-consuming businesses did not pass the World Bank's financial viability test and therefore did not receive GEF assistance. Other companies refused to undertake the test or did not apply for assistance at all. Many of these companies subsequently self-financed their ODS phaseout. In calculating the total ODS phased out in a given CEIT, the Implementing Agencies included the ODS phased out by all companies in the country, regardless of whether they were financed directly by the GEF. In some cases, only 30 percent of the ODS to be phased out in the country was financed by the GEF, but in the final calculation the GEF included 100 percent of the ODS phased out. In contrast, the MLF only used the ODS phased out as a result of its financing and specifically excluded in its calculation ODS phased out with any other funding. However, unlike the GEF World Bank ODS project, the MLF did not apply a stringent financial viability test to companies that received funding. Consequently, the GEF costs were lower, because the GEF finance was divided by a larger amount of ODS not all of which was phased out with GEF funding; and the MLF costs were higher, because they were divided by a smaller amount of ODS all of which was phased out with direct MLF financing.

Note that this efficiency of expenditure rating is based on a comparison of only four selected CEITs and four MLF countries. Validation using all 18 CEITs with all MLF-funded countries was beyond the scope of this evaluation.

6.8 Relationship between GDP and ODS Consumption

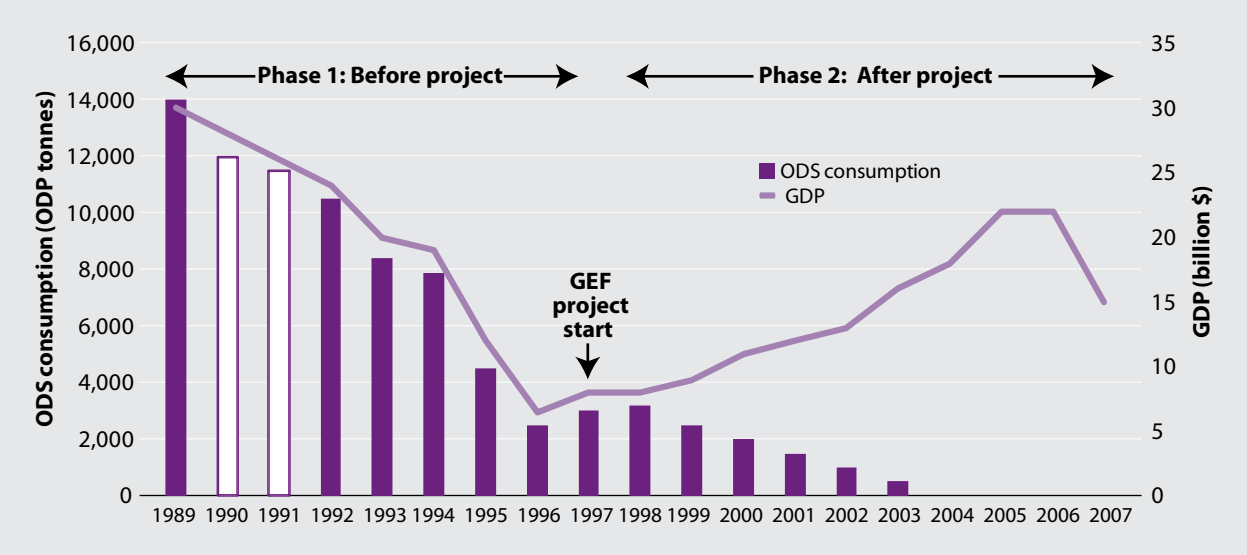
The relationship between GDP and ODS consumption was assessed for the four selected GEF CEITs and their MLF-funded counterparts. For the purposes of this correlation analysis, the MLF-funded developing country of Romania was considered a CEIT. Romania acceded to the EU January 1, 2007, and was removed from the list of developing countries by the Montreal Protocol parties in the same year under Decision XIX/19. Because many of Romania's legislative activities prior to accession were focused on harmonizing its ODS legislation with that of the EU, the country's ODS reduction activities were more consistent with a developed rather than developing country from 2000 to 2007.

The ODS consumption data for each CEIT and developing country was obtained from the UNEP Ozone Secretariat's Data Access Centre; these data are based on annual reports submitted by parties in accordance with Article 7 of the Montreal Protocol. A linear interpolation was used when reported ODS consumption data were missing for one or more years.

The correlation between GDP and reported ODS consumption in the **CEITs** was analyzed in two separate phases—before GEF project start (phase 1, 1986–97), and after GEF project start (phase 2, 1997–2007). As shown in figure 6.12,

Figure 6.12

Schematic of CEITs' ODS Consumption and GDP Before and After GEF Project Start



Sources: ODS consumption data are from the UNEP Ozone Secretariat's Data Access Centre (http://ozone.unep.org/Data_Reporting/Data_Access/). GDP data for 1992 to 2007 are from the International Monetary Fund; data for other years were interpolated from Soviet Union and other Eastern Bloc country statistics.

Note: White bars indicate that data for these years are interpolated.

GDP and reported ODS consumption both trend downward before the start of the project; after project start, GDP increases while reported ODS consumption decreases.

For the two phases, the Pearson product-moment correlation coefficient was used to examine the nature of the correlation (positive or negative) and its strength (weak, moderate, or strong) between GDP and reported ODS consumption in each of the four GEF-funded CEITs and Romania. A positive correlation would indicate that both GDP and reported ODS consumption are trending together in the same direction, whereas a negative correlation would indicate that they were diverging.

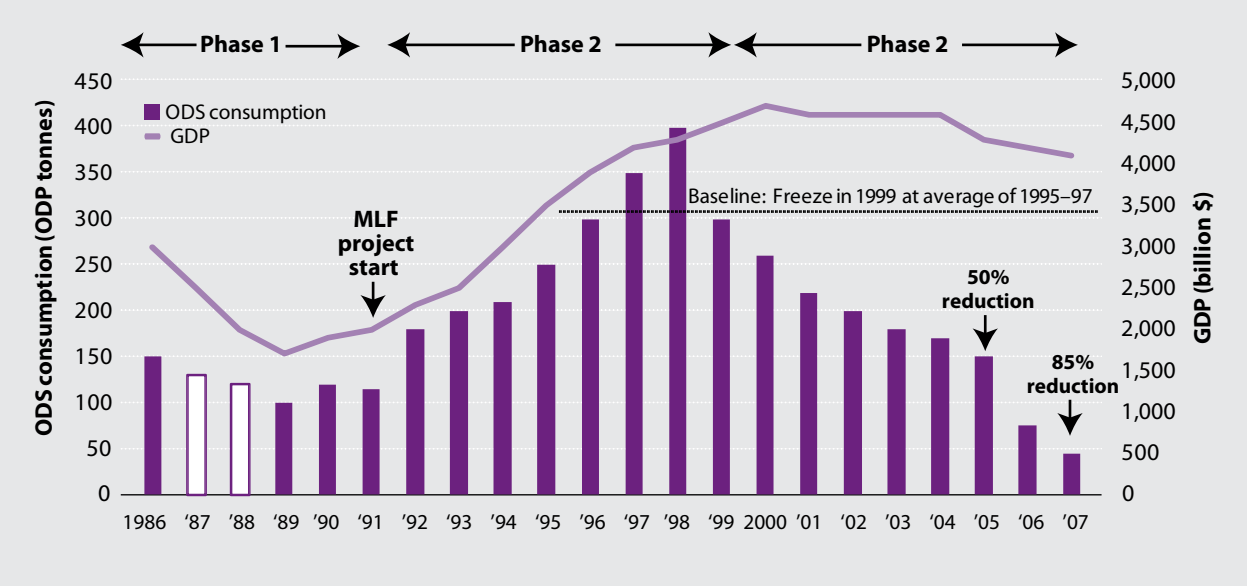
The correlation between GDP and reported ODS consumption was analyzed in the four MLF-funded **developing countries** for each of three separate phases from 1986 to 2007: preproject (phase 1, 1986–91), increase stocks (phase 2, 1991–99), and compliance (phase 3, 1999–2007).

As shown in figure 6.13, in phase 1, developing countries reduced ODS consumption as GDP declined. In phase 2, many developing countries increased their imports of ODS; this increase was generally to ensure that sufficient ODS was available for servicing refrigerators and air conditioning after 1999 when ODS consumption had to be frozen or reduced in compliance with the Montreal Protocol, or due to more widespread implementation of ODS technology, or for some combination of servicing and technology. Phase 2 typically lasted three to seven years, which delayed reduction of ODS consumption. In phase 3, ODS consumption was typically reduced, as countries complied with the 1999 freeze on ODS consumption mandated by the Montreal Protocol,[3] and

[3] The freeze level was based on average consumption of each country from 1995 to 1997, and so varied for each country depending on its consumption of ODS during this period.

Figure 6.13

Schematic of MLF-Funded Developing Countries' ODS Consumption and GDP Before, During, and After MLF Financing



Sources: ODS consumption data are from the UNEP Ozone Secretariat's Data Access Centre (http://ozone.unep.org/Data_Reporting/Data_Access/). GDP data for 1986 to 2007 are from the International Monetary Fund; data for other years were interpolated from Soviet Union and other Eastern Bloc country statistics.

Note: White bars indicate that data for these years are interpolated.

with the 50 percent and 85 percent reductions in ODS consumption required on, respectively, January 1, 2005, and January 1, 2007.

The nature and strength of the correlation coefficients in the developing country analysis were determined and interpreted for each of the three phases, using the same procedures as described above for the CEITs.

GEF-Funded CEITs

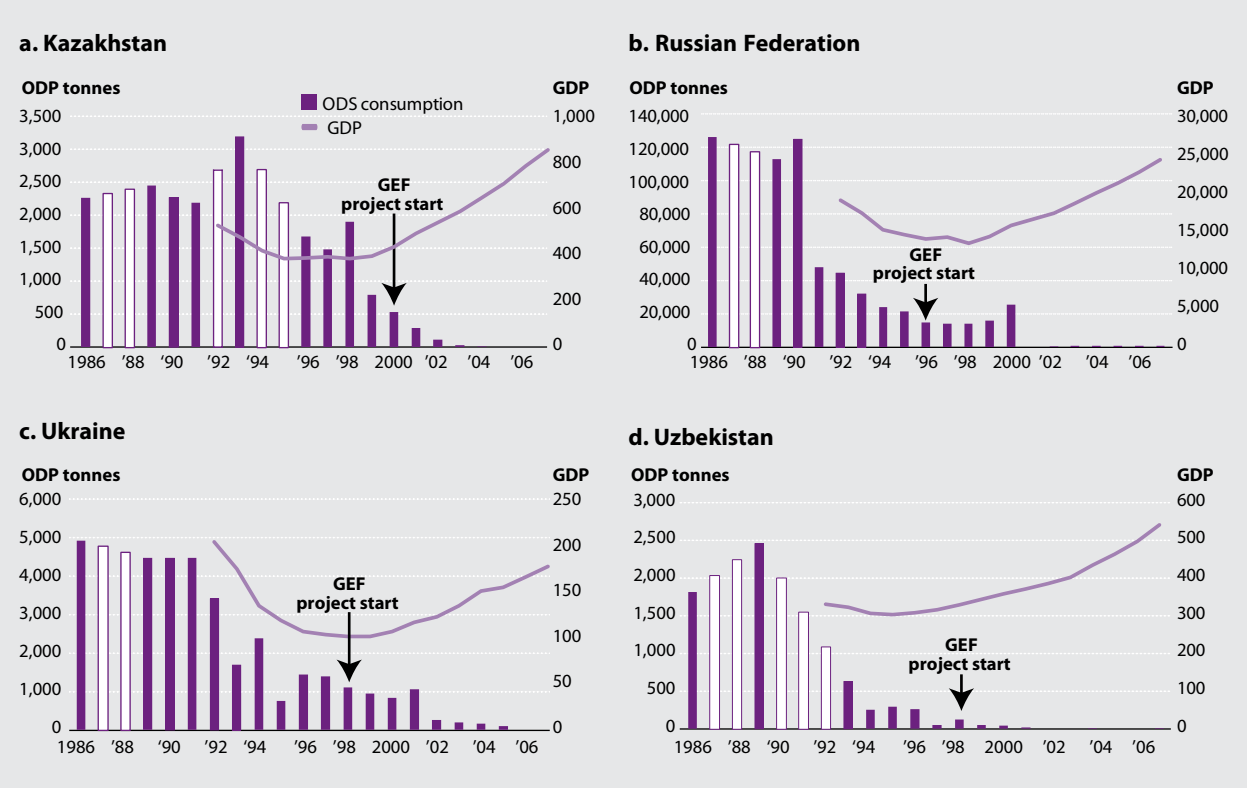
The relationship between GDP and reported ODS consumption is shown for the GEF-funded CEITs in figure 6.14.

ODS consumption reported by **Kazakhstan** followed the trend in GDP until 1999 when there was a significant reduction in ODS consumption (figure 6.14a). Nonetheless, and unlike in the other CEITs, ODS consumption exceeded the GDP trend line at that point. The GEF project started in 2000. The decline in consumption before the project's start may be the result of work carried out in the country to reduce ODS consumption in anticipation of the GEF-funded project. GDP increased significantly from 1999, while reported ODS consumption continued to decrease after the project commenced. This result indicates that the GEF finance was successful in reducing ODS consumption and, moreover, that ODS consumption was reduced when GDP increased.

ODS consumption reported by **Russia** followed the trend in GDP from 1992 until 2000, when ODS consumption was reduced to zero in 2001 (figure 6.14b). A small amount of ODS consumption was reported each year from 2002 until 2007 for uses that were exempted by the parties to the Montreal Protocol. Russia reported increased ODS consumption after the start of the project in

Figure 6.14

ODS Consumption and GDP in the GEF-Funded CEITs, 1986–2007



Sources: ODS consumption data are from the UNEP Ozone Secretariat's Data Access Centre (http://ozone.unep.org/Data_Reporting/Data_Access/). GDP data for 1986 to 2007 are from the International Monetary Fund; data for other years were interpolated from Soviet Union and other Eastern Bloc country statistics.

Note: White bars indicate that data for these years are interpolated. GDP data are in billions of local currency.

1996. This increase was due to the production and stock of CFCs and halon for national use and for export. GDP increased significantly from 1999, while reported ODS consumption continued to decrease to low levels from 2001 onwards. This result indicates that the GEF and other sources of finance were successful in reducing ODS consumption and, moreover, that ODS consumption was reduced when GDP increased.

ODS consumption reported by **Ukraine** followed the trend in GDP until 1999, when there was a reduction in ODS consumption (figure 6.14c). The GEF project began in 1998. GDP increased significantly from 1999, while reported ODS consumption continued to decrease, except in 2001 when it increased above the previous year. This result indicates that GEF funding was successful in reducing ODS consumption and, moreover, that ODS consumption was reduced when GDP increased.

Uzbekistan showed a significant decline in ODS consumption between 1989 and 1993 (figure 6.14d). From 1993 onwards, reported ODS consumption declined while GDP increased. Uzbekistan achieved a decline in ODS consumption before the start of the project in 1998 because of work undertaken by the government to implement legislation that reduced the ability

of businesses to import ODS. GDP continued to increase from 1999 on, while ODS consumption continued to decrease. This result indicates that the GEF finance was successful in reducing ODS consumption and, moreover, that ODS consumption was reduced when GDP increased.

The Pearson product-moment correlation coefficients for GEF-funded CEITs and Romania for GDP and ODS consumption before (phase 1) and after (phase 2) ODS project commencement are shown in table 6.1.[4] The results show a moderate to strong correlation between GDP and ODS consumption before the project for all the CEITs except Kazakhstan and Romania, which supports the illustrations presented in figures 6.14 and 6.15. The correlation between GDP and ODS consumption was weak for Kazakhstan because the ODS consumption exceeded the GDP trend line for most of the time prior to project start-up. Romania showed a strong negative correlation during phase 1 because ODS consumption was assumed to increase between 1987 to 1992, when at the same time GDP decreased. The six years 1987–92 were interpolated in a linear and increasing manner, as there was no reporting on ODS consumption by Romania for this period, increasing the uncertainty of this result.

Table 6.1

Correlation Coefficients for the GEF-Funded CEITs and MLF-Funded Romania Before and After ODS Project Commencement

		Correlation coefficient between GDP and ODS	
CEIT	Time span	Phase 1	Phase 2
Kazakhstan	1990–2000	0.49	
	2001–04		–0.92
Russian Federation	1990–96	0.98	
	1997–2000		–0.68
Ukraine	1992–97	0.77	
	1998–2004		–0.85
Uzbekistan	1990–97	0.79	
	1998–2001		–0.94
Romania	1986–91	–0.95	
	1994–2006		–0.55

After the project, there was a moderate to strong negative correlation for all the CEITs and Romania between GDP and ODS consumption. This again supports the illustrations in figures 6.14 and 6.15, since there was divergence between GDP and ODS consumption. In particular, Russia had a weaker negative correlation, possibly because of the increase in ODS stockpiling after the project which tracked the increase in GDP. These results indicate that the GEF finance was successful in reducing ODS consumption and, moreover, that ODS consumption was reduced when GDP increased.

MLF-Funded Developing Countries

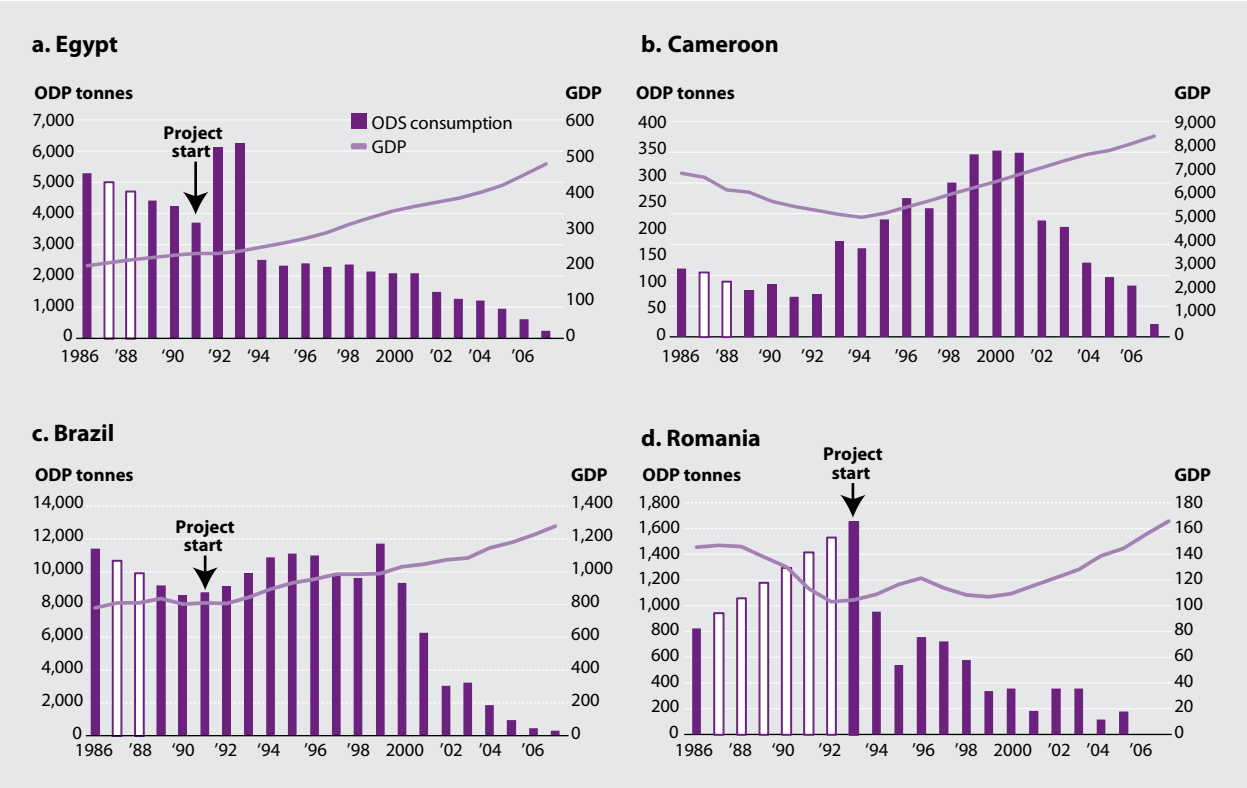
The relationship between GDP and ODS consumption is shown in figure 6.15 for the MLF-funded countries of Egypt, Cameroon, Brazil, and Romania.

MLF finance commenced in **Egypt** in 1991 (figure 15a). In each of the following two years, Egypt imported about 150 percent more ODS than in 1991. The country may have stockpiled ODS to

[4] Because Romania was preparing for EU accession and because it, unlike most developing countries, did not stockpile ODS, its consumption profile was more typical of a CEIT than a developing country. Consequently, a correlation between Romania's ODS and GDP was analyzed for two phases (without the phase 2 stockpiling that characterizes the developing countries) using the same methodology as for the other CEITs; this is included in table 6.1.

Figure 6.15

ODS Consumption and GDP in the MLF-Funded Developing Countries, 1986–2007



Sources: ODS consumption data are from the UNEP Ozone Secretariat's Data Access Centre (http://ozone.unep.org/Data_Reporting/Data_Access/). GDP data for 1986 to 2007 are from the International Monetary Fund; data for other years were interpolated from Soviet Union and other Eastern Bloc country statistics.

Note: White bars indicate that data for these years are interpolated. GDP data are in billions of local currency.

ensure that there was sufficient material available to meet refrigeration servicing needs when taking the reduction steps required for compliance with the Montreal Protocol. It is also possible that the ODS reports for 1992 and 1993 were incorrect and have not been corrected,[5] since the ODS consumption reported prior to 1992 and after 1993 tends to follow a rather predictable and consistent downward trend. For example, the large quantities of halon reported by Egypt for 1986 ODS consumption were not substantiated in subsequent years and could be erroneous. From 1994 onwards, Egypt continued to reduce ODS consumption almost every year with only occasional minor increases over the previous year, while GDP continued to increase. This result indicates that the MLF finance was successful in reducing ODS consumption and, moreover, that ODS consumption was reduced when GDP increased.

MLF finance commenced in **Cameroon** in 1992 (figure 15b). In each of the following nine years until 2001, Cameroon imported two to three

[5] Mistakes in reporting can be corrected retrospectively by the official reporting entity of the country submitting a corrected report to the Ozone Secretariat, together with reasons for the correction. The secretariat forwards the information for the consideration of the Implementation Committee, which advises the parties on the outcome of its deliberations.

times more ODS than it had consumed in 1991. By 2000, ODS consumption was from three to four times more than the 1991 consumption. As with Egypt, Cameroon may have stockpiled ODS in advance of required reduction steps while ensuring sufficient ODS to meet refrigeration servicing needs. In general, ODS that is used after the year of import or production does not contribute toward reported consumption in the following years. From 2002 onwards, Cameroon continued to reduce its ODS consumption every year, while GDP continued to rise. This result indicates that the MLF finance was successful in reducing ODS consumption and, moreover, that ODS consumption was reduced when GDP increased.

MLF finance commenced in **Brazil** in 1991 (figure 15c). In each of the following four years, Brazil imported about 20 percent more ODS than it had consumed in 1991. Here too, the country may have stockpiled ODS in advance of reduction requirements while ensuring the availability of materials to meet refrigeration servicing needs. ODS consumption during this period and in 1997 and 1998 followed the same trend line as GDP. There was a sharp increase in ODS consumption in 1999, which exceeded the GDP trend line. From 2000 onwards, Brazil continued to reduce ODS consumption almost every year with only occasional minor increases over the previous year, while GDP continued to increase. This result indicates that the MLF finance was successful in reducing ODS consumption and, moreover, that ODS consumption was reduced when GDP increased.

The MLF finance commenced in **Romania** in 1993 (figure 15d); from this year onwards, Romania continued to reduce its ODS consumption almost every year with only occasional and relatively minor increases over the previous year, while GDP continued to increase. The increases in ODS consumption tended to mirror the GDP trend line from 1995 to 1998. Romania's ODS consumption profile more closely matched the GEF-funded CEITs than it did the other developing countries—a circumstance discussed earlier in connection with Romania's preparation for its EU accession. Romania phased out its ODS consumption in 2006. This result indicates that the MLF finance was successful in reducing ODS consumption and, moreover, that ODS consumption was reduced when GDP increased.

The correlation coefficients for GDP and reported ODS consumption for Brazil, Cameroon, and Egypt are shown in table 6.2 for the three phases (Romania's correlation coefficients are presented in table 6.1).

The correlation coefficients for GDP and reported ODS consumption for Brazil showed a moderate negative correlation in phase 1, a weak positive correlation in phase 2, and a strong negative correlation in phase 3 (table 6.2). In phase 2, stockpiling followed the similar upward trend line at a time when GDP was also increasing. The strong negative correlation indicates a divergence of the GDP

Table 6.2

Correlation Coefficients for Three MLF-Funded Developing Countries Before, During, and After ODS Project Commencement

		Correlation coefficient between GDP and ODS		
Country	Time span	Phase 1	Phase 2	Phase 3
Brazil	1986–91	–0.56		
	1992–98		0.35	
	1999–2007			–0.88
Cameroon	1986–92	0.91		
	1993–98		0.64	
	1999–2007			–-0.97
Egypt	1986–91	–0.98		
	1992–98		–0.72	
	1999–2007			–0.98

(upward) from ODS consumption (downward). This divergence in 2000 occurred nine years after the funding, but at the same time as the freeze in consumption, and six years before the 50 percent reduction step, so it is likely that the freeze and reduction were the primary causes of the drop in reported ODS consumption. However, the MLF would have provided financial assistance to implement ODS-free technology and reduce ODS consumption, which is likely to have occurred in parallel with the increase in ODS.

The correlation coefficients for GDP and reported ODS consumption for Cameroon showed a strong positive correlation in phases 1 and 2, and a strong negative correlation in phase 3. This result conforms to the schematic in figure 6.13. In phase 1 and before receipt of MLF financial assistance, ODS consumption increased in parallel with GDP. After the financial assistance was received and in phase 2, stockpiling and GDP increased in the same upward direction. In phase 3, the strong negative correlation indicated the end of stockpiling and a divergence of the GDP (upward) from ODS consumption (downward). This divergence occurred nine years after funding but four years before the 50 percent reduction step, so it is likely that the reduction step was the primary cause of the drop in reported ODS consumption.

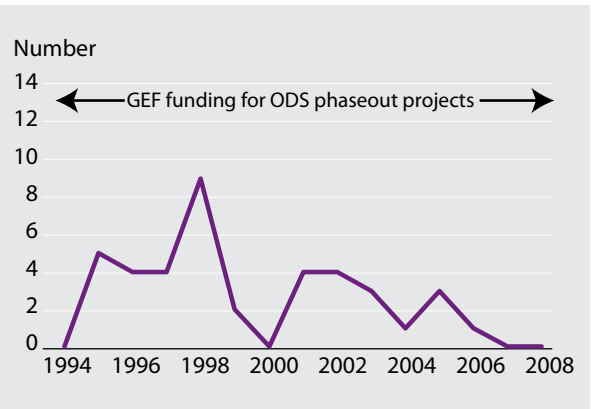
The correlation coefficients for GDP and reported ODS consumption for Egypt showed a strong negative correlation in phase 1, a moderate negative correlation in phase 2, and a strong negative correlation in phase 3. The phase 1 and 2 negative correlations reflected rising GDP with falling ODS consumption. In phase 3, the strong negative correlation indicated a divergence of the GDP (upward) from concurrent ODS consumption (downward). This divergence occurred two years after funding receipt but eight years before the 50 percent reduction step, making it likely that the MLF finance was the primary cause of the annual and reasonably consistent incremental reductions in reported ODS consumption from 1994 until 2007.

6.9 Fulfillment of the Requirements of the Montreal Protocol

The number of decisions agreed to by the parties to the Montreal Protocol related to compliance of CEITs with protocol requirements for ODS reduction and phaseout was recorded for each year from 1994 to 2008 (figure 6.16). The decisions were compiled from reports of the meetings of the parties to the Montreal Protocol.[6]

Figure 6.16

Number of Compliance Decisions by the Parties to the Montreal Protocol Affecting CEITs, 1994–2008



Fifteen of the 18 CEITs did not fulfill the protocol's requirements in one or more years during the period 1995–2006. In the period 1995–99, CEITs were responsible for all of the cases of noncompliance that were brought before the protocol's Implementation Committee. The number of problem cases in CEITs diminished over the period of GEF finance (1994–2007). From Janu-

[6] These are available at the UNEP Ozone Secretariat Web site (http://ozone.unep.org/).

ary 1, 2007, there were no decisions relating to compliance with the protocol by CEITs. This indicates that GEF financing had assisted the CEITs in fulfilling the protocol's requirements for ODS phaseout, which was the prime objective of the GEF ozone portfolio.

6.10 Summary and Discussion

Implementing Agencies

The evaluation's comparison of the Implementing Agencies found the following:

- Expenditure was proportional to the amount of ODS to be phased out in the CEITs.
- The World Bank expenditure was on average about five times more than UNDP-UNEP's because the Bank implemented projects that phased out about 27 times more ODS than UNDP-UNEP's.
- The time that each Implementing Agency took to phase out ODS was similar—on average, 3.3 years for the World Bank compared with 3.7 years for UNDP-UNEP.
- The World Bank was about three times more cost-effective than UNDP-UNEP; it paid $12.58 for each ODP kilogram phased out, compared to the $37.06 paid by UNDP-UNEP.
- UNDP-UNEP's efficiency of expenditure averaged 8.56 ODP gram per year per dollar; the World Bank exceeded this rate, phasing out ODS at an average of 43.30 ODP gram per year per dollar.

The GEF and the MLF

The evaluation's comparison of the two donor agencies found the following:

- The average GEF expenditure of $18.6 million in the four selected CEITs (Kazakhstan, Russia, Ukraine, and Uzbekistan) was much less than the average MLF expenditure of $30.57 million in four selected developing countries (Brazil, Cameroon, Egypt, and Romania), even though the amounts to be phased out and the GDP levels were generally similar across the two sets of countries (excluding Russia and Brazil). Therefore, based on an evaluation of the cost in the four countries in each portfolio, the GEF average expenditures were more economical than those of the MLF in these selected countries.
- The GEF-funded countries phased out ODS about four times faster than the MLF-funded countries. This is because there was a time limit imposed on the CEITs by the parties to the Montreal Protocol that was more restrictive than that established by the parties for developing countries. Therefore, the developing countries could be expected to take longer. Because this longer period of time results in more emissions to the environment and more ozone layer damage, there is an environmental cost paid for the additional time.
- The MLF was more cost-effective, averaging $8.55 for each ODP kilogram phased out, compared to the GEF at $14.45 for each ODP kilogram phased out.
- The GEF had a higher efficiency of expenditure rating, phasing out ODS at an average of 35.31 ODP gram per year per dollar across the four selected CEITs. The MLF phased out ODS at an average of 9.54 ODP gram per year per dollar across its four selected countries.

The results for the donor agencies might not be the same if a larger number of developing countries were compared, but such a comparison was beyond the scope of this impact evaluation.

GDP and ODS Consumption

In examining the relationship between GDP and ODS consumption phaseout, the evaluation

found that in all of the GEF-funded CEITs and two of the MLF-funded developing countries (Brazil and Cameroon), there was a moderate to strong correlation between GDP and ODS consumption before there was a divergence of GDP and reported ODS consumption. ODS consumption tracked GDP in a somewhat predictable manner. In these four CEITs shortly after the start of the financial assistance, ODS consumption no longer tracked GDP. In the two developing countries, there was a delay in ODS reduction due to stockpiling, but there was then a reduction in ODS consumption when GDP was increasing.

It is reasonable to assume, mainly because of the proximity in time of the cause and effect, that the cause of the decoupling of ODS consumption from GDP is the GEF project that financed ODS reduction and phaseout. This is a useful insight, as there are many country signatories to the Montreal Protocol that argue that further elimination of ODS is not possible without detriment to the growth of the economy. The result gained by the GEF and the MLF shows the contrary—that elimination of an environmentally damaging technology has been achieved without a significant impact on GDP.

Compliance with the Montreal Protocol

The evaluation found that noncompliance with the requirements of the Montreal Protocol was widespread among CEITs prior to their receiving GEF funding. Indeed, one of the main reasons for the GEF becoming involved in ODS phaseout in CEITs was to assist them in eliminating ODS technology and, in so doing, restore most of them to compliance with the requirements of the Montreal Protocol. Review of the noncompliance decisions that are produced annually by the parties to the Montreal Protocol found that CEITs no longer dominate the meetings of the Implementation Committee, which was the case in the past when CEITs found compliance challenging. As a measure of the success of GEF financing in countries' ozone portfolios, there were no decisions affecting CEIT compliance in 2007.

7. Assessment of Impact Drivers and Sustainability

This chapter presents the assessment of the ozone portfolio theory of change described in chapter 4. The first section discusses impact drivers relating to issues of government commitment; section 7.2 presents impact drivers relating to private enterprise sustainability, discussed by sector. Section 7.3 assesses the key threats or risks to impacts; section 7.4 looks at issues of catalytic impact. The chapter concludes with a discussion of benefits to the global environment and to human health as a result of ODS phaseout in CEITs.

The chapter contains a series of tables summarizing information on impact drivers and sustainability on a by-country basis; this information is taken from the 18 country reports (see volume 2), which are in turn based on responses to the evaluation interviews and survey questionnaire. The data thus collected were compiled and analyzed in two blocs: EU and non-EU countries (see table 7.1).

EU CEITs are subject to the EU legislation on ODS, which requires member states to adopt national legislation on ODS to implement the requirements of the EU legislation.[1] The non-EU CEITs

Table 7.1

Summary Data on 18 CEITs

CEIT	EU status	Development status	ODS project span
Bulgaria	EU	A2	1995–2000
Czech Republic	EU	A2	1994–98
Estonia	EU	A2	2000–07
Hungary	EU	A2	1995–98
Latvia	EU	A2	1997–2007
Lithuania	EU	A2	1998–2005
Poland	EU	A2	1997–2001
Slovakia	EU	A2	1995–2002
Slovenia	EU	A2	1995–2002
Armenia	Non-EU	A5	2004–09
Azerbaijan	Non-EU	A2	1999–2002
Belarus	Non-EU	A2	1997–2000
Kazakhstan	Non-EU	A2	2000–05
Russian Fed.	Non-EU	A2	1996–2004
Tajikistan	Non-EU	A2	2002–06
Turkmenistan	Non-EU	A5	1998–2005
Ukraine	Non-EU	A2	1998–2004
Uzbekistan	Non-EU	A2	1998–2007

Note: A2 = developed country under Article 2 of the Montreal Protocol; A5 = developing country under Article 5 of the Montreal Protocol.

[1] Regulation (EC) No 2037/2000, which came into force for all member states on October 1, 2000. Article 16 of the regulation requires member states to recover, recycle, and reclaim ODS contained in refrigeration, air conditioning, and heat pump equipment; domestic refrigerators and freezers; equipment containing solvents; fire protection systems and fire extinguishers; and to use technologies approved by the parties or by any other environmentally acceptable destruction technology when ODS is destroyed. Member states are required to report annually to the European Commonwealth on the quantities of ODS recovered, recycled, reclaimed, or destroyed.

had no such regional driver of legislation and thus had to establish their own national legislation on ODS. This distinction created a framework for the evaluation's assessments of the activities to reduce and phase out ODS, and the sustainability of these activities, that are described in this chapter.

Another important distinction among the CEITs was their designation as either a developed country under Article 2 of the Montreal Protocol or as a developing country under Article 5. All the countries in the evaluation were A2 except Armenia and Turkmenistan. The parties to the Montreal Protocol accepted Armenia's change from A2 to A5 in 2002, which was before the GEF project commenced in 2004. The parties accepted Turkmenistan's change from A2 to A5 in 2004, which was near the end of the GEF's seven-year project in that country. The implications of these changes are discussed under the relevant sections below.

7.1 Government Commitment

Government commitment was identified in the theory of change as an important driver to ensure progression from outputs to impacts. Several key components and/or indicators were identified for assessment in this evaluation:

- Legislation, including Montreal Protocol compliance (summarized in table 7.2)
- Customs and border security (summarized in table 7.3)
- Recovery, recycling, and reclamation (3R) programs (summarized in tables 7.4 and 7.5)

These and other indicators of government commitment (summarized in table 7.6) are discussed below.

Legislation

The CEITs **ratified, acceded, accepted, or approved up to six legislative instruments**: the Vienna Convention and the Montreal Protocol; followed by the London, Copenhagen, Montreal, and Beijing Amendments (table 7.2). As a condition of its provision of financial assistance, the GEF required that each of the CEITs become a party to the Vienna Convention, the Montreal Protocol, and the London Amendment. All of the CEITs were parties to all six instruments, except Kazakhstan, which had yet to accede to the Copenhagen, Montreal, and Beijing Amendments; and Azerbaijan, which had yet to accede to the Montreal Amendment. Acceptance of all six instruments by a country indicated that its government was fully committed to being bound by all the control measure obligations and requirements contained in the Montreal Protocol.

As Kazakhstan had not accepted the obligations of the Copenhagen and Beijing Amendments, HCFCs that were imported after April 1, 2004, by Kazakhstan were not in compliance with the Montreal Protocol, in accordance with the requirements of Decision XV/3 which was agreed to by the parties on trade in HCFCs in 2003. That decision clarified that trade in HCFCs should be between parties that had agreed to be bound by the obligations of both the Beijing and Copenhagen Amendments. The decision permitted developed countries that had yet to ratify, accede to, or accept the Beijing Amendment to submit data to the Ozone Secretariat by March 31, 2004, of their intention to do so, as well as to supply information to show that they were in full compliance with Articles 2, 2A–2G, and 4 of the Montreal Protocol. Kazakhstan was not mentioned in the report by the Ozone Secretariat to the parties in 2004, suggesting that information had not been submitted. Kazakhstan imported HCFCs in excess of its consumption limit from January 1, 2004, for each year from 2004 to 2007 inclusive, and exceeded the consumption limit for non–quarantine and preshipment methyl bromide in 2006 and 2007. These actions would make it difficult for Kazakh-

Table 7.2

Legislative Drivers of Key Activities to Reduce and Phase Out ODS in CEITs

CEIT	No. of relevant instruments agreed to	Legislation mandating 3R	Legislation for reporting on 3R	Legislation for qualification requirements	Year import of CFCs banned	Targeted legislation before or during project
Bulgaria	6	Yes	Yes	Yes	1996	Yes
Czech Republic	6	Yes	Yes	Yes	1995	Yes
Estonia	6	Yes	Yes	Yes	1999	Yes
Hungary	6	Yes	Yes	Yes	1994	Yes
Latvia	6	Yes	Yes	Yes	2001	Yes
Lithuania	6	Yes	Yes	Yes	1996	Yes
Poland	6	Yes	Yes	Yes	1996	Yes
Slovakia	6	No	Yes	Yes	1995	Yes
Slovenia	6	Yes	Yes	Yes	1997	Yes
Armenia	6	No	No	No	2007	Yes
Azerbaijan	5	No	No	No	2002	No
Belarus	6	—	Yes	Yes	2008	No
Kazakhstan	3	Yes	No	Yes	2005	No
Russian Fed.	6	No	No	No	1995	Yes
Tajikistan	6	Yes	No	No	2004	Yes
Turkmenistan	6	No	No	No	2005	No
Ukraine	6	No	No	No	—	No
Uzbekistan	6	Yes	Yes	No	2000	Yes

Note: — = not available.

stan to show that it was in full compliance with the relevant articles of the Montreal Protocol. Therefore, the government of Kazakhstan appeared less committed and focused on the protocol than the other CEITs evaluated.

The **legislation that mandated ODS 3R operations and reporting on the results of the 3R** was mainly implemented in the EU CEITs and in two (Tajikistan and Uzbekistan) of the non-EU CEITs. Slovakia did not implement legislation, as a national 3R program was not put in place; it instead imported recovered ODS in sufficient quantities to meet its servicing needs.

Qualification requirements for personnel that serviced refrigeration and air conditioning equipment were mandatory in many countries. All of the EU CEITs put in place qualification requirements as did two non-EU CEITs (Belarus and Kazakhstan). These countries also established procedures that specified the syllabus that was required to achieve a level of technical competence acceptable to the government. These activities minimized ODS emissions and conserved stocks of ODS for servicing. Many companies in non-EU CEITs without legislated qualification requirements complained that there was no incentive to ensure personnel were trained; they noted, moreover, that there were unqualified servicing workers who were "not doing a good job." Thus, CEITs that had legislated qualification requirements had put in place an ongoing and effective program that promoted the goal of minimizing ongoing damage to the ozone layer as a result of ODS emissions.

The **ban on the import of CFCs** is an important legislative indicator of government's focus in reducing ongoing demand for ODS and encouraging the use of alternatives. CEITs that banned CFC imports more than a year before the end of the project in their country were considered to have implemented legislation that targeted ODS reduction and phaseout, as they used the legislation to drive the reductions. The EU CEITs and Russia banned the import of CFCs much earlier (from 1994 to 2001) than the non-EU CEITs (2000 to 2008). Five of the non-EU CEITs did not implement bans on CFCs in a timely manner, thus delaying the adoption of alternatives due the availability of CFCs in the market.

Responses to the evaluation survey questionnaire indicated that 67 percent of the national ozone units in EU CEITs strongly agreed that sufficient legal and policy instruments were currently in place to address ODS reduction and phaseout; an equal percentage of the non-EU CEITs slightly disagreed with this assessment.

Customs and Border Security

The ability of a country to combat illegal trade in ODS depends on a number of factors, summarized in table 7.3 and listed below:

- Legislation to combat illegal trade and support customs and border security
- The number of customs and other staff who have been trained to detect illegal trade in ODS
- The equipment available to customs and other officers that enables them to distinguish between illegal and legal ODS and ODS-containing equipment
- Cooperation between customs and other agencies to share intelligence on illegal trade
- Penalties applied to those found conducting illegal trade

All of the CEITs **trained customs officers** during the project except for Belarus, Russia, and Ukraine. All of the non-EU CEITs, but only 78 percent of the EU CEITs, reported on the survey questionnaire that training had been undertaken during the project. Although the Czech Republic trained customs officers during the project, respondents commented that it was not done sufficiently early to combat imports of illegal CFCs, which undermined earlier ODS reduction/phaseout activities.

Forty-four percent of the CEITs delivered training on reducing illegal trade in ODS to customs officers between 2005 and 2009 after the projects were completed, indicating the sustainability of their commitment. In contrast, 56 percent of the CEITs did not follow up on project training.

CEITs sought support for customs training from external sources where this was possible after project completion. For example, Bulgaria obtained finance from an EU fund, and Ukraine used government finance. Belarus and Russia were the only two CEITs that did not train customs officers at all, either during or after the project. The implications of this are discussed below.

Almost three times more customs officers were reported to have been trained in the non-EU CEITs (988) as in the EU CEITs (339). Azerbaijan alone was reported to have trained about half of the customs officers trained in the 18 CEITs. This may reflect the increasing importance that the parties have placed recently on combating illegal trade in ODS, which has been publicized more widely from 2000 to 2009 in the Montreal Protocol than in the 1990s.[2]

[2] The first Montreal Protocol decision on illegal trade was in 1995; there were only three decisions up to 2000. From 2001 on, there has been a decision on illegal trade in almost every meeting of the parties.

Table 7.3

Customs and Border Security in CEITs

CEIT	Training of customs officers			Refrigerant identifiers	Reporting frequency[a]	Inter-agency cooperation[b]	Illegal imports intercepted		Penalties for illegal trade	Illegal trade suspected[c]
	Before project	After project	Total trained				During project	2006–09		
Bulgaria	Yes	Yes	135	32	12	Yes	No	No	Yes	No
Czech Republic	Yes	—	115	No	6	Yes	Yes	No	Yes	No
Estonia	Yes	No	24	Yes	3	Yes	Yes	Yes	Yes	No
Hungary	Yes	Yes	20	Yes	12	Yes	Yes	No	Yes	No
Latvia	Yes	No	40	No	—	Yes	—	—	Yes	No
Lithuania	Yes	No	5	No	6	Yes	No	No	Yes	No
Poland	Yes	—	—	40	—	—	—	—	Yes	No
Slovakia	—	—	—	No	Yes	Yes	—	Yes	Yes	No
Slovenia	Yes	Yes	—	No	12	Yes	—	Yes	Yes	No
Armenia	Yes	n.a.	88	12	12	—	No	No	—	n.a.
Azerbaijan	250	180	430	13	Often	—	—	Yes	—	No
Belarus	No	No	0	No	—	Yes	—	Yes	Yes	Yes
Kazakhstan	Yes	—	61	100	—	—	Yes	Yes	Yes	Yes
Russian Fed.	No	No	0	No	0	Yes	0	—	Yes	Yes
Tajikistan	105	—	105	22	Yes	Yes	Likely	Likely	—	Yes
Turkmenistan	Yes	No	—	Yes	—	Yes	—	Yes	—	n.a.
Ukraine	No	Yes	—	No	—	Yes	—	No	—	Yes
Uzbekistan	Yes	No	304	19	6	Yes	Yes	Yes	Yes	Yes

Note: n.a. = not applicable, as Armenia and Turkmenistan were recategorized as developing countries, and thus any trade in CFCs within the consumption limit was legal; — = not available. Where numerical data were available, these were provided.

a. Frequency (in months) of information sharing between customs service and other agencies.

b. Customs service and other agencies work together.

c. By the evaluation.

It was not possible to determine the percentage of officers trained to detect illegal trade in any country, as the total number of customs officers is kept confidential in many countries. However, remarkably few were trained in some countries. For example, Lithuania only has five officers trained; but the government reported that these officers went back to their checkpoints and passed information on to their colleagues.

The customs officers in about half the countries (10 CEITs) were **equipped with refrigerant identifiers**. This finding was supported by the analysis of the survey responses, which showed that four of the EU CEITs and four of the non-EU CEITs did not have identifiers. Kazakhstan reported that 100 identifiers were provided to its customs officers; this was about 40 percent of the total number of identifiers (238) provided to the 18 CEITs. Customs officers reported that the identifiers were not particularly reliable, as they gave false positives and were not able to identify blends of ODS and hydrofluorocarbons. Also, laboratory support was sometimes lacking to confirm a refrigerant identi-

fied at the border. These weaknesses undermine the effectiveness of identifiers as a tool to combat illegal trade.

Another technique used to intercept illegal trade was **sharing of intelligence information among agencies**, including the customs service. Six of the EU CEITs (Bulgaria, the Czech Republic, Estonia, Hungary, Lithuania, and Slovenia) and two non-EU CEITs (Armenia and Uzbekistan) reported that information was shared among agencies every 3–12 months—in most cases, in accordance with a legislative requirement. A further nine CEITs reported that the **customs service worked with other agencies**, typically the inspectorate. Based on information from all the CEITs except Poland and Kazakhstan, the countries shared information to combat illegal trade in ODS. Some countries, such as Kazakhstan and Uzbekistan, reported that they focused more on some countries than others, based on their experiences with illegal trade in the past, which assisted them in intercepting illegal trade in ODS more effectively.

According to survey responses, 44 percent of the EU CEITs and 56 percent of the non-EU CEITs agreed that illegal trade in ODS existed in their countries. About 30 percent of the countries reported that illegal trade had been intercepted during the GEF project; 50 percent had detected illegal trade in the three years after the project had finished. This indicated that the training of customs officers was having a sustainable effect. There were more non-EU CEITs than EU CEITs that reported **interceptions of illegal trade** in the past three years, which could be indicative of the relatively low demand for CFCs in the EU CEITs compared to the non-EU CEITs, where a market for CFCs reportedly exists.

All EU CEITs reported that they had **penalties** that could be applied to traffickers of ODS found guilty of illegal trade, but only four non-EU CEITs (Belarus, Kazakhstan, Russia, and Uzbekistan) reported that they had the ability to impose fines. Penalties under European Commonwealth (EC) legislation that have been transposed into national legislation in the EU CEITs are required to be "effective, proportionate and dissuasive."[3] As a result, some EU CEITs impose jail sentences as well as fines for those found culpable of illegal trade in ODS. The penalty for illegal ODS trade in one of the non-EU CEITs (Uzbekistan) was judged by the customs service to be not sufficiently dissuasive and therefore unlikely to discourage illegal ODS trade. Uzbekistan reported that it was revising its penalty system for illegal ODS trade. In the meantime, its customs service reported that the fine was not as important as the disruption in business for the violators due to the increased number of checks conducted. All of the EU CEITs reported on the survey questionnaire that they had legislation in place to combat illegal trade, compared to 77 percent of the non-EU CEITs. This legislation allowed 89 percent of the EU CEITs, and 22 percent of the non-EU CEITs, to return confiscated ODS to the country of origin; also, 89 percent of the EU CEITs, and 67 percent of the non-EU CEITs, could impose fines for illegally traded ODS. More of the non-EU CEITs (57 percent) reported legislation that could impose a jail sentence for those caught smuggling ODS compared to EU CEITs (44 percent).

On the basis of interviews with the national ozone units in all countries, the customs services and inspectorates in some countries, and servicing operations in many countries, the evaluation was able to form an opinion on the **likelihood of illegal trade in ODS** (mainly CFCs). Many of the interviewees reported on incidences of illegal

[3] Article 21 (penalties) in Regulation (EC) No 2037/2000 on "Substances that Deplete the Ozone Layer."

trade; some even cited the price of CFCs on the local black market. Illegal trade was unlikely in the EU CEITs, mainly because CFC-based equipment is rare and there is little demand for CFCs consequently, rather than due to the vigilance per se of customs and other agencies at the border.

In contrast, illegal trade was likely in all of the non-EU CEITs except Armenia, Turkmenistan, and Azerbaijan. The first two countries are Article 5 countries, and thus trade in CFCs is still legal for them within the consumption limits of the Montreal Protocol. In Azerbaijan, the evaluation concluded that the large number of customs officers who have been trained to detect illegal ODS, combined with the high frequency of reporting by customs to the national ozone unit, had countered illegal trade effectively.

Other issues related to illegal trade are discussed in section 7.3.

Training of Personnel in the Use of 3R Equipment

The aim of the 3R scheme was threefold:

- To permanently reduce the demand for imported or produced refrigerants by using recovered and recycled CFCs
- To reduce the demand for CFCs that was being partly met by illegal imports by using recovered and recycled CFCs
- To reduce the cost of early CFC equipment retirement by extending the period in which phaseout takes place by using recovered and recycled CFCs

Recovering, recycling, and reusing ODS was important for providing a source of ODS within the country to support the refrigerant demand when servicing refrigeration and air conditioning equipment, at a time when imports or production of CFCs were reduced or banned altogether. The ability of countries to implement effective 3R programs depended on the legislation they had in place, the training of personnel in refrigerant management, and the availability of equipment and its distribution. Each of these factors is summarized in table 7.4 for the 18 CEITs and discussed below, together with the extent to which this training enabled countries to recover ODS including halons and to destroy unwanted ODS. The sustainability of these operations is also discussed, based on an examination of the extent to which these 3R activities were continued after the conclusion of the GEF project.

More than 10,500 technicians were trained during the course of the 3R subprojects, and a further 5,500 were trained after the project was completed. The task of training personnel in best-practice servicing of refrigeration and air conditioning equipment became the responsibility of the national ozone unit in each country. In many CEITs, a **refrigeration association** was formed in response to this challenge, if such an association did not already exist prior to the start of the GEF project. These associations not only helped in organizing the training by providing a venue and handling liaison with teaching staff, but also assisted in the distribution of recovery and recycling equipment to the service centers. Some of them kept track of this equipment over time, and redistributed it as necessary to service centers that were more active than others in ODS recovery and recycling. In most cases, the associations evolved into organizations with a large membership of influential businesses that coordinated effectively with the national ozone units and assisted them in the development of legislation concerning their servicing operations. Many of them now have full-time staff advising the membership, whose salaries are paid for with income from membership and training fees.

Table 7.4

Training of Personnel in the Servicing of Refrigeration and Air Conditioning Equipment in CEITs

CEIT	Association or institute	Number trained		Technicians charged for training after project	Certification (years valid)	Legislation requires qualifications	Unqualified technicians penalized
		During project	Before or since project				
Bulgaria	Institute	1,500	500	Yes	Certificate	Yes	Yes
Czech Republic	Association	850	1,700	Yes	Greencard (3)	Yes	Yes
Estonia	Association	200	Yes	Yes	Certificate	Yes	No
Hungary	Association	3,600	3,000	Yes	Greencard (5)	Yes	Yes
Latvia	Association	180	54	Yes	Greencard (3)	Yes	Yes
Lithuania	Association	0	272	Yes	Greencard (5)	Yes	Yes
Poland	Foundation	1,725	No	No	Greencard (0)	Yes	Yes
Slovakia	Association	1,760	Yes	Yes	Certificate	Yes	—
Slovenia	Chamber of Commerce	211	—	—	Certificate	Yes	—
Armenia	Association	685	No	n.a.		No	No
Azerbaijan	None	1,101	No	No		No	No
Belarus	Association	1,000	No	No	Certificate	Yes	No
Kazakhstan	None	3,365	26	Yes	Certificate	Yes	No
Russian Fed.	Institute	600	No	No		No	No
Tajikistan	Association	334	No	No		No	No
Turkmenistan	None	366	No	No	Certificate	No	No
Ukraine	None	456	No	No		No	No
Uzbekistan	None	1,648	No	No		No	No

Note: n.a. = not applicable; — = not available.

The evaluation found that associations were active mainly in the EU CEITs, with good examples in Bulgaria and Poland, and in the non-EU CEITs of Armenia, Belarus, Russia, and Tajikistan. The Institute for Refrigeration and Air Conditioning in Bulgaria not only carried out many of the activities described above, but also organized small teams to assemble the recovery and recycling equipment. In Poland, the Prozon Foundation was at the heart of recovery and recycling operations, and took responsibility for ODS reclamation and for organizing destruction when reclamation was not possible. Prozon also maintained a database of the recovery and recycling machines and their locations. The Chamber of Commerce in Slovenia provided technical training courses for best-practice servicing of refrigeration and air conditioning equipment. The State Institute of Applied Chemistry in St. Petersburg, Russia, was the principal institution responsible for policy and technology advice on ODS in that country, although it was not known to what extent it advised on the choice of equipment for ODS recovery and recycling.

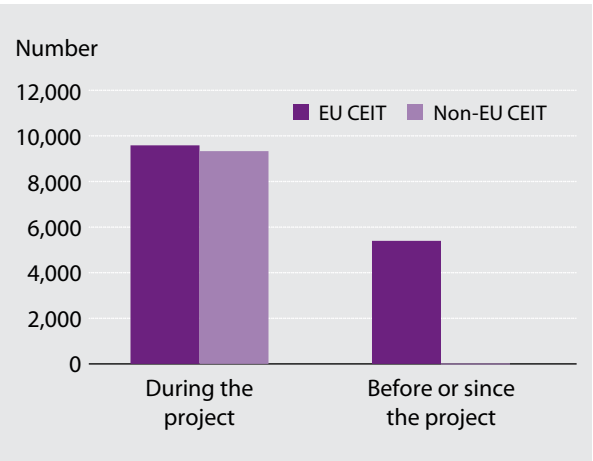
There was no association or comparable entity in Azerbaijan, Kazakhstan, Turkmenistan, Ukraine, and Uzbekistan. Some of these countries were in the process of forming an association, but the requirement for legal approval had delayed their establishment. Some of the companies in these countries did not see the benefits of an associa-

tion and even regarded it as unlikely to be useful because of its links to the national ozone unit or the government. In these cases, the government, with its legislative capability, was seen as "the enemy," likely to hinder rather than help business operations and ultimately reduce profitability.

The advantages of an association or similar organization were demonstrated by the number of technicians trained before and after the GEF project was completed (figure 7.1). Most of the EU CEITs had associations or similar organizations that took responsibility for follow-up training. Such follow-up is an important activity in that it ensures that technicians' skills and knowledge are up to date and in line with legislation, and so promotes the sustainability of ODS phaseout. There were almost no technicians trained before or since the project in the non-EU CEITs, many of which did not have associations. The only follow-up training among the non-EU CEITs has been in Kazakhstan, but the number trained since project completion (26) is much lower than the number trained during the project (3,365).

Figure 7.1

Number of Technicians Trained in EU and Non-EU CEITs During and After the GEF Project



According to the responses received to the survey questionnaire, 78 percent of the EU CEITs reported **training in refrigeration servicing during the project**, compared with 89 percent of the non-EU CEITs.

In most of the EU CEITs, **training conducted after the project was completed was paid for by the trainee**; during the project, these costs were covered by project funds. Self-payment was evidence of the sustainability of the training program, and was strongly linked to the presence of an association in the country.

Many of the EU CEITs provided trainees with a **"greencard" or certificate** upon their having passed the training course. The greencard (blue in Latvia) is a small identification card to be shown to clients as evidence of the holder's qualifications. It is typically valid for three to five years and can be renewed with further training. In Poland, the greencard was temporarily withdrawn pending implementation of new legislation on qualification requirements. In the EU CEITs, not all applicants passed the examination, as trainees had to demonstrate that they had achieved a standard of knowledge and practical proficiency.

In the non-EU CEITs, only Belarus, Kazakhstan, and Turkmenistan issued a certificate; the other countries had no certificate or identification card. Also, there were no reports of applicants failing the training courses. The absence of a certificate or identification card, together with no legislative requirement for qualifications, increased the prospects of unqualified personnel servicing refrigeration and air conditioning equipment. The servicing sector in Ukraine, as an example, cited the involvement of unqualified personnel. Ukraine has no legislation for training, administers no certificate or greencard system, and has undertaken no training since the project was completed in 2004.

To deter unqualified personnel, most of the EU CEITs reported that legislation was in force to **penalize workers who lacked qualifications** for servicing refrigeration and air conditioning equipment. Most of the non-EU CEITs had neither legislation for qualification requirements nor to penalize unqualified technicians.

Another advantage found by those CEITs that invested in training was that it encouraged ongoing and proficient use of ODS recovery and recycling equipment. Extended use of the equipment beyond the closure of the project promoted sustainability from the use of the equipment, and such activities continued to protect the ozone layer.

ODS 3R Equipment

The GEF financed a range of equipment that was distributed to servicing centers for ODS 3R (table 7.5). Manual pumps came with a plastic bag to temporarily store ODS. Electrical recovery pumps transferred the refrigerant to a small cylinder. Recovery and recycling machines recovered the refrigerant, filtered the coarse material, and returned the slightly cleaner refrigerant to the equipment. Reclamation machines recovered the refrigerant and "deep cleaned" it using more sophisticated filters than those in the recovery and recycling machines.

Manual pumps were distributed to only one of the EU CEITs (Estonia), and to 67 percent of the

Table 7.5

ODS 3R Equipment Used in CEITs

		Type of machine				Destruction capability during or after the project	
CEIT	Manual pumps	Recovery	Recovery and recycling	Reclamation	Machines database	Inside country	Outside country
Bulgaria	0	1,000	30	2	No	No	Yes
Czech Republic	0	0	500	2	No	No	Yes
Estonia	50	50	5	1	No	No	Yes
Hungary	0	0	625	1	No	No	No
Latvia	0	0	40	2	No	No	Yes
Lithuania	0	0	50	3	Yes	No	Yes
Poland	0	550	140	1	Yes	Yes	Yes
Slovakia	0	0	0	0	No	Yes	No
Slovenia	—	—	—	—	Yes	No	Yes
Armenia	100	70	5	0	Yes	No	No
Azerbaijan	300	300	50	0	No	No	No
Belarus	0	50	5	1	No	No	No
Kazakhstan	50	595	59	0	No	No	No
Russian Fed.	0	0	925	0	No	No	No
Tajikistan	50	117	5	0	Yes	No	No
Turkmenistan	30	31	3	0	No	No	No
Ukraine	0	86	0	1	Maybe	Yes	No
Uzbekistan	300	430	0	12	Yes	Yes	No

Note: — = not available.

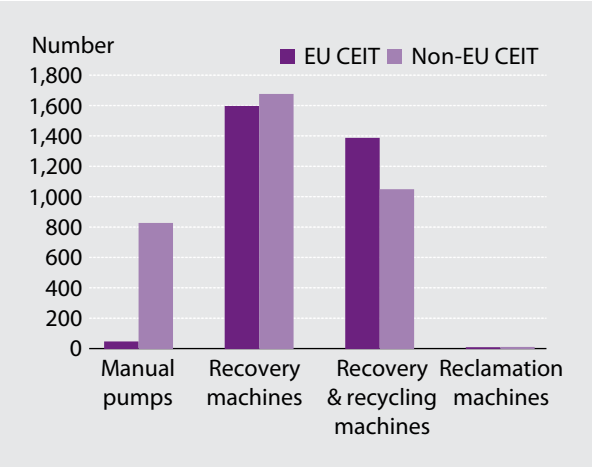
non-EU CEITs. They had the advantage of being relatively light compared to the other units, making them easier to transport without a vehicle. However, hand pumping required more effort than the electrical recovery machines, and they were reported to not be as widely used for this reason.

Recovery machines (about 4,200) outnumbered manual pumps (880) by fourfold. They were distributed about equally between the EU and the non-EU CEITs (figure 7.2). Bulgaria had about 25 percent of all the recovery equipment in the 18 CEITs because it did not use GEF financing to purchase assembled machines, instead opting to purchase components and assemble the equipment itself; this strategy enabled it to make more machines for the same allocated funds.

As shown in figure 7.2, more **recovery and recycling machines** were distributed in EU CEITs than in non-EU CEITs. These were usually larger, heavier units that required a vehicle for transport to the ODS-containing equipment. More technicians in the EU CEITs than in the non-EU CEITs had a vehicle to transport these machines. **Reclamation machines** were relatively rare, with generally one, two, or sometimes three allocated per country. Uzbekistan was unusual in having 12 such machines, and some countries—Armenia, Azerbaijan, Kazakhstan, Slovakia, Tajikistan, and Turkmenistan—had none. Slovakia had none because it imported recycled refrigerant that was presumably clean. The number of reclamation machines allocated to Russia was unknown.

Figure 7.2

Number of 3R Machines Distributed to Servicing Centers in EU and Non-EU CEITs



A **database of the location of these machines** has been maintained by about 30 percent of the CEITs—Armenia, Lithuania, Poland, Slovenia, Tajikistan, Ukraine, and Uzbekistan. Uzbekistan maintained its database mainly for the purpose of reallocating underutilized machines to companies that could make better use of them. Poland recently initiated a database to ensure that the machines were stored and used appropriately.

Sometimes the refrigerant recovered was so contaminated it could not be reclaimed. According to survey questionnaire responses, 89 percent of the EU CEITs stored such contaminated ODS for later destruction, compared to only 11 percent of the non-EU CEITs. In most of the EU CEITs, the contaminated refrigerant was destroyed (the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia) or used as feedstock by the chemical industry (the Czech Republic). Contaminated ODS was not destroyed in the non-EU CEITs, except in Ukraine where commercial destruction facilities exist.

In many countries, businesses involved in servicing reported that, in the absence of destruction facilities, they had stored contaminated refrigerant in cylinders on their properties on the understanding that it eventually would be destroyed. Only two of the EU CEITs (Poland and Slovakia) and two non-EU CEITs (Ukraine and Uzbekistan) reported that they had **refrigerant destruction facilities in their countries during the project**.

In Uzbekistan, the facilities were not commercial but small scale, rather impractical, and expensive to use.

All of the EU CEITs except Hungary reported that they shipped **contaminated ODS to a facility in another country to be destroyed**, but none of the non-EU CEITs reported this as an option. Non-EU CEITs might ship contaminated refrigerant to another country in the future if destruction facilities remained unavailable in their own countries. This conclusion is supported by an analysis of the survey questionnaire: 55 percent of the EU CEITs reported that they had destroyed ODS in their own country between 2007 and 2009, whereas none of the non-EU CEITs' ODS was destroyed in local facilities (see also section 7.3).

Other Activities Indicating Government Commitment

Other activities carried out during and after the GEF project demonstrated governments' ongoing commitment to monitor the recovery and recycling of unwanted domestic refrigerators, halon recovery and storage, the reporting of 3R results, and implementation of other legislation on ODS aimed at reducing ODS emissions (table 7.6).

In the non-EU CEITs, only Kazakhstan and Uzbekistan developed a program for the **recovery of ODS from unwanted refrigerators**; all of the EU CEITs had such a program in place. Most of the EU CEITs recovered ODS from both the cooling circuit and the insulation foam. Kazakhstan and Uzbekistan recovered ODS from the circuit, but the remaining two-thirds of the ODS contained in the insulation foam was not recovered. The other seven non-EU CEITs took refrigerators to landfills, where, over time, ODS would be emitted—an environmentally unacceptable result.

Halon was recovered and banked by few of the CEITs. Only Estonia, Hungary, Kazakhstan, Latvia, and Poland collected halon during the project and banked it. A regional halon bank was established in Estonia to service the needs of the Baltic countries, but so far halon has been received only from Latvia and none from Lithuania. The program in Kazakhstan was halted when trained technicians were no longer available to collect and store the halon. In most of these countries, halon collection and storage was not formulated into the project. Russia did not recover halon during the project because the businesses involved failed to comply fully with the procurement procedures to obtain halon reclamation equipment.[4] The relatively expensive equipment needed for halon reclamation was a deterrent to government involvement in such programs in countries where this equipment was not financed by the project; this is discussed further in section 7.3.

Eleven CEITs—most of which were EU CEITs—reported the amount of **ODS recovered, recycled, and reclaimed during their projects** in compliance with Regulation (EC) No 2037/2000. Reports from Latvia and Slovakia were not made available for the evaluation. Many of the non-EU CEITs stopped collecting this information once the project had been completed, with the exception of Belarus, Tajikistan, and Uzbekistan. Some of the servicing companies visited in the non-EU CEITs continued to collect and maintain a database on ODS amounts recovered, recycled, and reclaimed, but did not submit the information to the national ozone unit, since, they reported, there was no interest from the government in collecting it. The evaluation concluded that legislation was

[4] Some large Russian companies, such as Gazprom, maintain their own private banks. See UNEP Halons Technical Options Committee (2007).

Table 7.6

Other Activities Indicating CEIT Government Commitment to Reduce and Eliminate ODS

CEIT	Refrigerator recovery during or after the project	Halon recovery during the project	3R results during the project	3R results after the project	ODS or related legislation implemented after the project
Bulgaria	Yes	No	No	Yes	Yes
Czech Republic	Yes	No	Yes	Yes	Yes
Estonia	Yes	Yes	Most	Yes	Yes
Hungary	Yes	Yes	Yes	Yes	Yes
Latvia	Yes	Yes	No	No	No
Lithuania	Yes	No	Some	Yes	Yes
Poland	Yes	Yes	Yes	Yes	Yes
Slovakia	Yes	—	No	No	Yes
Slovenia	Yes	No	—	Yes	—
Armenia	No	No	Yes	n.a.	n.a.
Azerbaijan	No	No	No	—	No
Belarus	No	No	No	Yes	Yes
Kazakhstan	Yes	Yes	Yes	No	No
Russian Federation	Yes	No	Yes	No	No
Tajikistan	No	No	Yes	Yes	Yes
Turkmenistan	No	No	Yes	No	No
Ukraine	No	No	No	No	No
Uzbekistan	Yes	No	Yes	Yes	Yes

Note: n.a. = not applicable; — = not available.

necessary to encourage reporting after project completion.

Survey questionnaire responses revealed that all of the EU CEITs and 78 percent of the non-EU CEITs had **3R programs in place in 2007**. All of the EU CEITs reported that the quantities of ODS recovered, recycled, reclaimed, and destroyed were reported to the national ozone units. Only 44 percent of the national ozone units in the non-EU CEITs collected such information—again, mainly because there was no legislation in place requiring such information to be collected. The quantity of ODS reported to be recovered in 2007 in EU CEITs was almost 400 percent more than in the non-EU CEITs (table 7.7).

Table 7.7

Quantity of ODS Recovered in EU and Non-EU CEITs in 2007 (kg)

ODS	EU CEITs	Non-EU CEITs
CFCs	22,969	15,798
HCFCs	90,588	19,304
Halon	20,532	800
Other	109	—
Total	**134,198**	**35,902**

Almost 23 tonnes of CFCs were reported to be recovered, indicating that there were still significant quantities recoverable from equipment some 13 years after the ban on the import and production of CFCs in the EU CEITs.

As a further indicator of government commitment to ozone layer protection, nine CEITs continued to **draft and implement legislation** after the GEF project had been completed. These were mainly the EU CEITs, and largely in response to the requirements of the EC regulation on fluorinated gases. These gases, such as hydrofluorocarbons, have been used to replace ODS in refrigeration and air conditioning. Among other items, the EC legislation requires member states to implement activities addressing the qualification requirements of technicians who service refrigeration and air conditioning equipment containing fluorinated gases and put in place procedures that would minimize emissions of these gases. The conditions that have been put in place also apply to ODS; this related legislation has thus benefited ozone layer protection. Latvia has such legislation in place, but it was implemented during the term of the project which concluded later than in the other EU CEITs. In the non-EU CEITs, only Belarus, Tajikistan, and Uzbekistan have put legislation in place after the project finished.

7.2 Business Commitment

This section discusses the commitment of businesses in the 18 CEITs in the refrigeration, aerosol, foam, solvent, and servicing sectors to the reduction and phaseout of ODS.

Refrigeration Sector

The refrigeration sector covered businesses that manufactured domestic refrigerators, compressors, refrigerated display cabinets, or mobile air conditioning units. The evaluation examined 22 refrigerator production companies, 8 in the non-EU CEITs and 14 in the EU CEITs (table 7.8).

The World Bank was the Implementing Agency for 15 of the subprojects, and UNDP and UNEP were the joint Implementing Agencies for 7 of them. The World Bank conducted a financial viability test for each business as part of the process of determining whether it would be funded; UNDP-UNEP did not test any company's financial viability.

All of the businesses except one (EDA, Poland) achieved its **goal of phasing out ODS**. EDA, a compressor manufacturing company, went bankrupt before its target of 320 ODP tonnes (the quantity attributed to future ODS avoided as a result of the conversion to CFC-free compressors) was achieved. The Sumgait subproject in Azerbaijan implemented through UNDP-UNEP had a target of zero ODS, because the Implementing Agencies did not attribute future ODS phaseout to the replacement of CFC-containing compressors with CFC-free compressors.[5]

There was no correlation between Implementing Agency performance and its use or nonuse of a preinvestment **financial viability test** with the ODS phaseout achieved and whether or not the company was currently operational.

Thirteen of the 22 businesses were still operational in 2009, meaning that 58 percent of GEF financing in the refrigeration sector was financially sustainable. Nine companies were not operational in 2009. Of these, the World Bank was the Implementing Agency for six, and UNDP-UNEP for three.

Nine companies reported that the GEF financial assistance had **increased their production** and **improved their profitability**, indicating that the conversion to non-ODS technology had been

[5] This procedure for not attributing any ODS phaseout due to the manufacture of new ODS-free compressors was consistent with the procedures used by the MLF, which aimed to avoid double-counting of the reduction in ODS consumption in refrigerator manufacture projects. See UNEP (2000), paragraph 10.

Table 7.8

Businesses Receiving Financial Assistance for ODS Phaseout in the Refrigeration Sector

CEIT	IA	Name	GEF funding (mil. $)	Met ODS target	ODS phased out (ODP tonnes)	Operational	Increases realized after the project			
							Production	Profitability	Supplier sales	Employment
Bulgaria	WB	Cool Star	0.536	Yes	27	Yes	Yes	Yes	Likely	—
Bulgaria	WB	MRAZ	3.338	Yes	128	No	No	No	No	Unlikely
Bulgaria	WB	Frigo	1.076	Yes	17	No	—	—	—	—
Bulgaria	WB	Brist	2.046	Yes	10	Yes	Yes	Yes	Likely	Yes
Bulgaria	WB	Klima Inkom	1.012	Yes	19	Yes	—	—	—	—
Czech Rep.	WB	Thermo King	0.249	Yes	110	Yes	n.a.	n.a.	—	—
Hungary	WB	Frigolux	0.440	Yes	16	Yes	Yes	Yes	Likely	—
Lithuania	UNDP	Snaigė	2.009	Yes	112	Yes	Yes	Yes	Likely	No
Lithuania	UNDP	Oruva	1.729	Likely	20	No	Unlikely	Unlikely	Unlikely	Unlikely
Poland	WB	Polar	0.529	Yes	200	Yes	Yes	Yes	Likely	Likely
Poland	WB	Zamex	1.098	Yes	75	No	—	—	—	Unlikely
Poland	WB	EDA	1.581	Unlikely	320	No	No	—	Unlikely	—
Slovenia	WB	LTH	1.754	Yes	26	No	Unlikely	Unlikely	Unlikely	Unlikely
Slovakia	WB	Samsung	2.590	Yes	—	No	No	No	No	No
Armenia	UNDP	Saga	0.170	Yes	6	Yes	Yes	Yes	Yes	—
Azerbaijan	UNDP	Sumgait	2.400	Yes	0	No	No	No	No	No
Azerbaijan	UNDP	Chinar	2.900	Yes	122	Yes	No	No	No	No
Belarus	WB	Atlant	4.320	Yes	282	Yes	Yes	Yes	Yes	Yes
Russian Fed.	WB	Iceberg	0.629	Yes	115	Yes	Yes	Yes	Yes	Yes
Tajikistan	UNDP	Pamir	0.123	Yes	0.2	No	No	No	No	No
Uzbekistan	UNDP	SINO	1.516	Yes	35	Yes	No	No	No	No
Ukraine	WB	Nord	9.775	Yes	500	Yes	Yes	Yes	Yes	Yes

Note: n.a. = not applicable; — = not available; IA = Implementing Agency; WB = World Bank.

good for business. It is likely that companies supplying these nine businesses with materials also increased their sales, so GEF financing had a catalytic effect beyond those companies that benefited directly from the funding.

Some of these companies—including Nord (Ukraine), Snaigė (Lithuania), and Atlant (Belarus)—leveraged their improved profitability to purchase other companies and establish daughter companies in other countries. This increase in production and expansion of manufacturing facilities makesit likely that **employment increased** after the transition and prior to the recent economic crisis. GEF funding thus contributed to a positive socioeconomic impact by increasing local employment. Details of the changes to the companies as a result of GEF financial assistance are described in volume 2 of this report.

Accurate and comprehensive project formulation contributed to successful ODS phaseout. According to the survey questionnaire responses, 56 percent of the national ozone units in the EU CEITs strongly agreed that the subprojects were well formulated by the Implementing Agencies; 11 percent of their counterparts in the non-EU CEITs strongly agreed with this statement, while

another 67 percent agreed. Similarly, 44 percent of the national ozone units in the EU CEITs strongly agreed that the subprojects were well implemented; 67 percent of the national ozone units in the non-EU CEITs agreed with this statement. These responses suggest that EU CEITs experienced a more satisfactory result on subproject formulation and implementation, compared to the non-EU CEITs. About 56 percent of the EU CEITs strongly agreed with the statement that they were consulted during the project formulation and implementation phase; none of the non-EU CEITs strongly agreed with this statement.

Overall in the refrigeration sector, about 60 percent of the businesses that received GEF financial support are still operational, many more than 10 years after the closure of the project. About 40 percent reported that they were more profitable after the transition to non-ODS technology than before. The technology that had been installed 10 years ago, in many cases, was still operational, albeit in some companies with lower output in the past two years than in the period prior to the economic crisis.

Aerosol Sector

Eleven aerosol companies were examined in this evaluation (table 7.9), four in the non-EU CEITs and seven in the EU CEITs. All but four manufactured household aerosols containing a wide range of ingredients and used for such activities as house and car cleaning or body grooming; the other companies (Mediroll in Hungary, Polfa Tarch in Poland, and Lek and Krka in Slovenia) produced aerosols for medicinal purposes.

The World Bank was the **Implementing Agency** for eight of the subprojects, and UNDP and UNEP were the joint Implementing Agencies for the other three. All of them achieved their **ODS phaseout target**.

Three of the 11 plants were either not **operational** or partially operational. Mediroll in Hungary had used its GEF finance to develop and market a surgical instrument sterilization product that used ethylene oxide as the sterilant. Ethylene oxide has since been banned in Hungary and therefore production was discontinued, but the company still manufactured a wide range of other medical products. The GEF finance to Mediroll was modest compared to the amount of ODS phased out. Therefore, although the product was not sustainable, the ODS phaseout was successful.

Two of the other facilities involved aerosol companies that were partially operational. The Chimprom aerosol facility in Russia operated once every three to four years according to market demand. This limited market production (referred to by the company as "campaign production") was undertaken only in reaction to discrete and occasional sales to consumers. Similarly, the Yerevan Household Chemistry Plant in Armenia produced aerosol engine cleaning degreasers in a single round of campaign production annually, but only when there was a demand for the product. The main part of its operations was not functioning, and it was considered bankrupt. This facility also reported difficulty in obtaining **spare parts** for its operations, but 6 of the other 11 facilities reported that spare parts were readily available at a reasonable cost.

It was not possible to correlate the failure (no production in one company) and partial failure (limited market production in two companies) with the presence or absence of a financial viability test performed on these companies by the Implementing Agencies. All of the businesses achieved their ODS phaseout; either their product or company failed to survive completely or partially after the ODS was phased out.

Five of the aerosol plants **increased their production** and **improved their profitability** as a

Table 7.9

Businesses Receiving Financial Assistance for ODS Phaseout in the Aerosol Sector

CEIT	IA	Name	GEF funding (mil. $)	Met ODS target	ODS phased out (ODP tonnes)	Opera-tional	Spare parts available	Increases realized after the project			
								Produc-tion	Profit-ability	Supplier sales	Employ-ment
Hungary	WB	Mediroll	0.048	Yes	107	No	n.a.	—	Unlikely	Unlikely	Unlikely
Hungary	WB	Auto-Mobil	0.081	Yes	97	Yes	—	—	—	—	—
Latvia	UNDP	Kvadro	—	Yes	5	Yes	Yes	Yes	Yes	Yes	—
Lithuania	UNDP	Vilnius	0.468	Yes	246	Yes	Yes	Yes	Yes	Likely	—
Poland	WB	Polfa Tarch	0.446	Yes	320	Yes	Yes	—	Yes	—	—
Slovenia	WB	Krka	0.414	Yes	79	Yes	—	—	—	—	—
Slovenia	WB	Lek	1.777	Yes	157	Yes	—	Yes	Yes	Yes	Yes
Armenia	UNDP	Yerevan	0.035	Yes	14	CP	No	No	No	—	—
Russian Fed.	WB	Chimprom	4.733	Yes	1,212	CP	Yes	No	No	No	No
Russian Fed.	WB	Harmonia	6.185	Yes	1,105	Yes	Yes	Yes	Yes	Yes	—
Ukraine	WB	Ukranian	3.100	Yes	500	Yes	Yes	Yes	Yes	Yes	Yes

Note: n.a. = not applicable; — = not available; IA = Implementing Agency; CP = campaign production (partially operational); WB = World Bank.

result of the GEF financial assistance, which indicated that the conversion to non-ODS technology had been good for business. It is likely that **companies supplying materials** to these businesses also increased their sales, so the GEF finance had a catalytic effect beyond the aerosol companies that benefited directly from the funding. Companies that were not directly funded benefited from the expert advice provided to the companies that were funded.[6] This again showed that the catalytic effect of GEF funding went beyond the companies funded in the sector.

Harmonia, now the largest aerosol producer in Russia, was one of the companies that reported increased profitability. However, it was not optimistic of similar profit margins in the future, as a more profitable market had developed that required more sophisticated aerosol-filling equipment than that supplied by the project 10 years ago. Harmonia reported that it felt locked into the older GEF-financed technology, as it was unable to sell the equipment to raise funds for new equipment. It also reported that the Russian government would impose a high sales tax on any disposal of equipment derived from an international project, making any such sale prohibitively expensive and further discouraging new investment.

Only one of the companies (Ukrainian Aerosols) reported an **increase in the number of employees** in response to increased business. The same company was making arrangements with another local company to jointly develop and market products in a way that was expected to benefit both companies, but which neither could achieve individually.

The conversion to non-ODS technology in the aerosol sector was overall successful. Most of the companies that had converted were still in operation in 2009, and some were more profitable than prior to the conversion. Given that the aerosol market is highly competitive due to the possibility in many countries of cheaper imports, the

[6] Information provided to the GEF impact evaluation workshop held in Tashkent, September 7–8, 2009, by Russia, which had the greatest share of GEF aerosol projects.

survival rate of the companies in the CEITs was satisfactory.

Foam Sector

There were 11 foam companies examined in this evaluation (table 7.10). Three companies were in the non-EU CEITs, and eight were in the EU CEITs. The World Bank was the **Implementing Agency** for eight of the subprojects, and UNDP and UNEP were the joint Implementing Agencies for three of them. Six of the companies manufactured sandwich panels, four manufactured flexible foam used for tank or pipe insulation, and one was a spray foam company.

All achieved their **ODS phaseout target**, except Trade Market (Kazakhstan), which achieved about 90 percent ODS reduction as it reverted to HCFCs after transitioning the project to ODS-free technology. Trade Market was a larger company which in 1998 supplied chemicals to 16 other companies for the manufacture of small-scale rigid and flexible foam. Four of the companies in the rigid foam operations went bankrupt, as they were not able to sustain the relocation costs, and almost all the companies in flexible foam operations went bankrupt because of cheaper imports from Russia. The sandwich panel operations under Trade Market are therefore shown as **operational**, but the flexible foam is not. There was no correlation between an Implementing Agency's use or nonuse of a financial viability test and the subsequent survival of the foam manufacturing company.

Metalplast was deleted from the company records in Poland in 2006 when it was purchased by another company (Ruuki), which was operational in 2009. The evaluation assumed that the equipment that had been supplied in the GEF project was being used by Ruuki; it therefore was scored as operational.

Three companies reported that **spare parts were available** for the machinery financed by the GEF which covered sandwich panel, spray, and flexible foam operations in Hungary, Latvia, and Russia. There was no information from the other companies on availability of spare parts.

Five of the foam facilities reported that their **production increased** and their **profitability improved** as a result of the GEF financial assistance, which indicated that the conversion to non-ODS technology had been good for business. For some, **employment** either increased or was likely to have increased. It is likely that the businesses that supplied these facilities with materials also increased their sales, indicating that the GEF finance had a catalytic effect beyond those five companies producing foam products that benefited directly from the funding. The reasons for their increased production and profitability are provided in volume 2 of this report.

Two other companies that were operational did not increase production or improve profitability. One was Metalucon in Hungary, which reported that the sandwich panel manufacturing equipment was used a great deal in the past, but in 2009 its use was down to about one day a month. The factory was operating four to six hours on a four-day week. Metalucon reported difficulty competing with cheaper panels produced locally in Hungary. The other company was Ritols from Latvia, which reported a similar level of operation before and after the conversion. Ritols applied spray foam for insulation in established as well as new buildings; during the economic crisis, its work involved mainly old buildings as there was little new construction.

The evaluation concludes that the conversion to non-ODS technology in the CEIT portfolio was successful in the foam sector. Most of the companies that had converted were still in operation in

Table 7.10

Businesses Receiving Financial Assistance for ODS Phaseout in the Foam Sector

CEIT	IA	Name	Foam type	GEF funding (mil. $)	Met ODS target	ODS phased out (ODP tonnes)	Operational	Spare parts available	Increases realized after the project			
									Production	Profitability	Supplier sales	Employment
Czech Rep	WB	BHL	S	0.554	Yes	80	Yes	—	Yes	Yes	Likely	Likely
Hungary	WB	Hajdu	F	1.010	Yes	63	Yes	—	Yes	Yes	Likely	—
Hungary	WB	Metalucon	S	0.683	Yes	46	Yes	—	Unlikely	Unlikely	Unlikely	Unlikely
Hungary	WB	Metisol	S	0.336	Yes	80	Yes	Yes	Yes	Yes	Likely	No
Latvia	UNDP	Ritols	Spray	0.106	Yes	13	Yes	Yes	No	No	No	No
Poland	WB	Inzynieria	F	0.149	Yes	19	Yes	—	—	—	—	—
Poland	WB	Metalplast	S	0.481	Yes	300	Yes	—	—	Yes	—	—
Slovenia	WB	Trimo	S	1.153	Yes	28	Yes	Yes	Yes	Yes	Yes	Likely
Kazakhstan	UNDP	Trade Market	S	1.154	No	90	Yes	—	Yes	Yes	Yes	Yes
Kazakhstan	UNDP	Trade Market	F	0.285	Yes	45	No	—	No	No	No	No
Russian Fed.	WB	Stroydetal	F	1.082	Yes	39	Yes	Yes	Yes	Yes	Yes	Yes

Note: — = not available; IA = Implementing Agency; S = sandwich panels; F = flexible; WB = World Bank.

2009, and some of them were more profitable than prior to the conversion. Because the foam market is highly competitive with cheaper imports available in many countries, the survival rate of the companies in all CEITs was satisfactory except, as noted above, Kazakhstan.

Solvent Sector

Eleven companies that had converted to ODS-free solvents were examined by the evaluation (table 7.11). Four companies were located in the non-EU CEITs, and seven in the EU CEITs. The World Bank was the **Implementing Agency** for 10 of the subprojects, and UNDP and UNEP were the joint Implementing Agencies for one—the Pavlodar Chemical Company (PCC) in Kazakhstan, which produced industrial chemicals.

All except PCC achieved their **ODS phaseout target**. For PCC, the GEF financed replacement of CFCs with methylene chloride as a solvent to remove 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 methylene chloride as a way of conserving the total used. The equipment was installed, but was not operational as it had not been certified. The costs of certification were not included in the GEF finance and were about twice the cost of the equipment, and PCC was unsure whether it would be able to pay these costs. PCC was therefore evaluated as not **operational**.

The World Bank's 10 solvent subprojects that were examined in this evaluation were successful. The only subproject undertaken by UNDP-UNEP (PCC) was not successful after the equipment was installed. PCC's financial viability was not determined prior to investment by UNDP-UNEP, but financial viability tests were undertaken by the World Bank for the other solvent subprojects. The evaluation concluded that the lack of certification for PCC's equipment was related more to project formulation than company financial viability, and therefore that there was no correlation between the financial viability test and the inoperability of the equipment installed.

Table 7.11

Businesses Receiving Financial Assistance for ODS Phaseout in the Solvent Sector

CEIT	IA	Name	GEF funding (mil. $)	Met ODS target	ODS phased out (ODP tonnes)	Operational	Spare parts available	Increases realized after the project			
								Production	Profitability	Supplier sales	Employment
Bulgaria	WB	VMZ	0.649	Yes	50	Yes	—	—	—	—	—
Hungary	WB	MMG	1.147	—	91	No	—	—	—	—	—
Hungary	WB	Hitelap	0.187	Yes	32	Yes	Yes	Yes	Yes	Likely	Yes
Hungary	WB	Tisza	0.124	Yes	24	No	—	—	—	—	—
Hungary	WB	BRG	0.012	Yes	1.5	Yes	—	—	—	—	—
Hungary	WB	Rutitex	0.346	Yes	8	Yes	Yes	Yes	Yes	Yes	No
Slovenia	WB	Labod	0.181	Yes	2.8	Yes	—	Yes	Yes	Likely	Likely
Belarus	WB	Minsk Comp	—	Yes	49	Yes	—	No	Yes	No	Unlikely
Belarus	WB	Tsvetotron	—	Yes	32	Yes	—	Unlikely	Yes	Unlikely	Unlikely
Belarus	WB	Minsk Inst	—	Yes	6.2	Yes	—	No	Yes	Yes	Unlikely
Kazakhstan	UNDP	Pavlodar	0.099	No	0	No	n.a.	No	No	No	No

Note: n.a. = not applicable; — = not available; IA = Implementing Agency; WB = World Bank.

MMG and Tisza, both Hungarian companies, were also scored as not operational. MMG was the largest manufacturer of control and automation devices in its country. In 2009, it was reported to be in receivership, and the evaluation was unable to determine whether its ODS had been phased out. Tisza manufactured shoes, and the GEF financed a range of equipment to replace ODS solvents. Soon after the plant was operational, Tisza established a daughter company to which it transferred the GEF-paid equipment. The daughter company went into liquidation shortly afterwards, and the fate of the equipment was unknown.

Three companies (Hitelap and Rutitex in Hungary, and Labod in Slovenia) reported that their **production increased** and **profitability improved** as a result of the GEF financial assistance, which indicates that the conversion to non-ODS technology had been good for business.

Employment increased in Hitelap, a company in Hungary manufacturing printed circuit boards for electronic firms, using sophisticated and expensive electronic and X-ray technology. Machines purchased with GEF funds were reported by the company to be crucial for its operations, even 13 years after they were installed. The project helped the company increase production 10-fold, and enabled it to comply with environmental and safety legislation. It is likely that the **companies that supplied these successful businesses with materials** also increased their sales, indicating that the GEF finance had a catalytic effect beyond those companies benefiting directly from the funding.

Rutitex Ltd is a chain of dry-cleaning laundries in Hungary. The project enabled early amortization of its CFC-operated machines as well as compliance with environmental legislation. Rutitex competitors that were not funded by the GEF replaced their dry-cleaning equipment with open-top cleaners, which were subsequently banned under the EC directive on volatile organic compounds,[7] and they went bankrupt.

[7] The Solvents Emissions Directive (1999/13/EC), entered into force on April 1, 2001, in the Euro-

The conversion to non-ODS technology in the CEIT portfolio was successful in the solvent sector. Approximately 90 percent of the financial investment by the GEF in these subprojects was in equipment that is still being used. Most of the companies that had converted were still in operation in 2009, and some were more profitable than prior to the conversion.

Servicing Sector

Sixteen companies that participated in the refrigerant 3R program were visited in this evaluation (table 7.12). All of these companies were located in the six Central Asian CEITs, Russia, and Ukraine, except one that was located in Slovenia. In all, almost 800 servicing companies operate in those countries; therefore, the evaluation's conclusions are based on visits to less than 2 percent of the companies in operation.

UNDP and UNEP were the joint **Implementing Agencies** for 12 of the subprojects, and the World Bank was the Implementing Agency for the remainder.

The **ODP tonnes targeted** in each country that were to be eliminated as a result of the servicing program were defined in all of the countries except Russia. The ODP tonnes phased out as a result of the servicing program were reported for two countries (Armenia and Uzbekistan) but not for Azerbaijan, Kazakhstan, Russia, Slovenia, and Ukraine.

Armenia achieved 86 percent of its relatively low **phaseout target per year** of 5 ODP tonnes. This phaseout was achieved through an incentive program that aimed to eliminate the use of CFCs by replacing or retrofitting refrigeration equipment in 35 businesses.

Uzbekistan achieved a much lower phaseout of 16 percent (15 ODP tonnes) of its targeted 92 ODP tonnes per year. Country representatives noted that the relatively low quantity of CFCs recovered reflected the scarcity of CFCs compared to 1995 and 1996. Several of the servicing companies, which had handled more CFCs in the mid-1990s than when the project was operational, made similar observations. In an effort to increase refrigerant recovery, Uzbekistan reassigned machines from poorly to highly efficient companies, based on a review of CFC quantities recovered and recycled. In general, the amount reported as recovered and recycled by countries as lower than targeted could be due to underreporting by the servicing companies or an overly ambitious target initially developed in the course of subproject formulation, or a combination of the two.

All of the servicing companies assessed were **operational**, except one in Kazakhstan. Torgtekhnika had not used the recovery machine because there were insufficient CFCs to recover and recycle following Kazakhstan's import ban: the recovery machine had arrived too late, as most of the CFCs were already gone. The other servicing companies generally reported that the machines had been well used in the past, but that their operational cost for the limited amount of refrigerant no longer made them cost-effective to use.

Two companies reported that **spare parts** for the equipment were available (Electroservice in Ukraine, and Oasis in Kazakhstan); four others cited difficulties in obtaining spare parts. As a result, some machines had been cannibalized to keep others operational, or machines were left in a state of disrepair. Even when the parts were available, their cost was reported to be an impediment to purchase. For example, one machine hose cost

pean Union for new installations, and has applied to all installations since October 31, 2007.

Table 7.12

Businesses Receiving Financial Assistance for ODS Phaseout in the Servicing Sector

CEIT	IA	Name	GEF funding (mil. $)	No. of companies in 3R program	Tonnes targeted per year	ODS phased out (ODP tonnes per year)	Operational	Spare parts available	Improved profitability
Armenia	UNDP	Incentive Program	0.482	35	5.6	4.3	Yes	—	Yes
Azerbaijan	UNDP	Titan	1.106	32	85	—	Yes	—	—
Kazakhstan	UNDP	Oasis	2.545	600	70	—	Yes	Yes	Yes
Kazakhstan	UNDP	Combitech	—	—	—	—	Yes	No	Yes
Kazakhstan	UNDP	Polair	—	—	—	—	Yes	—	Yes
Kazakhstan	UNDP	Torg Teknik.	—	—	—	—	No	—	No
Kazakhstan	UNDP	Auto Klimat	—	—	—	—	Yes	—	Yes
Russian Fed.	WB	Podolsktorg.	9.265	24	—	—	Yes	—	Yes
Russian Fed.	WB	Volgograd	—	—	—	—	Yes	—	—
Ukraine	WB	Electroservice	2.144	9	538	—	Yes	Yes	Yes
Slovenia	WB	Gorenje Servis	0.190	1	11.4	—	Yes	—	Yes
Uzbekistan	UNDP	Savdotek.	1.328	100	92	15	Yes	No	Yes
Uzbekistan	UNDP	Shark Shab.	—	—	—	—	Yes	No	Yes
Uzbekistan	UNDP	Yo'L Ref.	—	—	—	—	Yes	—	—
Uzbekistan	UNDP	Kerio Ser.	—	—	—	—	Yes	—	Yes
Uzbekistan	UNDP	Savodo Tek.	—	—	—	—	Yes	No	Yes

Note: — = not available; IA = Implementing Agency; WB = World Bank.

the equivalent of a week's salary for a technician in Uzbekistan.

The majority of the operational servicing companies visited reported that the recovery and recycling machines improved their profitability. They no longer had to buy CFCs, which in many cases were becoming more expensive or were not obtainable. Some companies reported that they were selected for refrigerator repair by clients because they had machines that allowed them to reuse the refrigerant. Most companies reported that they did not pass on cost savings to their clients.

On the basis of the small sample of companies visited, the use of recovery and recycling equipment in the CEIT portfolio was satisfactory in the servicing sector. Most of the equipment was still in use. However, there was a lack of information in most countries on the quantities recovered and recycled. Where information was available, the quantities were often much less than targeted in the subproject formulation. Spare parts were becoming an issue for some companies; the implications of this are discussed in the following section.

7.3 Theory of Change: Assessment of Threats and Risk

Illegal Trade in ODS

The Montreal Protocol requires all countries to have a licensing system in place to regulate type and quantity of ODS imports and exports. Responses to the survey questionnaire showed that 100 percent of the EU CEITs, and 89 percent of the non-EU CEITs, reported having such a licensing system. For these systems to be effective, however, it is necessary to have quotas restricting

the quantity of ODS that can be imported and to have procedures in place for allocating the quota equitably across companies. All of the EU CEITs reported having quotas for ODS, compared with only 56 percent of the non-EU CEITs.

The large volume of legitimate ODS trade that takes place for exempted and legal uses provides cover for illegal trade. One study calculated that more than 24,000 legitimate transboundary shipments of ODS occurred in 2004, presenting customs officers with the complex task of differentiating legal from illegal shipments (Chatham House and EIA 2006).

Illegal trade in ODS can arise in many forms (UNEP DTIE OzonAction Programme 2009). For example, ODS containers can be disguised to give the appearance of transporting non-ODS substances. Traders can attempt to import or export ODS without licenses, using false descriptions in customs documents. In other examples, traders have fraudulently represented ODS as being exported legitimately from industrialized to developing countries (where the phaseout date is later) but have in fact exported empty cylinders and sold the ODS illegally in industrialized countries (UNEP 2001).

The World Customs Organization Regional Intelligence Liaison Offices serve as the focal point for international intelligence analysis and liaison enforcement. The offices collect, collate, evaluate, and disseminate information on customs offenses to the offices in the region, and periodically produce bulletins listing seizures of global and regional relevance, trend analyses, and analytical reports.

During the mid-1990s, most of the ODS entering Europe and the United States illegally was believed to have originated in Russia, and cases of illegal trade in CFCs manufactured in Russia were detected in Estonia, the United Kingdom, the United States, and other countries (EIA 2008). Illegal ODS trade in CEITs became a cause of serious concern during the 1990s. The parties to the Montreal Protocol have agreed on three times as many decisions on illegal trade in 2001–09 as they had in 1998–2000, signifying their heightened level of concern.

Most of the CEITs have intercepted illegal trade in ODS since 2002. Those reported in this evaluation are shown in annex J, along with information from other sources. As shown, interceptions of Asian origin have become increasingly more frequent in non-EU CEITs. The cases reported by customs agencies are relatively small scale, in contrast to the large amounts of CFCs available on the market in Central Asian countries. This indicates large-scale smuggling of ODS which must have bypassed border security (UNEP DTIE OzonAction Programme 2009).

Table 7.13 summarizes examples of illegal trade reported in annex J. Uzbekistan has reported a large number of cases, which is explained by the efficiency of its customs service and its popularity as a transshipment route from Asia to other countries in the region, such as Turkmenistan and Kazakhstan.

The evaluation assessed the risk of illegal trade for each of the CEITs based on information contained in table 7.1 (legislation), table 7.4 (training), and table 7.5 (equipment) involving the ability of the customs service and inspectorate to combat illegal trade. This assessment found two countries at moderate risk of illegal trade in ODS entering the market (Ukraine and Uzbekistan), four countries at high risk (Kazakhstan, Russia, Tajikistan, and Turkmenistan), and the remaining CEITs at low risk (table 7.14).

One of the main problems facing customs officers is the large number of categories of ODS that have

Table 7.13

Examples of Illegal ODS Trade Reported in CEITs Since 2002

CEIT	No. of reported events	Implied sources of ODS	ODS	ODP tonnes	Tonnes	Year of event
Armenia	2	Saudi Arabia, United Arab Emirates	CFC	—	—	2007?
Belarus	1	Not stated	CFC	—	—	2003
Czech Republic	3	Czech Rep., other not stated	HCFC	> 0.021	> 0.380	2002–03
Estonia	13	Estonia, other not stated	Halon, HCFC	> 2.404	> 0.470	2005, 2007?
Kazakhstan	1 + reported risk	Russia, China	CFC, HCFC	> 0.006	> 0.110	2007, 2009
Poland	> 2	Ukraine	HCFC, CFC	> 0.150	> 0.150	2005?
Russian Federation	4 + reported risk	China, Germany, Russia, other not stated	CFC, TCE, other	46.377	> 109.960	2007, 2008, 2009
Slovakia	20	Not stated	—	—	—	2004–09
Tajikistan	Several	Not stated	CFC mainly	—	—	—
Turkmenistan	1 + reported risk	Not stated	CFC, other?	—	> 1.224	2006, 2009
Ukraine	Reported risk	Not stated	CFC	—	—	2009
Uzbekistan	> 21	China, Kyrgyzstan, Uzbekistan	CFC, HCFC, MB, other	—	> 1.764	2002–08

Note: — = not available; MB = methyl bromide; TCE = trichloroethylene. See annex J for further details and information sources.

not been phased out but are still permitted, either because the ODS is not controlled in the Montreal Protocol, or there is an exemption for some parties and uses. For example, there are restrictions on some refrigerants as fluids but not if the fluids are contained within equipment, because the parties elected to control ODS at the source rather than in the equipment. There are exemptions for ODS used as feedstock and process agents, because feedstock is consumed and not emitted, and process agents are used under controlled conditions with emission restrictions. Some uses are permitted without quota restrictions; for example, methyl bromide for quarantine and preshipment (QPS), but banned in developed countries for non-QPS uses and not banned in developing countries for the same uses until 2015. It is almost impossible for customs officers to be fully conversant with all the nuances of ODS cross-border and to ensure that all transactions are compliant with the Montreal Protocol. They must instead rely on their knowledge of the legislation in each country and must make decisions to deny or allow import-export based on this knowledge. Training of customs officers was therefore seen as a high priority by many of the CEIT governments.

Recovery, Recycling, Reclamation, and Destruction of ODS

The important elements of a successful program to conserve ODS for servicing refrigeration and air conditioning equipment include training and equipment, underpinned by legislation to require qualifications of servicing personnel and reporting the results on an annual basis to the national ozone unit.

As noted above, all countries had gained access to two or more different types of recovery and recycling equipment as a result of the GEF finance, and all had undertaken training of personnel during the project.

Those countries that continued 3R programs after the end of the project were the EU CEITs, all of

Table 7.14

Risk of Illegal Trade in ODS in CEITs After 2010

CEIT	Assessment	Reason
Armenia	Low	• Article 5 country with imports declining, and effective recovery and recycling program • Officers recently trained
Belarus, Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia	Low	• Legislation in place with dissuasive penalties • Trained customs officers with detection equipment and interagency communication • New legislation on ODS in EU countries requires country profiling
Azerbaijan	Low	• Frequent communication between national ozone unit and customs • Trained officers
Kazakhstan	High	• Relatively few customs officers trained to detect ODS, lack of knowledge by customs of ODS legislation • Rarely used detection equipment • Few interceptions of ODS • Bribery of customs officers
Russian Federation	High	• Weak coordination between Ministry of Environment and the customs service leading to limited information exchange • No trained customs officers • Inconsistent data on ODS imports and exports • Few interceptions of ODS • Customs officers jailed in 2009 for taking bribes • Cheap virgin CFCs on the market and widespread reports of interceptions
Tajikistan	High	• Some trained customs officers but rapid rotation, so knowledge of ODS detection lost • Large demand for CFCs due to old equipment and insufficient funds for CFC-free replacements • Insufficient recovery and recycling program, which contributes to 10 percent of the CFCs required
Turkmenistan	High	• Poor interagency coordination with customs • Few trained officers • identifiers not with customs • Cannot afford to replace CFC-based equipment • Reports of cheap CFCs on the market • Recovery and recycling program left weakened by staff who have left the country • License system and quotas not in place
Ukraine	Moderate	• Reports of cheap CFCs on the market • Poor interagency coordination • Inspectorate monitoring ODS via license system and quotas
Uzbekistan	Moderate	• Legislation in place to penalize those engaging in illegal trade • Penalties being strengthened • Trained customs officers with detection equipment and interagency communication • Good record of interceptions of illegal trade in ODS

which had an association or similar organization, training after the project, legislation for qualification requirements, and reporting of program results on an annual basis (table 7.15). Associations were present in only three non-EU CEITs (Armenia, Belarus, and Tajikistan). The evaluation assessed the risk of failure of the 3R programs in the EU CEITs as **low**.

Armenia, Belarus, Kazakhstan, Tajikistan, and Uzbekistan were assessed as having a **medium risk of failure** for their 3R programs. Both Armenia and Belarus had an association or similar organization functioning independently of the national ozone unit; Belarus also had legislation for qualifications and 3R reporting in place. Although Kazakhstan did not have an association, it was unusual among non-EU CEITs in that it did have procedures for training technicians and legislation for qualification requirements—both of which would enhance the prospects for continuation of its 3R program. Tajikistan had an association that collected data on the quantities of ODS recovered and recycled, assisted with training personnel in the 3R program, and helped the government disseminate information on the importance of ODS recovery and recycling.

Countries assessed with a **high risk of failure** for their 3R programs were Azerbaijan, Russia, Turkmenistan, and Ukraine. These countries had none of the key elements in place that encouraged programs to continue after the GEF project ceased.

For example, Turkmenistan and Armenia as developing countries were required to phase out their consumption of CFCs by January 1, 2010, which in effect means that they cannot import CFCs after that date if they are to remain compliant with the Montreal Protocol. They can, however, use the CFCs from their 3R programs to refill existing CFC-dependent equipment, thereby avoiding the need for any CFC imports. The 3R program is therefore most important when CFC imports are limited (to 15 percent of base level from January 1, 2007, to December 31, 2009) or not permitted at all (after January 1, 2010).

For the remaining developed country non-EU CEITs, the ability to recover and recycle ODS reduced the prospects of illegal trade in CFCs. To remain compliant with the Montreal Protocol, CFCs were used from their 3R programs to service existing CFC-dependent equipment, which not only helped avoid illegal imports of CFCs, but also avoided premature retirement of CFC-dependent equipment. This was important for companies that could not afford to immediately reinvest in CFC-free equipment.

All of the EU CEITs have access to destruction facilities, but only one of the non-EU CEITs (Ukraine) does. The Czech Republic reported that it did not destroy all its ODS but shipped it to Germany for use in the chemical industry. This is a useful alternative to destruction, where such feedstock use is possible. Uzbekistan destroyed illegal ODS that had been intercepted by its customs service in the past, but its facility is not commercial, and consequently is expensive to use and impractical. Uzbekistan was therefore judged as not having access to commercial facilities for safely and economically destroying ODS (table 7.15).

Many of the servicing companies in the non-EU CEITs reported that contaminated ODS was taking up valuable storage space in their facilities and that there was no means by which to destroy it. The amount of ODS stored varied from small amounts of 12–13 kilograms in small cylinders to several larger cylinders that could store several hundred kilograms. The risk of this contaminated ODS being emitted increased the longer it was stored. Because it was difficult to ascertain whether old contaminated ODS was released to make space for new contaminated ODS, the amount stored

Table 7.15

Assessment of the Prospects for Continuing ODS 3R Program in CEITs

CEIT	3R machines	Refrigeration association or similar entity	Training after the project	Legislation for qualifications	Legislation for reporting on 3R	Access to destruction	Risks of annual 3R program failure
Bulgaria	Yes	Yes	Yes	Yes	Yes	Yes	Low
Czech Republic	Yes	Yes	Yes	Yes	Yes	Yes	Low
Estonia	Yes	Yes	Yes	Yes	Yes	Yes	Low
Hungary	Yes	Yes	Yes	Yes	Yes	Yes	Low
Latvia	Yes	Yes	Yes	Yes	Yes	Yes	Low
Lithuania	Yes	Yes	Yes	Yes	Yes	Yes	Low
Poland	Yes	Yes	No	Yes	Yes	Yes	Low
Slovakia	Yes	Yes	Yes	Yes	Yes	Yes	Low
Slovenia	Yes	Yes	Yes	Yes	Yes	Yes	Low
Armenia	Yes	Yes	No	No	No	No	Medium
Azerbaijan	Yes	No	No	No	No	No	High
Belarus	Yes	Yes	No	Yes	Yes	No	Medium
Kazakhstan	Yes	No	Yes	Yes	No	No	Medium
Russian Federation	Yes	No	No	No	No	No	High
Tajikistan	Yes	Yes	Yes	No	No	No	Medium
Turkmenistan	Yes	No	No	No	No	No	High
Ukraine	Yes	No	No	No	No	Yes	High
Uzbekistan	Yes	No	No	No	No	No	Medium

and released could be underestimated. It was clear, however, that the servicing companies wanted a permanent solution to the problem such as destruction and that to release the ODS would be damaging to the environment and counter to the original intentions of the program.

Continued Use of ODS: Halon

Halon continued to be used as a firefighting and explosion-suppression agent in several of the CEITs. Many of the EU CEITs banned the import of halon and equipment that relied on halon in the early 1990s. Later, Regulation (EC) No 2037/2000 required that, as of January 1, 2004, EU CEITs decommission all noncritical uses of halons and recover them for destruction using acceptable or approved technologies or any other environmentally acceptable destruction technology. A critical use was defined at one that did not have a technically and economically feasible alternative; this mainly referred to equipment used by the military as well as by the aviation and petroleum industries.

Halons have thus been replaced by alternatives in many installations in the EU CEITs, and the halon either destroyed or banked for uses that still remain critical. This banking is important, as halon production ceased in all developed countries on January 1, 1994, and has almost ceased in developing countries except for relatively small quantities produced in North Korea. Therefore, the only halon that is available to replace any lost from its existing applications is used halon that has been reclaimed and banked for this purpose. The use of recycled halon—whether imported or obtained from national banks—is not counted as

part of a country's consumption, and is therefore compliant with the Montreal Protocol.

Estonia and Lithuania documented the halon that had been decommissioned from ships and TV towers (see volume 2). Estonia's halons were stored in Tallinn, which serves as the regional halon bank for the Baltic countries. In Poland and the Czech Republic, companies recovered and banked halons using equipment they paid for themselves, as the GEF paid only for training activities related to halon recovery and banking.

The non-EU CEITs were not as active as the EU CEITs in replacing decommissioned halon with alternatives; halon was therefore much more of an environmental problem in these countries:

- **Armenia** has no management plan to replace halon, and its only activity in this regard has been a meeting in 2007 to raise awareness of key stakeholders.
- **Azerbaijan** banned the import of halon in 1997, and the GEF funded a recovery and reclamation system for a halon bank in 2001. However, the evaluation could find no evidence of the bank or any records of halon recovered since its establishment.
- **Belarus** intended to phase out halon by 2000 and received GEF finance for training, but a program has yet to be developed to recover and reclaim halon.
- **Kazakhstan** received funding for equipment and training, but its recovery program has been in abeyance for several years since the technicians trained to operate the equipment were no longer available.
- **Russia** received funding for equipment and training, but the program did not materialize, as equipment procurement did not comply with World Bank rules.
- There was no report by the national ozone units in **Tajikistan** and **Turkmenistan** on halon and so it was not possible to determine its importance in those countries.
- In **Ukraine**, the GEF paid for the establishment of a halon information center which would estimate the supplies and consumption of halon, review international codes and best-practice standards in this field, and develop a halon bank management program. Halons were recovered and reclaimed and returned to users, but there was no legislation in place that required decommissioned halon to be replaced with alternatives. A database of installed halon was established, but this is now out of date, and 17 of 20 codes and standards have been finalized. About 63 percent of the total halon in Ukraine was installed in firefighting systems at gas pumping stations located on the gas pipelines that supplied gas to Europe from Russia. There were 19 such gas pumping stations installed between 1970 and 1980, creating a demand for halon. So far, one halon-based system has been replaced with a carbon dioxide fire-suppression system. Two other pumping stations are scheduled for halon replacement.
- In **Uzbekistan**, imports of halon were banned for all except essential uses in 2000, but there has been no management plan developed for halon. In response to Uzbekistan's request to the parties for an exemption for its aircraft industry, UNEP's Technology and Economic Assessment Panel recommended in 2002 that the country import recycled halon. The aircraft industry in Uzbekistan therefore continues to create a demand for halon.

In 2005, the Technology and Economic Assessment Panel estimated that 1.173 million ODP tonnes of halon had been banked globally in 2002. As CEITs were responsible for about 17 percent

of ODS consumption globally, it is reasonable to assume that in 2002 CEITs had 17 percent of the global halon in banks, equivalent to 199,410 ODP tonnes. Given the leakage rate from banks, this was expected to be reduced to 77,690 ODP tonnes by 2015. In 2009—about halfway between 2002 and 2015—the evaluation could account for about 567 ODP tonnes of halon on ships flagged to Azerbaijan, 30,000–60,000 ODP tonnes of halon in Russia, and about 1,500 ODP tonnes of halon in Ukraine—a total for these three CEITs of 32,000–62,000 ODP tonnes. The environmental impact of halon in CEITs is discussed further in section 7.5.

In 2007, the Ozone Secretariat reported that halon was being stockpiled by governments or businesses either because they intend to use them in the future or because they find the cost of destruction too high (UNEP Ozone Secretariat 2007). Such stockpiles are being held under various conditions which allow varying degrees of annual leakage; there are no Montreal Protocol requirements on the maintenance of these stockpiles, and there is little information on their size. In the absence of legislation or other incentives requiring or encouraging destruction, holders of such stockpiles have an economic incentive to release stocks into the atmosphere when the cost of maintaining them exceeds the value of the substance. Preventing the release of stockpiled ODS would result in benefits to the ozone layer as well as regarding climate change.

Continued Use of ODS: Methyl Bromide

Non–Quarantine and Preshipment Uses

Methyl bromide is a broad-spectrum pesticide which has been used to control pests in certain agricultural crops and stored products since the 1930s. The Montreal Protocol required the phaseout of methyl bromide on January 1, 2005, in industrialized countries and by 2015 in developing countries. The majority of industrialized countries have successfully phased it out, with a handful of countries granted so-called critical-use exemptions after the phaseout date.

Some of the EU CEITs were not able to end their use of methyl bromide by the due date and required a further four years in critical uses to implement alternatives. The last EU CEIT to end critical uses of methyl bromide was Poland in 2008. None of the non-EU CEITs have requested critical uses of methyl bromide, until a recent 2009 application to the parties by Russia.

Among the non-EU CEITs, Russia, Kazakhstan, and Ukraine each faced different issues relating to methyl bromide consumption:

- **Russia** reported methyl bromide consumption only in 1994–96,[8] with zero consumption in each year from 1997 to 2007. But as noted above, in 2009, for the first time, Russia requested an exemption of 135 tonnes of methyl bromide for the post-harvest sector in 2010. The Technology and Economic Assessment Panel has asked for further information, and as of May 2009 had not made any recommendations regarding this request (UNEP TEAP 2009). Details on the specific use(s) were not available. However, alternatives have been widely adopted for virtually all post-harvest sectors worldwide.
- **Kazakhstan** had not yet ratified the Copenhagen Amendment and was therefore not legally bound by the methyl bromide phaseout schedule. Kazakhstan used methyl bromide until 2000, and reported zero consumption in 2001–05. However, the government reported

[8] Specifically, 1,043 ODP tonnes in 1994, 1,430 ODP tonnes in 1995, and 96 ODP tonnes in 1996. Reporting data throughout this section are from the UNEP Ozone Secretariat's Data Access Centre (http://ozone.unep.org/Data_Reporting/Data_Access/).

consumption of 19.8 ODP tonnes in 2006 and 60 ODP tonnes in 2007, which was not compliant with the phaseout schedule for methyl bromide. The national ozone unit indicated that the substance was being used to treat soil in greenhouses for tomato production, and in grain elevators. As a party to the Montreal Protocol, Kazakhstan is expected to ratify the Copenhagen Amendment and comply with methyl bromide phaseout.

- **Ukraine** reported methyl bromide consumption of 390 ODP tonnes in the mid-1990s, and zero consumption from 1996 to 2007. During this period, about 150–840 ODP tonnes per year were reported to be used for QPS, but were probably for non-QPS uses that were banned in developed countries as of January 1, 2005. Currently, an estimated 60 ODP tonnes of methyl bromide are held in stock, and about 5–6 ODP tonnes per year were believed to be used for grain.

This continued use of methyl bromide is the result of poor management by the respective governments to differentiate QPS from non-QPS uses, to monitor its use in both categories, and to implement alternatives for non-QPS uses in a timely and well-coordinated manner. Given that the parties first listed methyl bromide as a controlled substance in 1992, such measures should have been possible. The parties to the Montreal Protocol have been aware of the substance's impending phaseout for the last 15 years, and the vast majority have established procedures to replace its use.

Quarantine and Preshipment Uses

Methyl bromide is used for controlling pests in specific types of commodities such as fruit and grain, mainly as a requirement of quarantine authorities in the importing country. When the Montreal Protocol first placed controls on methyl bromide, a general exemption was created for all QPS uses of methyl bromide, meaning that the Montreal Protocol does not require QPS uses to be phased out at present.

In 2007, four of the EU CEITs (the Czech Republic, Estonia, Lithuania, and Slovakia) reported that methyl bromide was not used at all for QPS; Bulgaria reported 0.2 ODP tonnes, Hungary 1.9 ODP tonnes, and Poland 3.6 ODP tonnes. In 2007, five of the non-EU CEITs reported that methyl bromide was not used at all for QPS (Armenia, Azerbaijan, Belarus, Turkmenistan, and Ukraine); Russia reported 19.9 ODP tonnes in 2007, and Tajikistan 3.8 ODP tonnes. No reports were submitted in 2007 by Kazakhstan, Latvia, and Uzbekistan. The total amount reported for QPS in 2007 from the 16 CEITs was 29.6 ODP tonnes.

Several CEITs appeared to be misclassifying non-QPS use as QPS, which would mean that some methyl bromide uses were being continued after the phaseout date, and that QPS uses are overestimated. However, because the relative volume of methyl bromide being used for QPS was relatively small, it has been assessed as less of a risk to the ozone layer than other ODS used in greater quantities.

Lack of Government Commitment

Government commitment was assessed above by examining the number of legislative instruments associated with the Montreal Protocol that had been agreed to by the CEITs and the extent of national legislation that reduced and phased out ODS (summarized in table 7.1). The level of government commitment was also assessed by evaluating activities undertaken by governments after the project was completed, such as monitoring and reporting on ODS, including halon, that was recovered and recycled; and the implementation of further legislation to protect the ozone layer

(summarized in table 7.7). Here, criteria from tables 7.1 and 7.7 have been extracted to provide an assessment of the threats and risk that arise when there is a lack of government commitment; these are summarized in table 7.16.

The evaluation assessed the level of government commitment as high in the EU CEITs, Tajikistan, and Uzbekistan; medium in Armenia, Belarus, and Kazakhstan; and low in Azerbaijan, Russia, Turkmenistan, and Ukraine. The basis for these assessments depended on the source of funding for the operations of the national ozone unit, legislation that restricted and promoted ODS phase-out, and other factors as described below.

Governments in CEITs were assessed as having a **high** level of commitment when the national ozone units were funded from the central budget. Eighty-nine percent of the EU CEITs reported on the survey questionnaire that their national ozone units were funded from a central government budget, compared with 44 percent of the non-EU CEITs. Fifty-six percent of the non-EU CEITs reported that the national ozone units depended on donor agency funding or contracts. Units were assessed as unsustainable when they were not funded from the government budget, since external sources of funding were typically short term, unpredictable, and unsustainable.

Governments in CEITs were assessed as having a high level of commitment when they had implemented legislation on ODS or that affected ODS operations after the project was completed; the customs service had intercepted illegal ODS

Table 7.16

Assessment of Government Commitment to Ozone Layer Protection in CEITs

CEIT	National ozone unit financed from central budget	Legislation mandating ODS recovery and recycling	ODS or related legislation implemented after project	Illegal imports intercepted 2006–09	Penalties for illegal trade	Level of government commitment
Bulgaria	Yes	Yes	Yes	No	Yes	High
Czech Republic	Yes	Yes	Yes	Yes	Yes	High
Estonia	Yes	Yes	Yes	Yes	Yes	High
Hungary	Yes	Yes	Yes	No	Yes	High
Latvia	Yes	Yes	Yes	No	Yes	High
Lithuania	Yes	Yes	Yes	Yes	Yes	High
Poland	Yes	Yes	Yes	No	Yes	High
Slovakia	Yes	No	Yes	Yes	Yes	High
Slovenia	Yes	Yes	Yes	Yes	Yes	High
Armenia	Yes	No	Too soon	Unknown	Unknown	Medium
Azerbaijan	Yes	No	No	Unknown	Unknown	Low
Belarus	Yes	Unknown	Yes	Unknown	Yes	Medium
Kazakhstan	No	Yes	No	Yes	Yes	Medium
Russian Fed.	No	No	No	Unknown	Yes	Low
Tajikistan	Yes	Yes	Yes	Yes	Unknown	High
Turkmenistan	No	No	No	Yes	Unknown	Low
Ukraine	No	No	No	No	Unknown	Low
Uzbekistan	Yes	Yes	Yes	Yes	Yes	High

imports in the last three years and had trained customs officers, most of whom had ODS detection equipment; the governments had implemented legislation to impose penalties for illegal trade in ODS; and the governments had legislation in place that mandated ODS recovery and recycling.

The EU regional legislation on ODS was most likely the key factor that promoted continuation of a high level of government commitment among the EU CEITs, as many of them were already committed to ozone layer protection before and during their projects. Typically, legislation that mandated ODS recovery and recycling was accompanied by legislation requiring the training of technicians and reporting of results.

Even where a CEIT had a key element in place, institutional problems might prevent optimal use of this element. For example, Azerbaijan had government funding, but the national ozone unit was not performing optimally.

Armenia, Belarus, and Kazakhstan were categorized as having a **medium level of government commitment**, as they had fewer of these elements in place. Azerbaijan, Russia, Turkmenistan, and Ukraine were rated as having a **low level of government commitment**, with the fewest elements in place compared to the other CEITs. These governments had little continuity of activities on ozone layer protection after the GEF-funded projects were completed, mainly because there was no funding of the national ozone unit from a central budget. Legislation was either not in place or had been drafted but not adopted, as appropriate and knowledgeable staff were unavailable. ODS recovery and recycling was either not occurring at all or was occurring in a rather ad hoc and unplanned way. There was no monitoring of ODS results or use of these results to fine-tune policies to improve servicing operations. Training of technicians was, in most cases, nonexistent, leading to unqualified workers servicing air conditioning and refrigeration equipment. CFCs were readily available on the market for a reasonable price, as there was little enforcement of prohibited ODS by the customs service to prevent their being imported and placed on the market.

Responses to the survey questionnaire indicated that a majority of the EU CEITs either agreed (56 percent) or strongly agreed (11 percent) that their national ozone units had sufficient staff to address new ODS projects and sufficient support from other ministries within the government; a minority of the non-EU CEITs held this conviction (33 percent agreed with the statements, and 11 percent strongly agreed).

Without government commitment, there is a risk that the poor control of ODS that prevailed prior to GEF project start-up will recur in response to the government's not having funded staff to perpetuate and build on project achievements. This in turn could adversely affect the ability of governments to phase out remaining ODS.

7.4 Catalytic Action

Scale-Up and Spill-Over Effects

Like a chemical acting as a catalyst to speed up the rate of a chemical reaction, the finance provided by the GEF not only eliminated the use of ODS in the country being financed, but also reduced the time to phase out ODS in companies not directly financed by the GEF, thereby speeding the rate of ODS elimination in the country. The catalytic action was the result of a multifaceted approach by the GEF that not only financed companies but also a diversity of programs including institutional strengthening, training of customs and personnel, ODS recovery and recycling, training of servicing technicians, awareness-raising campaigns, and halon recovery and reclamation.

Forty percent of the companies reviewed in this impact evaluation (excluding the servicing companies) reported increased production and improved profits as a result of the GEF finance:

- Nine refrigerator production companies
- Five aerosol production facilities
- Seven foam producers
- Six companies that had converted to non-ODS solvents

It is likely that the companies supplying these businesses with materials for their production also increased their sales. Therefore, the GEF finance had a catalytic effect beyond those companies that benefited directly from the funding.

Some of the refrigerator companies—including Nord (Ukraine) and Snaigė (Lithuania)—used their improved profitability to purchase other companies and establish daughter companies in other countries. This is an example of catalytic action and scale-up extending beyond the national boundaries of the company financed by the GEF. Because of the increase in production and expansion of manufacturing facilities, employment increased after the transition and prior to the current economic crisis. The GEF funding therefore had a positive social impact by increasing local employment.

The training in general commenced with a train-the-trainer program—a technique widely used by UNEP—in which relatively few were trained initially. These trainers subsequently trained 10–20 times more personnel. The train-the-trainer method thus leverages or catalyzes the number of staff who can be trained in a way that significantly and rapidly increases the total number qualified for the tasks. The catalytic effect has become sustainable in many countries; for example, in 10 CEITs (Belarus, the Czech Republic, Estonia, Hungary, Kazakhstan, Latvia, Lithuania, Slovakia, Turkmenistan, and Uzbekistan), the trainees were prepared to pay the costs of the training themselves. Lithuania reported that only five officers had been trained, but these persons subsequently trained other officers at their checkpoints. The catalytic effect of the training in the customs sector is a factor that would be difficult to determine, but it may have a positive influence in combating illegal ODS trade.

Awareness-raising campaigns were put in place by almost all of the CEITs to promote positive action toward activities that protected the ozone layer. For example, Poland reported that an awareness-raising campaign was essential in promoting ODS recovery and recycling, and that the program had not been working effectively until this was undertaken. Latvia carried out the most extensive awareness-raising campaign of all the CEITs; this was targeted mainly at schools. As a result of the widespread activities and enthusiasm generated by the project, ozone layer protection is now recognized as one of the criteria for "green schools," which will have a catalytic impact on generations of schoolchildren beyond the initial work. Some countries reported that the campaigns were useful for engendering support at the political level for policies and legislation on ozone layer protection.

It was difficult to quantify the overall catalytic impact in relation to the phaseout of ODS. However, the evaluation estimated this to be about 40 percent of the total ODS phased out in the CEITs (table 7.17), based on reported ODS consumption before and after the GEF project, and the quantity of ODS phased out compared to the amount targeted. The impact on companies includes cofinancing, since this itself was a type of catalytic impact.

Importance of Champions

"Champions" are generally important in any endeavor (Andersen and Zaelke 2003). In the

Table 7.17

Estimated ODP Tonnes in CEITs Phased Out as a Result of Catalytic Action

Parameter	ODP tonnes	%
ODS consumption prior to GEF finance (1996)	21,000	
Targeted for phaseout with GEF finance	12,000	
Actually phased out with GEF finance (2007)	11,000	52
ODS consumption after project (2007)	1,665	8
Phased out by companies without GEF financial assistance (2007)	8,335	40
Total	**21,000**	**100**

Sources: ODS consumption data are from the UNEP Ozone Secretariat's Data Access Centre (**http://ozone.unep.org/Data_Reporting/Data_Access/**). ODP tonnes targeted for phaseout are from chapter 4, and actual phaseout data are estimated from the success rate in volume 2 of this report; phaseout data by companies not receiving GEF funding are calculated as the difference.

present context, their importance in implementing ODS-free technology can be illustrated by the examples of champions in the Nord domestic refrigerator company in Ukraine and in Nikochem in Russia.

Nord attributed the success of the GEF project in its company 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 deputy of parliament. Nord encouraged the government to decisions resulting in the funding of phaseout projects in Nord and other businesses. As a result, Nord demonstrated a steady production growth of about 10 percent annually. Nord's overall production reached 1.2 million refrigerators in 2007. The growth in domestic appliance production leveraged Nord's capacity to expand its manufacturing operations in commercial refrigeration equipment at its affiliated company Donbass Plus. The Ukraine projects were unlikely to have materialized without the Nord champions.

Nikochem is one of the largest chemical production companies in Russia, exporting to 22 countries worldwide. The company was recognized as one of the 1,000 best companies in Russia and the best company of the Volgograd region. The company shut down its CFC production and has since diversified into a range of alternative, profitable chemicals that can be produced at relatively low volume. The company mitigated the adverse impacts of its production system by using best-practice natural ecosystems such as settling ponds and greenhouses. Unlike other chemical companies in Russia which closed down CFC production without significant diversification into alternative products, the members of Nikochem's board of directors are another example of irreplaceable business champions, steering the company to profitability, while taking the environment into consideration in its production processes.

Key Factors Influencing Catalytic Action

The key factors influencing catalytic action are **innovation**, **demonstration**, **replication**, and **cooperation**. Often a single project reflects a combination of these factors. Government policies, measures, and actions have a significant impact on the speed and extent of catalytic action. The private sector's involvement in projects and cofinancing are crucial, as are the inputs of Implementing Agencies and their consultants in formulating and implementing projects based on the most cost-effective and environmentally beneficial technology.

Following are examples of the key factors that influenced catalytic action in the CEITs with regard to ODS phaseout. For further detail on these and other government and business responses, see volume 2 of this report.

Innovation

Lek is one of the largest manufacturers of drug and cosmetic aerosols in Slovenia. The GEF provided $1,992,600 in financial assistance toward the replacement of 157 ODP tonnes of CFC-11 and CFC-12 with hydrocarbons (as propane-butane) used in the production of Byvacin, an antibiotic spray applied to the skin. An innovative method was developed as a result of the conversion, resulting in less production costs and improved product sales. Lek reported that, without the GEF funding, Byvacin production would have stopped, and jobs would have been lost. Indeed, sales of Byvacin on the export markets were so successful, Lek regained its pre-1989 sales levels and was able to employ 20 additional staff in one of the highest unemployment areas in Slovenia.

Trimo is one of Europe's largest manufacturers of fire-resistant sandwich panels used in building insulation. Polyurethane foam is used as an adhesive to bond mineral wool fibers to the metal walls of the panels. During the early 1990s, about 40–60 percent of the production was exported, mainly to Eastern Europe and Russia. Technical benefits accruing from the GEF project helped Trimo significantly increase its production of fire-resistant panels and expand its access to new markets in Germany. This latter accomplishment was in part due to compliance with the latest German fire standards, for which the subproject paid the costs of certification. Daughter companies were established in other countries including Dubai, Serbia, and Russia. The subproject was a catalyst for innovative technical developments that drew visits from other experts from Japan, Russia, and Saudi Arabia, with a view to replicating the technology in other countries.

Ekotez manufactures ODS recovery and reclamation equipment. The GEF contributed toward the cost of production of the recycling and recovery machines that were used in many of the CEITs. Ekotez became an agent for reclamation equipment, designed and sold one of the first recovery machines, and became a partner in 53 international programs—including with Nord and REFMA in Ukraine under a United Nations Industrial Development Organization project—over a 10-year period. The GEF-funded program in the CEITs, with its emphasis on ODS recovery and reclamation, was the commercial inspiration for the innovative equipment developed by Ekotez.

Snaigė is the only domestic refrigerator and freezer manufacturer in the Baltics. The elimination of ODS and its replacement with innovative (at the time) non-ODS technology resulted in an increase in refrigerator production. The GEF funding enabled the company to put in place modern production and refrigeration technologies that increased production capacity; improved competitiveness, environmental compliance, manufacturing quality, and working conditions; and reduced production costs and labor as well as the energy demand of refrigerators. The 30 percent savings in energy consumption promoted sales of refrigerators on EU markets, as purchasers could claim, as in the Netherlands, government-funded rebates. Snaigė's number of models increased from 7 before 1997 to 25 after the project.

Innovative technologies that were implemented in these and other companies were the result of a relatively small number of technical experts in the Implementing Agencies who were current with ODS-free technology globally. To provide sector-specific technical advice and assistance, the World Bank formed the **Ozone Operations Resource Group**, comprised of engineers and scientists recognized internationally as leaders in their particular ODS sector. The group kept the Bank up to date on innovative and environmentally suitable technological advances, commercially available

ODS substitutes, the cost-effectiveness of various technical options, and related developments.

Demonstration

Bratri Horakove Ltd (BHL) is the largest manufacturer of sandwich panels in the Czech Republic. The GEF project paid for the high-pressure non-CFC foam-blowing technology implemented as a replacement for CFCs, and financed the construction of 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/carbon dioxide blend. These technological changes allowed BHL to increase its market share from 10 percent to 30 percent to become the largest foam panel manufacturer in the Czech Republic. BHL also hosted demonstration workshops with other Czech foam manufacturers to share the results of the trials of different foam-blowing formulations. Its laboratory was made available to other Czech manufacturers for testing the properties of products produced with various foam-blowing agents and procedures.

Labod is the largest dry-cleaning company in Slovenia; in the early 1990s, it used CFCs to clean leather, silk, and similar materials. The GEF funded the replacement of 1,1,1-trichloroacetic acid with $C_{11}H_{24}$ (an aliphatic hydrocarbon). The change in cleaning chemicals improved operating efficiencies by reducing the amount of chemical required to clean a larger quantity of clothes. This reduced costs and improved profitability. The company attributed its improved profits to the environmentally friendly method for dry cleaning. Labod ran demonstration workshops to show several hundred other dry-cleaning operations in Slovenia that hydrocarbons were easy to implement and resulted in cost-effective cleaning operations.

In 1992, **Thermo King** was the largest refrigerated transport company in the Czech Republic. Among a range of subprojects with this company, the GEF funded the development of prototype non-CFC transport refrigeration units, and retrofit procedures for industrial refrigeration equipment that could be used by producers of refrigeration systems and maintenance/repair providers. The company's Research Institute of Refrigerating Engineering was essential in the development of the retrofit procedures since it contained testing facilities and laboratories for commercial performance and service-life trials. The transport refrigeration units were retrofitted with R-401b; energy efficiency was reported to be improved by 8 percent, despite ODS being used (89 percent HCFCs in the blend). Retrofit manuals were produced in English, Russian, and Czech to promote the implementation of a variety of CFC-free retrofit options in CEITs and Europe.

Replication

More than 3,300 machines were used in 18 CEITs for 3R operations, about 1,000 of which were in **Bulgaria** alone. Bulgaria's number of recovery machines was larger than in any of the other CEITs surveyed because it assembled its machines from components rather than purchasing them from a supplier. Specifically, its Institute for Refrigeration and Air Conditioning provided a team of technicians to assemble 20–30 units per week from component parts in the late 1990s. The institute estimated that about 70–75 percent of these recovery machines, which were replicated throughout the country, were still operational, underscoring the continued value of this equipment to service personnel. The machines thus have a sustainable impact, reducing ODS almost 10 years after project completion.

In other CEITs, the machines were distributed to a **network of refrigeration servicing organiza-**

tions. In Poland, for example, a payment system was established to finance the collection and transport of ODS from all servicing stations on the network to a centralized reclamation facility. Some of the larger companies, such as Combitech in Kazakhstan, had their own networks established; in other countries, including Ukraine, a single business (Electroservice in Kiev) took responsibility for obtaining and distributing the machines to other servicing organizations.

The **Slovenian government** took an approach to 3R that differed from that of the other CEITs. The Ministry of Environment decided the 3R program would be carried out by a single company. At the time, Gorenje Servis was the largest servicing organization in the country, handling about 30 percent of the Slovenian market for refrigerator and heat pump servicing through a network of 10 servicing stations and 29 technicians. The company received 3R equipment from the project, and financed its own publicity campaign to raise awareness on the damage caused by CFCs to the ozone layer. The campaign encouraged the general public to employ qualified technicians to recover ODS. This resulted in a 20 percent increase in servicing work for Gorenje Servis, compared with the same period in the previous year. As a result of Gorenje Servis's actions and success, another company in Slovenia, LTH, purchased its own 3R equipment.

Training of technicians was a key element of the 3R programs. Some of the CEITs translated **UNEP's manual on the 3R program** into their national languages, which facilitated uniform delivery of the program across the various CEITs. In this way, more than 10,500 personnel were trained in 3R during the project, and a further 5,500 after the project was completed. The efficient and effective replication of this program had a threefold impact:

- It reduced countries' imports of CFCs, since recovered and recycled CFCs could be used instead to service equipment. This in turn reduced countries' official consumption of ODS as reported to the parties annually.
- Because new ODS was not being produced, any future ozone depletion as a result of new production was avoided.
- It extended the operational life of the equipment that still depended on CFCs as a cost-effective method was used to avoid premature retirement of such equipment.

Cooperation

Governments have encouraged cooperation through public awareness-raising activities, which were a key component of the reduction and phase-out of ODS in almost all of the CEITs. The most extensive such campaign ("Protect and Be Protected") was carried out in Latvia over the course of a year to educate schoolchildren on the value of protecting the ozone layer. The unit worked with five experts/teachers across different disciplines to produce press releases; information on ODS regulations for nongovernmental organizations, state authorities, and private companies; a Web page; portable experiments; a video on ozone layer protection; an "Ozone Layer–Friendly School" competition; posters and maps; multilevel teaching aids; publications; regional training workshops for primary school teachers as well as for chemistry, biology, geography, and physics teachers; souvenirs, prizes, and certificates; a Latvian version of the UNEP *Ozzy Ozone* video; and a closing ceremony for 142 schools.

Awareness-raising campaigns not only encouraged the public to take their refrigerators for ODS recovery and recycling, but also reduced public resistance toward legislation on ODS and encouraged political action.

As a **commercial example of cooperation**, LTH, the largest commercial refrigerator manufacturer in Slovenia, financed the purchase of its own 3R equipment and developed refrigerator servicing capacity. The equipment was used to collect and store recovered refrigerants, to identify recovered refrigerants, and in 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 cooperated with other servicing companies in Croatia, Bosnia and Herzegovina, Bulgaria, and the former Yugoslav Republic of Macedonia to provide information and advice on ODS 3R programs.

Sometimes the GEF program expanded the horizon of companies in seeking entirely new materials not based on traditional petrochemical raw materials. For example, Ritols is a privately owned company in Latvia that now uses an ODS-free water-blown system for the production of rigid polyurethane spray foam for building insulation. As a result of the GEF project, Ritols is now part of a scientific program to find innovative plant rather than petrochemical sources for polyurethane foam.

As an **example of cooperation encouraged by the Implementing Agencies,** the World Bank ran a series of workshops designed to capture and build on the experiences and good practices of countries involved in ODS phaseout. Regional workshops were held in Budapest (May 1997) with the Czech Republic, Slovenia, and Hungary; in Bledno and Ljubljana (October 1997) with the Czech Republic, Poland, Slovenia, and Hungary; and in Prague (March 1998) with Belarus, the Czech Republic, Hungary, Poland, Russia, Slovakia, and Slovenia. Workshops with CEITs were also convened by the Bank and held in Warsaw and Moscow in October 1998 and March 1999, respectively.

7.5 Benefits to the Global Environment and Human Health

This section aims to quantify the environmental benefits of the GEF projects: the reduction in ozone-depleting chemicals; the reduction in global warming gases; and the avoided impacts of ultraviolet radiation on agriculture, fisheries, materials, and human health. The contribution of the GEF program is also compared with the results of global action on ODS.

Ozone Layer

Action taken under the Montreal Protocol has reduced the annual consumption of ODS from more than 1,791,600 ODP tonnes per year (the historical global baseline[9]) to 68,700 ODP tonnes per year in 2007 (UNEP Ozone Secretariat 2008). This indicates a global reduction of 96 percent. Without the protocol, ozone depletion would have risen worldwide, reaching at least 50 percent in the northern mid-latitudes and 70 percent in the southern mid-latitudes by 2050.

Figure 7.3 shows the reported annual consumption of ODS in 18 CEITs from 1989 to 2007. The CEITs started with a baseline consumption of about 304,000 ODP tonnes, or 17 percent of the global baseline. Consumption in the CEITs fell significantly during the early and mid-1990s due to prevailing weak economic conditions. Thus, there was a large drop in ODS consumption in CEITs before the first GEF intervention in the mid-1990s.

[9] The baseline is a specific year of ODS consumption chosen by the Montreal Protocol as the starting point for calculating the percentage of ODS reductions in subsequent years. The baseline for major CFCs, for example, was 1986 in industrialized countries and the average of 1995–97 in developing countries, according to data from the Ozone Secretariat. The baseline and consumption data do not cover all ODS, but only those types for which the protocol has set phaseout dates.

After the GEF program was initiated in many CEITs,[10] annual consumption of ODS was reduced from about 21,000 ODP tonnes in 1996 to 1,665 ODP tonnes in 2007 (figure 7.4). This means that the GEF projects contributed to the elimination of about 19,260 ODP tonnes of annual ODS consumption, or about 1.1 percent of the global benefit to the ozone layer.

Figure 7.4 also shows that a substantial reduction in the consumption of the four major groups of ODS targeted by the GEF finance—CFCs, halon, methyl chloroform, and methyl bromide—occurred during the GEF intervention period after 2000. The business-as-usual triangle in the figure illustrates the range of ODS consumption that could be expected from normal business practices after 2000 in the absence of GEF intervention and assistance; the figure indicates that the GEF intervention prevented annual consumption of more than 25,000 ODP tonnes and probably prevented substantial growth in ODS.

Global Warming

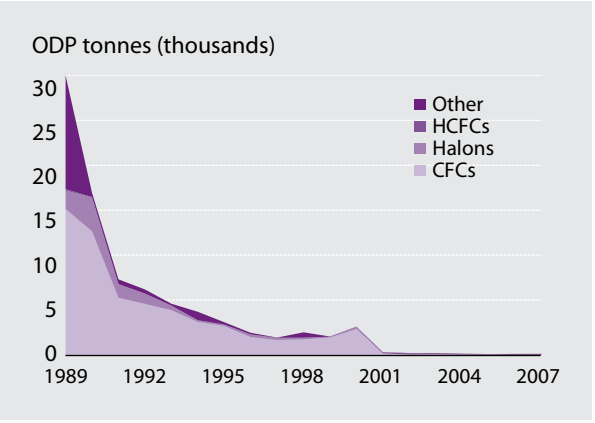
ODS consumption contributes to global warming because most ODS are greenhouse gases. The elimination of ODS therefore has significant benefits for climate. For this analysis, the global warming impact of ODS phaseout was calculated by converting annual ODS consumption data into CO_2eq per year, and comparing the change that occurred over time globally and in CEITs.

- **Change in global ODS level, 1989–2007.** Global annual consumption of ODS was reduced from about 9.244 billion tonnes CO_2eq/year in 1989 to 1.870 billion tonnes CO_2eq/year in 2007. This indicates a global reduction of 7.374 billion tonnes CO_2eq in the annual consumption level, with direct benefits for the climate.

[10] The GEF program began in 1993 in one CEIT, but in most, it started after 1995; 1996 has been used as a representative starting point for ODS consumption in this analysis.

Figure 7.3

Consumption of ODS in CEITs, 1989–2007 (ODP tonnes)

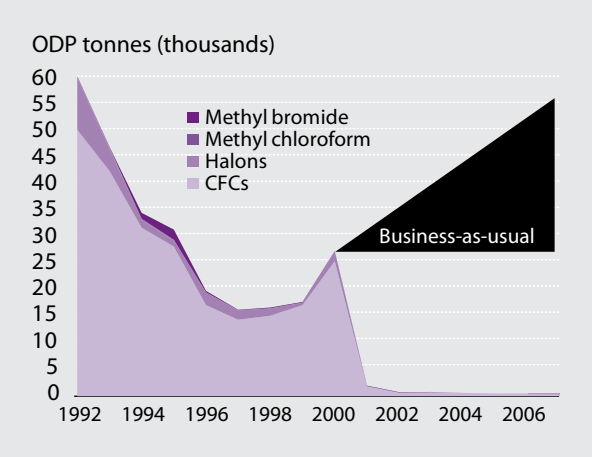


Source: UNEP Ozone Secretariat's Data Access Centre (http://ozone.unep.org/Data_Reporting/Data_Access/).

Note: There was a 99 percent reduction from 1989 to 2007.

Figure 7.4

Consumption of ODS in CEITs, 1992–2007 (ODP tonnes)



Source: Ozone Secretariat 2009.

Note: In most CEITs, the GEF program began in 1995–2000. The business-as-usual triangle shows the range of theoretical ODS consumption without the GEF finance.

- **Change in CEIT ODS level, 1989–2007.** ODS consumption in CEITs was reduced from about 1.315 billion tonnes CO_2eq/year in 1989 to 42 million tonnes CO_2eq/year in 2007, including all of the ODS reductions made in CEITs before the GEF program was initiated. This indicates a beneficial reduction of 1.273 billion tonnes CO_2eq in CEITs and amounts to about 17 percent of the global reduction.
- **Change in CEIT ODS level after the GEF program was initiated, 1996–2007.** After the GEF program was initiated in many CEITs, ODS consumption was reduced from about 147 million tonnes CO_2eq/year in 1996 to 42 million tonnes CO_2eq/year in 2007, yielding a beneficial reduction of about 105 million tonnes CO_2eq. The GEF program therefore contributed about 8 percent of the total reductions made in CEITs, and about 1.4 percent of the global reduction of 7.374 billion tonnes CO_2eq achieved between 1989 and 2007.

Other Environmental Impacts

Without the Montreal Protocol, ozone depletion of 50 percent would have doubled the ultraviolet B radiation reaching the Earth in the highly populated northern mid-latitude regions. In the southern mid-latitudes, ozone depletion of 70 percent would have quadrupled ultraviolet B levels (UNEP Ozone Secretariat 2008). Instead, the ozone hole has about 40 percent ozone depletion.

The high level of ultraviolet B would have been damaging to living organisms and ecosystems including plants, forests, aquatic organisms, wildlife, farm animals, and to building materials (Environment Canada 1997). Most of the negative impacts have not been quantified. However, a Canadian study estimated global benefits from the Montreal Protocol amounting to $459 billion in the period 1987–2060 in three areas alone—fisheries, agriculture, and building materials:

- $238 billion due to avoided damage to fisheries
- $191 billion due to avoided damage to agriculture
- $30 billion due to avoided damage to materials

Since the CEITs consumed 17 percent of the global quantity of ODS base levels in the past, it can be assumed that they contributed 17 percent of the global benefits cited above, or $77 billion arising from the phaseout of ODS in CEITs for fisheries, agriculture, and materials. The impact of the GEF projects in CEITs was estimated to be 1.1 percent of the global total, indicating benefits of $5 billion in these three sectors (table 7.18).

Table 7.18

Estimated Value of Damage Prevented by the Montreal Protocol for Selected Sectors (billion $)

Sector	Global	CEIT 18 total	CEIT 18 GEF impact
Fisheries	238	40	2.6
Agriculture	191	32	2.1
Materials	30	5	0.3
Total	**459**	**77**	**5.0**

Estimated Human Health Benefits

Although an impact report normally contains quantitative rather than estimated information, this is not possible with regard to human health benefits, which can only be realistically identified in terms of estimated reduced numbers of deaths and other impacts.

There have been few studies estimating the human health benefits of the Montreal Protocol. In 1997, the government of Canada estimated that, in the period from 1987 to 2060, the Montreal Protocol would have prevented

- 19,100,000 cases of non-melanoma skin cancer,
- 1,500,000 cases of melanoma skin cancer,

- 333,500 skin cancer fatalities,
- 129,100,000 cases of cataracts (Environment Canada 1997).

The impact of the GEF projects in CEITs is therefore estimated to be 1.1 percent of the above values:

- 210,100 cases of non-melanoma skin cancer
- 16,500 cases of melanoma skin cancer
- 3,669 skin cancer fatalities
- 1,420,100 cases of cataracts

The protocol's Technology and Economic Assessment Panel co-chair concluded that:

> …the benefits of stratospheric ozone protection far exceed the costs. Consider the additional evidence that industrial customers that were once dependent on ODS have [examples that show] costs are lower with alternatives, and that alternatives and substitutes are so economical that most consumers have not noticed the price effects of the strong Montreal Protocol controls (Environment Canada 1997, p. 2).

Chapter 6 discussed how the GEF and MLF finance has decoupled the transition of ODS to ODS-free technology from GDP. This decoupling allowed the economy to continue to grow while ODS consumption declined rapidly. Examples in this chapter and in volume 2 have shown that, on many occasions, the implementation of ODS-free technology has not only stabilized the financial situation of a given company but also improved its profit through new business opportunities.

Annex A. Evaluation Matrix

A.1 Matrix Objectives

The overarching objective of the evaluation matrix is to evaluate the impact of the GEF ozone portfolio of projects on the phaseout of ozone-depleting substances in countries with economies in transition. The subobjectives are as follows:

1. To evaluate the impact of the GEF ozone portfolio investments in CEITs in reducing ODS production
2. To evaluate the impact of the GEF ozone portfolio investments in CEITs in reducing ODS consumption
3. To assess the sustainability of the GEF investments in maintaining ODS phaseout in CEITs (paying particular attention to issues of trade in ODS under Article 4 of the Montreal Protocol and illegal trade)
4. To assess the extent to which the GEF investments catalyzed further changes in the behavior and decisions of stakeholders (the focus is on private sector follow-on investments and outcomes of capacity development and technical assistance to assist government policy, regulation, and enforcement)
5. To compare and contrast the investment and other measures of the GEF to phase out ODS production/consumption with those of the MLF
6. To distill key lessons from the GEF ozone portfolio that have the potential to improve future ODS interventions and in the persistent organic pollutants and climate change focal areas

A.2 Definitions and Abbreviations Used

3R	recovery, reclamation, and recycling [of ODS], as in the servicing sector
catalyzed	induced changes that were not directly funded by the project
climate change	programs under the United Nations Framework Convention on Climate Change
consumption	Montreal Protocol term defined as production plus imports minus exports
GWP	global warming potential, with carbon dioxide indexed as 1; the ability of chemicals to warm the planet, according to their radiative qualities; many ODS have a high GWP
IA	Implementing Agency (UNDP, UNEP, or World Bank)
NOU	national ozone unit
POP	persistent organic pollutant
sector	refrigeration, firefighting, and servicing are examples of three sectors
servicing tail	allowable consumption of ODS, usually in the last 10 years of the phaseout, and usually less than 5 percent of the base-level consumption

TEAP	Technology and Economic Assessment Panel of the Montreal Protocol
UV	ultraviolet radiation, some forms of which can cause cancers; UV is a consequence of a weakened ozone layer
WB	World Bank

Key question and subquestions	Indicators/basic data	Sources of information	Methodology
Subobjective 1: To evaluate the impact of the GEF ozone portfolio investments in CEITs in reducing ODS production			
What was the intended series of causal linkages that reduced ODS production? • What was the status of compliance of CEITs vis-à-vis-the Montreal Protocol preceding the GEF intervention? • What were or are the quantities of each type of ODS produced each year? • What caused fluctuations in production? • What was the relationship between the production and consumption sectors in ODS-producing and -consuming CEITs? • What were the production sector issues in CEITs that triggered the GEF intervention?	• ODS production and consumption data • Montreal Protocol ODS reduction schedule • Reduction in producer sale of ODS over time • Reduction in ODS exports over time to each market • ODS quantities reported by producers as exports to other specific CEITs • The scope of GEF ODS phaseout activities in the consumption sector in many CEITs • Pressure from the international community	• Data officially reported to the Ozone Secretariat under Article 7 • Reports of the Montreal Protocol Implementation Committee • Records of ODS sold by producer over time, by market destination • Evaluation reports • Ozone Secretariat database • Database of the GEF ODS phaseout program • Reports of UNEP Division of Technology, Industry, and Economics and Environment Investigation Agency • Montreal Protocol Implementation Committee decisions	• Literature review of – country programs – subproject documents – closing implementation report (WB) – project implementation report (UNDP) – country and project evaluations • Semi-structured interview, with survey questions sent in advance to – Ozone and GEF Secretariats – WB, UNDP, UNEP – NOUs and program managers – stakeholders during field visits – MLF Secretariat and Evaluation Unit – selected experts • Comparison of World Bank impact (Russia and Ukraine) with UNDP-UNEP (Kazakhstan and Uzbekistan) impact – Statistical comparison – Field-based qualitative comparison • UNDP-UNEP terminal evaluation(s)
• What were the GEF policies in place to address ODS phaseout in ODS-producing CEITs? • What were or are government counterpart strategies, including economic instruments that disincentivized ODS production?	• GEF operating procedures • GEF financing policies regarding ODS production sector • Role and actions of bilateral donors • Production taxes, duties, fees • ODS waste disposal charges for producer • Financial support to producer to invest in technology that produces ODS-free substances	• GEF Evaluation Office desk reviews of completed ODS projects • GEF Egnyte Database • WB, UNDP-UNEP, and GEF Secretariat staff • Bilateral agency documents • National legislative instruments in force over time • Producer investment in alternative technology • Evaluation reports	
• What were or are the policies and measures that reduced demand for ODS production?	• Country programs adopted by national governments as environmental national priorities • Import ban on national ODS equipment for ODS production • Export ban on ODS exports • National restrictions on the use of ODS • Voluntary commitment by producer to phase out • Incentives for the production of ODS-free substances	• Commitments of producers pledged in signed grant agreements • UNEP voluntary commitment pledge by producers • Evaluation reports	

Key question and subquestions	Indicators/basic data	Sources of information	Methodology
• What were inputs, elements, and components of the Special Initiative Project on the ODS phaseout in the production sector in the Russian Federation?	• Documentation of scope, policies, and strategy • Institutional arrangements • Funding level and disbursement schedule • Cofinancing commitments • Government and producer commitments • Technical expertise • Technical assistance component • Implementation arrangements • Monitoring and verification procedures	• Special Initiative Project criteria and objectives • Swedish EPA, especially Mr. Husamuddin Ahmadzai • Survey results • Interview results	
• What were major outputs of the project?	• The closure of each production facility covered by the project • The creation of institutional capacity to supervise, monitor, and enforce closure of ODS production	• Government and WB, UNDP-UNEP verification and supervision reports	
• What were environmental, technological, and social impacts of the Special Initiative Project?	• The elimination of ODS production capability through permanent closure of operative and latent ODS production capacity • Creation of ODS stockpiling banks under the control of the government • Accelerated ODS phaseout in Russia and former Soviet Union countries and transition to non-ODS technologies • Compliance with bans on ODS import and export • Reduction in ODS emissions • Reduction in emission of highly potent greenhouse gases • Presence of ODS-free alternatives • Ratification of Montreal Protocol amendments • Compensation for unemployment, retraining, relocation	• Verification reports • Monitoring and verification material • Article 7 ODS consumption data reported by Russia and former Soviet Union countries • Intergovernmental Panel on Climate Change data on emissions of GWP materials • Results of interview with staff in the Research Centre for Applied Chemistry in St. Petersburg • Status of Montreal Protocol ratification • Conditionality on social implications in grant agreements with businesses	
• What were the major risks and how were they mitigated?	• Penalty clauses in grant agreements and verification arrangements • Implementation Committee sanctions • Timely adoption of government policies	• Grant agreements • Verification reports	
• In what ways did the political and financial climate help or hinder progress in achieving the objectives? • What action had been taken to overcome difficulties?	• Time for legislation to be adopted • Personnel availability and continuity in national project implementation unit • Financial resources from bilateral donors in addition to the GEF • Actions to overcome difficulties	• Evaluation reports • Survey results • Interview results	

Key question and subquestions	Indicators/basic data	Sources of information	Methodology
• Was the Special Initiative Project sustained as planned?	• Continuity of strong government support to enforce the sustainability of the project • Effectiveness of the verification and monitoring system	• Verification and evaluation reports • Survey results • Interview results	
• How different was the project design and the modus operandi of the IAs to achieving the objective(s) in ODS phaseout in the production sector by the GEF and the MLF?	• Criteria and policies of the GEF and the MLF in the production sector • Implementation and verification arrangements • Funding arrangements, including loans • Training • Capacity building • Technology transfer • Monitoring and evaluation • Responsiveness to problems • Other	• GEF ODS operational program and focal area strategies • MLF policies and procedures • Evaluation reports • Survey results • Interview results	
Subobjective 2: To evaluate the impact of the GEF ozone portfolio investments in CEITs in reducing ODS consumption			
What was the intended series of causal linkages that reduced ODS consumption? • What was or is ODS consumption each year? • What was or is the quantity imported according to import country? • What caused fluctuations in consumption?	• Reduction in ODS consumption over time • Reduction in retailer sale of ODS over time • Reduction in ODS imports over time from each country	• Data officially reported to the Ozone Secretariat under Article 7 • Records of ODS imported over time, by import country	Same as Subobjective 1
• What criteria were used to define national priorities for ODS consumption phaseout? • What criteria were used to select a business as a target for GEF assistance?	• Extent of business financial or other contribution • Quantity of ODS consumed/enterprise • Importance of the business to the national economy	• Country programs • Evaluation reports • Survey results • Interview results	
• What were or are the economic instruments that disincentivized ODS use?	• Import taxes, duties, fees • User taxes, duties, fees • ODS waste disposal charges for user • Financial support to users to invest in technology that uses ODS-free substances	• National legislative instruments in force over time that restricted ODS • User investment in technology that no longer relied on ODS	
• What were the inputs, elements, and components of GEF ODS phaseout projects in specific industrial sectors in CEITs?	• Scope, strategies, and policies • Institutional and implementation arrangements • Funding level and disbursement schedule • Cofinancing commitments • Government and ODS-consuming business commitments • Technical expertise • Technical assistance component • Implementation arrangements • Monitoring and verification procedures	• Project documents • Verification and evaluation reports • Survey results • Interview results • Site visits	

Key question and subquestions	Indicators/basic data	Sources of information	Methodology
• What were or are the policies and measures that reduced the demand for ODS consumption?	• Signatory to Montreal Protocol and its amendments • Import ban on national ODS equipment for ODS consumption • Export ban on ODS exports • National restrictions on the use of ODS • Voluntary commitment by user sector to phase out • Incentives for the user to use ODS-free substances	• Date Montreal Protocol amendments ratified • Resulting legislative framework for ODS phaseout • National strategy to implement the legislation, including coordination (NOU), training programs, monitoring, reporting, and verification • Public awareness campaigns • UNEP voluntary commitment pledge by user sector • Other evidence of government or user commitment to ODS phaseout	
• What were major outputs of the project?	• Type of manufacturing processes converted to non-ODS technologies • Number of manufacturing facilities converted • Creation of additional institutional capacity • Technology transfer • Training of personnel • Adoption of legislation measures • Public awareness	• Project documents • Verification and evaluation reports • Survey results • Interview results • Site visits	
Subobjective 3: To assess the sustainability of GEF investments in maintaining ODS phaseout in CEITs			
To what extent has the ODS phaseout been sustained? • What is the annual ODS production by type over the past 10 years? • What it the consumption (as defined in Article 1) of ODS in the past 10 years?	• Table and figures of ODS production by year and type • Table and figures of ODS consumption by year and type • Evaluation reports	• Ozone Secretariat Data Centre	Same as Subobjective 1
• What policies and measures have been introduced to minimize the supply of, and demand for, ODS?	• Ratification of amendments to the Montreal Protocol • Import/export licensing systems • Import quotas • Import ban on ODS-containing equipment • Export ban on materials made with ODS for which that use has been phased out • Strengthening institutional and interagency linkage and cooperation through establishing interagency ozone committees, ozone offices • Promoting formation of professional associations • Other	• Evaluation reports • Survey results • Interview results • Field visits	

Key question and subquestions	Indicators/basic data	Sources of information	Methodology
• What economic and financial instruments have been used/considered in the country to control ODS supply and demand?	• Import taxes, duties, fees • ODS waste disposal charges • Subsidies for 3R • User payment for collection of old ODS-based appliances • Other	• Legislative documents • Awareness campaign • Evaluation reports • Survey results • Interview results • Field visits	
• Why is ODS still produced, if this is the case? • Why is ODS still imported, if this is the case? • Why is ODS still exported, if this is the case?	• See first row, Subobjective 3	• Evaluation reports • Survey results • Interview results • Field visits	
• Which businesses that received GEF funding are or are not operational today? • Why did businesses that obtained GEF finance remain in business or go out of business? • Why did some businesses go back to ODS technology after briefly adopting ODS-free methods (backsliding)?	• List of businesses that received GEF funding and their addresses, with ☺, 😐, or ☹ indicating their operational state • Reasons provided by IA, stakeholders, interviewees, and managers of related businesses for staying in business, going out of business, or backsliding to ODS	• Evaluation reports • Survey results • Interview results	
• What actions were undertaken by IAs to promote ODS 3R to businesses in order to avoid consumption and production of ODS? • What actions were undertaken by the government to promote ODS 3R to businesses in order to avoid consumption and production of ODS?	• List of actions taken by IAs on 3R • List of actions taken by the government to promote 3R, such as – establishment grant – training – equipment provision – awareness campaign – policies and measures – stockpiling of ODS for the servicing tail	• Evaluation reports • Survey results • Interview results • Legislative review • Policies and measures reported by NOU	
• How many businesses undertake 3R? • How much ODS is recovered, reclaimed, and recycled each year?	• Number of recovery and recycling facilities • Quantity of Annex A (Group 1) and B (Group 1) substances recovered, reclaimed, and recycled for each of the past 5 years [CFCs] • Quantity of Annex A (Group 2) substances recovered, reclaimed, and recycled for each of the past 5 years [halon] • Quantity of unrecyclable and contaminated ODS destroyed each year • Number of technicians trained annually in how to undertake 3R competently	• Evaluation reports • Survey results • Interview results • Ozone Secretariat, according to reports by the party	

Key question and subquestions	Indicators/basic data	Sources of information	Methodology
• What actions have been taken to reduce the risk of illegal imports of ODS in order to sustain the phaseout?	• Initial training of, and training updates for, customs officers • Spot checks at border including results and frequency of inspection • Reports of seizure of illegal ODS; identification of illegal ODS using laboratory methods • Correspondence with importing countries to promote coordinated action • Registration and licensing of ODS importers • Provision of ODS identifiers to customs officers • Establishment of a computer-based customs information system connected to agencies responsible for the import/export licensing system • Substantive penalties for illegal trade	• UNEP customs training • Reports submitted to the Ozone Secretariat on illegal trade • Evaluation reports • Interview results • Laboratory results • Evidence of international coordination • Discussions with Prof. Janusz Kozakiewicz	
• What actions were taken to improve and maintain institutional strength during the course of the ODS phaseout? • What evidence is there that the government did or did not see the need to continue the institutional arrangements after the ODS phaseout projects were finished? • What lessons can be drawn from these experiences?	• Number of personnel supported by GEF/IA funds prior to, during, and after project completion • Number of personnel supported by government funds prior to, during, and after project completion • List of actions by government on institutional strengthening • Number of personnel (nongovernment-funded and government-funded) before and after the actions • Report of lessons learned	• Evaluation reports • Interview results • Survey results	
• What actions were taken to reduce the risk of the unavailability of ODS-free technology? • What actions were taken to reduce the risk of the continuity of supply of ODS-free technology?	• Reduced import tariffs • Expedited customs clearance • Expedited procurement • Use of local manufacture and expertise to produce ODS-free technology • Reaching out to subject matter experts • Other actions	• Evaluation reports • Interview results • Survey results	
Subobjective 4: To assess the extent to which the GEF investments catalyzed further changes in behavior and decisions of stakeholders			
To what extent did the GEF investment in eligible businesses initiate follow-on investment in other businesses? • What was the percentage share of the manufacturing business that was financed for conversion by the GEF investment? • Conversely, what was the percentage share of the manufacturing business that was not financed for conversion by the GEF investment? • [See link to criteria for funding eligibility above.]	• Number of businesses that were financed directly, and the percentage contribution to the output of the sector • Percentage share of manufacturing sector financed, for each key sector • Percentage share of manufacturing business that was not financed directly	• Evaluation reports • Interview results • Survey results	Same as Subobjective 1

Key question and subquestions	Indicators/basic data	Sources of information	Methodology
• Do these non-GEF-financed businesses remain in operation today? • How might the GEF-financed businesses have helped the non-GEF-financed businesses to transition to non-ODS technology?	• Number of non-GEF-financed businesses in key sectors • Directly financed business helped unfinanced business by – sharing expertise – improving the availability of non-ODS refrigerants – demonstrating the operational viability of ODS-free technology	• Evaluation reports • Interview results • Survey results	
• What criteria can be used to separate catalytic results from the direct results of investment? • How important was the effort of businesses that were not directly funded in the overall transition away from ODS?	• Involvement of unfunded businesses in workshops and other awareness-raising activities • Bank loans that were taken out by unfunded businesses to finance their own transition to ODS-free technology • Estimate of the percentage of unfunded businesses that transitioned to ODS-free technology in key sectors	• MLF Secretariat staff • MLF database • UNEP • UNDP • WB • GEF Secretariat staff • Local banking community	
Subobjective 5: To compare and contrast the investment and other measures of the GEF to phase out ODS production/consumption with those of the MLF			
What was the GEF's overall intention in funding the ODS program in CEITs? • What was the historical chain of events that led the GEF to include ODS phaseout in the GEF program for CEITs? • What percentage reduction in consumption and production did the GEF expect compared to the base level? • How long did the GEF expect the reduction and phaseout in production and consumption to take? • Did the GEF expect some sectors and countries to take longer than others to phase out ODS? • Why did the GEF expect the results to be sustainable? • What procedures and methods did the GEF use to determine the level of funding that should be provided in each country for ODS phaseout? • What procedures and methods did the GEF use to approve the level of funding? • What were the criteria used to allocate effort to phase out ODS among the WB, UNEP, and UNDP? • What procedures were used to ensure effective coordination among the different agencies?	• List of reasons for including CEIT countries in the ODS phaseout program • Percentage reduction expected • Period of time from inception that was expected for the ODS phaseout • Expected time by sector and by country, with reasons • List of actions by the GEF that led to the belief that the results would be sustainable • Criteria used to determine the level of funding for each country and sector • Criteria used to allocate effort among the WB, UNEP, and UNDP • Procedures put in place to ensure effective coordination among the IAs	• GEF Secretariat Web site • GEF Secretariat (for statistical analysis advice) • Evaluation reports in the four focus CEITs • Interview results • Survey results	• Same as Subobjective 1 • Statistical comparison of speed of production and consumption change within four focus countries (Russian Federation, Ukraine, Kazakhstan, and Uzbekistan) – In comparison to four MLF projects of comparable socio-economic status – Production and consumption status (if appropriate and possible)

Key question and subquestions	Indicators/basic data	Sources of information	Methodology
What was the MLF's overall intention in funding the ODS program in these four MLF-funded countries? • What was the historical chain of events that led the MLF to include ODS phaseout in these MLF-funded countries? • What percentage reduction in consumption and production did the MLF expect compared to the base level? • How long did the MLF expect the reduction and phaseout in production and consumption to take? • Did the MLF expect some sectors and countries to take longer than others to phase out ODS? • Why did the MLF expect the results to be sustainable? • What procedures and methods did the MLF use to determine the level of funding that should be provided in each country for ODS phaseout? • What procedures and methods did the MLF use to approve the level of funding? • What were the criteria used by the MLF to allocate effort to phase out ODS among the various IAs? • What procedures were used to ensure effective coordination among the different agencies?	• List of reasons for including MLF countries in the ODS phaseout program • Percentage reduction expected • Period of time from inception that was expected for ODS phaseout • Expected time by sector and by country, with reasons • List of actions by the MLF that led to the belief that the results would be sustainable • Criteria used to determine the level of funding for each country and sector • Criteria used to allocate effort among IAs • Procedures put in place to ensure effective coordination among IAs	• MLF Secretariat Web site • Evaluation reports in the four MLF countries • Interview results • Survey results	
Subobjective 6: To distill key lessons from the GEF ozone portfolio that have the potential to improve future ODS interventions and in the POPs and climate change focal areas			
What are the key lessons from the GEF ozone portfolio investments? • What were the opportunities and challenges that the IAs faced in Ukraine (WB), the Russian Federation (WB), Kazakhstan (UNDP-UNEP) and Uzbekistan (UNDP-UNEP)? • What actions were taken by the IAs to overcome these challenges? • How successful were these actions in overcoming each challenge?	• List of opportunities • List of challenges or difficulties • List of actions taken to overcome challenges • Description of whether or not the action taken was fully, partially, or not successful	• WB • UNEP • UNDP • Evaluation reports in the four MLF countries • Interview results • Survey results	Same as Subobjective 1
• What are the opportunities and challenges being faced by countries seeking to mitigate the impact of climate change? • Of these challenges, which are common to the CEIT program and which are unique to climate change? • In what ways does the GEF experience in CEITs help with addressing issues effectively in climate change?	• List of opportunities • List of challenges or difficulties • List of actions taken to overcome challenges • Description of whether or not the action taken was fully, partially, or not successful • Description of sectors, and the size/importance of the problem, that could be assisted by the GEF in addressing climate change	• WB • UNEP • UNDP • GEF Least Developed Country Fund • Experts within the GEF involved in climate change • Interview results • Survey results	

Key question and subquestions	Indicators/basic data	Sources of information	Methodology
• What are the opportunities and challenges being faced by countries seeking to mitigate the impact of POPs? • Of these challenges, which are common to the CEIT program and which are unique to POPs? • In what ways does the GEF experience in CEITs help with addressing issues effectively in POPs?	• List of opportunities • List of challenges or difficulties • List of actions taken to overcome challenges • Description of whether or not the action taken was fully, partially, or not successful • Description of sectors, and the size/importance of the problem, that could be assisted by the GEF in addressing POPs	• WB • UNEP • UNDP • GEF POPs Fund • Experts within the GEF involved in POPs • Interview results • Survey results	
• What are the opportunities and challenges in CEITs that are or are not present in MLF-funded countries that have comparable socioeconomic conditions to CEITs? • What actions were taken by the MLF IAs to overcome these challenges? • How successful were these actions in overcoming each challenge?	• List of opportunities • List of challenges or difficulties • List of actions taken to overcome challenges • Description of whether or not the action taken was fully, partially, or not successful	• MLF Secretariat • GEF Secretariat	
• What actions did the GEF take that worked well in the country to help with the phaseout of ODS? • What actions did the GEF take that did not work well in the country? • If the ODS phaseout program were to start again tomorrow, list actions that the GEF could take to perform better. • Describe actions that the GEF could take in the future to assist the country in addressing ODS, climate change, and POPs issues.	• List of priorities • Coordination with staff • Payment delivery • Procurement operations • Coordination of program • Communication • Institutional strengthening	• NOUs in CEITs/field visits • Interview results • Survey results • Evaluation reports	

Key question and subquestions	Indicators/basic data	Sources of information	Methodology
What are the overall contributions of the GEF ozone portfolio at the global level? • Quantify the impact of the ODS phaseout in CEITs on the recovery of the ozone layer. • What is the likely impact on global human health as a result of the phaseout in CEITs due to the lower UV values? • What is the likely impact on the environment (fauna, flora) as a result of the phaseout in CEITs due to the lower UV values?	• Calculations of impact at the global level due to reduced UV • Estimate of the impact on global human health expressed as number of cancers avoided • Estimate of the impact on cropping systems, fauna, and flora according to pro rata estimates from existing reports	• Canadian report (1997) on UV impact on global cancer incidence • Australian report on UV impact on cancer • Report of the Montreal Protocol's Environmental Effects Panel • Experts, including: – Dr. van der Leum, Co-chair Environmental Effects Panel – Prof. Janet Bornman, Director, International Global Change Institute	• Calculations of impact at the global level due to reduced UV, based on two reports • Expert comment on calculations and estimates of the impact of the GEF CEIT program • Calculations of GWP reductions, based on known ODP reductions from Ozone Secretariat Data Centre • TEAP expert comments on calculations and estimates of the impact of the GEF CEIT program • Estimates of ODS remaining in equipment, based on original base size, transitions away from ODS, stocked ODS, and annual leakage rates in each sector • Calculations of the impact on global warming of leakage of ODS from existing equipment • TEAP expert comments on calculations and estimates of the impact of the GEF CEIT program
• Describe the improvement to climate change as a result of the CEIT ODS phaseout program. • Quantify the reduction in global warming in CEITs, measured in carbon dioxide equivalents, due to the reduction in the GWP attributable to phased-out ODS. • Estimate the number of years the phaseout of ODS in CEITs advances the time required to globally decrease global warming due to greenhouse gases.	• Calculations of GWP reductions, based on known ODP reductions from the Ozone Secretariat Data Centre • Calculations of how many years the phaseout of ODS in CEITs is estimated to have advanced the time required to globally decrease global warming due to greenhouse gases • TEAP expert comments on calculations and estimates of the impact of the GEF CEIT program	• Paper by Velders et al. (2007) and estimates by us on impact at global level	
• Quantify the impact on recovery of the ozone layer due to leakage of ODS from existing equipment contained in CEITs. • Quantify the impact on global warming of leakage of ODS from existing equipment contained in CEITs.	• Estimates of ODS remaining in equipment, based on original base size, transitions away from ODS, stocked ODS, and annual leakage rates in each sector • Calculations of the impact on global warming of leakage of ODS from existing equipment • TEAP expert comments on calculations and estimates of the impact of the GEF CEIT program	• TEAP report in response to Decision XVIII/12 which examined the potential impact of ODS leakage from existing equipment on the recovery of the ozone layer and the potential impact on climate	

Annex B. Interview Guide: Government

This annex presents a sample semi-structured interview guide used as a basis for discussions with governments. Questions were provided in Russian where relevant. The guide has been copyedited for consistency. Note that the comments in italics at the beginning of most sections of the guide are taken from an earlier World Bank report. They were reproduced by the GEF Evaluation team as a basis for the questions that follow.

Russian Federation Ministry

No.	Question	For discussion in meeting	Written response required
	Existing institutions, legislation, and control measures *The Project has supported the counterparts to effectively develop the necessary regulatory and institutional tools to allow Russia to move forward with future ODS management, consistent with international expectations and standards. However, the Ministry of Natural Resources (MNR, renamed as the Ministry of Natural Resources and Ecology [MNRE]) has not assigned or resourced any permanent responsibility for ODS issues within its structure once the Project is over, despite having this capacity readily available. Similarly the overall institutional mechanism that supervised the Project, namely the Interagency Commission for Ozone Layer Protection (IAC), is currently inoperative, despite having been an effective vehicle for consensus building and decision making for most of the Project.* *Based on this, the overall conclusion is that the Project long term impact on institutional development is dependent on the results of the current restructuring of environmental management responsibility within the GOR. More specifically, it will require the new Federal Service for Environmental, Technological and Nuclear Oversight (FSETNO) or MNR to assume direct responsibility for this issue and provide capacity to address it, building on that provided by the Project. MNR has amalgamated FSETNO through the most recent Government restructuring process. More generally, this would also have been seen as a pre-condition for any future international initiatives of this type, either related to ODS or other global chemical pollutant issues.*		
1	What is the institutional set-up to deal with the Montreal Protocol issues within the government? Please provide a flow chart describing responsibilities and reporting lines.	MNRE	✓
2	What actions were taken to improve and maintain institutional strength during the course of the ODS phaseout?		✓
3	What was the number of dedicated ozone personnel supported by GEF funds prior to, during, and after project completion?		✓
4	What was the number of dedicated ozone personnel supported by government funds prior to, during and after the project completion?		✓
5	The Russian Federation has ratified all the amendments to the Montreal Protocol and adopted a series of legislation measures so far to comply with the Montreal Protocol. What were or are the policies and measures that reduced the demand for ODS consumption (for example, control and ban of ODS imports/exports; control and ban of imports of ODS-containing equipment; national restrictions on the use of ODS; promotion of voluntary commitment by user sector)?	MNRE	✓
6	What are the most important and effective legislative acts being used to control and enforce imports and exports of ODS and equipment containing ODS?		✓

No.	Question	For discussion in meeting	Written response required
7	Please provide details of any new legislation related to ODS, in particular HCFCs and HCFC-containing equipment.	MNRE	✓
8	How useful is your experience in phasing out CFCs to coping with the implementation of the HCFC phase-out program?		✓
9	Please describe in detail how the quota and licensing system is working in the country.		✓
10	To what extent have the institutional strengthening component and assistance provided by the GEF facilitated the creation of a policy, administrative, economic, technical, and political context essential for the success of investment projects and verifiable phaseout of ODS? In particular, could the GEF project be credited for establishment and updating of the country program, a system of data collection for purposes of international reporting as required under the Montreal Protocol, establishment of regulatory controls on ODS consumption, import and export, and licensing of residual ODS consumption?		✓
11	In your opinion, how could the scope and efficiency of the institutional strengthening arrangements provided under the GEF be improved if we were to start again today?	MNRE	✓
	Enforcement (Customs)		
12	What are the major challenges in enforcing the national legislation in order to fully meet the requirements of the Montreal Protocol?		✓
13	What is the role of the national customs office in enforcing the systematic collection of ODS import/export data?	MNRE	✓
14	Was a computerized database of imported/exported data established in the country? If, yes how does this database operate?		✓
15	Does the customs office have a training program for customs officers to prevent illegal trade of ODS? If yes, please describe how it works. How many customs officers have been trained in handling ODS import/export procedures?	MNRE	✓
16	What ODS identifiers and/or other technical means are used at customs entry points? If yes, how many entry points are equipped with such equipment?		✓
17	What penalties may apply in case of contraventions of established ODS import/export regime (fines, cessation or confiscation of commodities and goods, others)? Please give examples of identified contraventions and measures taken by customs.		✓
18	To what extent has the institutional strengthening component under the GEF ODS project contributed to the improvement of the ODS enforcement regime in the Russian Federation?		✓
19	What actions have you taken to reduce the risk of illegal imports of ODS in order to sustain the phaseout? In particular: • Initial training of, and training updates for, customs officers • Spot checks at border including results and frequency of inspection • Reports of seizure of illegal ODS, identification of illegal ODS using laboratory methods • Correspondence with importing countries to promote coordinated action • Registration and licensing of ODS importers • Provision of ODS identifiers to customs officers • Establishment of a computer-based customs information system connected to agencies responsible for the import/export licensing system • Substantive penalties for illegal trade		✓
	ODS phaseout in the consumption sector		
20	What were the national priorities in ODS phaseout in consumption sectors in the Russian Federation?		✓
21	What national strategies were used in the ODS phaseout in the aerosol, refrigeration, foam, solvent, fire protection, and refrigeration servicing industrial sectors?	MNRE	✓
22	To what extent did the GEF subprojects in industrial sectors contribute to the implementation of national sectoral ODS phaseout strategies?		✓
23	What economic instruments were used by the government that promoted the ODS consumption phaseout (import and ODS user taxes, duties, fees, financial support to users to invest in ODS-free technology)?	MNRE	✓

No.	Question	For discussion in meeting	Written response required
24	What were the major challenges faced by the government in phasing out ODS consumption to meet requirements of the Montreal Protocol?	MNRE	✓
25	To what extent did the scope, policies, and implementation modalities of the assistance provided by the GEF in consumption sectors met the expectations of the government of the Russian Federation?	MNRE	✓
Expenditure/infrastructure			
Despite the opportunity afforded by the Bank through several extensions of the grant closing dates, MNR's performance in 2001-2003 was the primary reason for not being able to use approximately US$7.7 million of GEF funding which could have funded additional residual ODS phaseout sub-projects, sixteen of which were prepared and approved.			
26	What are the underlying reasons for curtailing spending under the third GEF funding tranche and diverting about $7.8 million from resources allocated to the consumption sector to the Special Initiative Project in the production sector?	MNRE	✓
ODS phaseout in the production sector			
Articles 2A to 2E of the Montreal Protocol contain provisions allowing developed countries to exceed established limits in production of ODSs in order to meet the basic domestic needs of Article 5 countries.			
27	Why was the Russian Federation not successful in producing ODS for basic domestic needs?		✓
28	What methodology and criteria were used in negotiating the level of funding for the Special Initiative Project to phase out the ODS production capacity in the Russian Federation?		✓
29	What were the environmental, technological, and social impacts of the Special Initiative Project?		✓
30	In what ways did the political and financial climate help or hinder progress in achieving the objectives of the Special Initiative Project?	MNRE	✓
Funds were allocated under the Special Initiative Project to develop technologies for production of non-ODS alternatives.			
31	What were the major achievements in development of production technologies of non-ODS alternatives?	MNRE	✓
Remaining inventories of banked ODS anticipated to be eliminated at the end of 2005.			
32	What is the current size of ODS inventories in the Russian Federation?		✓
Sustainability of the institutional strengthening component			
The technical assistance component of the GEF project covered the establishment of a formal licensing system for ODS consumption and production, assignment of quotas, import/export controls and a system of data collection for the purposes of international reporting under the MP. This in itself is a major positive outcome, particularly when it was accomplished during a period of major institutional change and instability in the environmental management sector. In its Implementation Completion Report (ICR) the World Bank expressed its concern regarding its sustainability of given the absence of any material commitment within the responsible government agencies to assume responsibility for or to fully implement these tools. "This is unlikely to have any direct impact on the overall achievements of the Project in sustained phasing out of primary ODS production and consumption since the results of the investment component are effectively irreversible. However, it raises concerns about Russia's ability and willingness to implement the evolving international phase out requirements of the MP in areas such as methyl bromide and transitional substances or even more broadly in being part of global chemical management agenda where Russia should be a major participant. Having said this, upon closing there is an indication that the Government may be responding to this issue within the current round of restructuring of environmental management responsibility. However, provision of policy direction through such vehicles as maintaining a current Country Program as well as and updating or direct enforcement of regulatory requirements by environmental authorities have uncertain prospects pending stabilization of the overall institutional structure in the sector." *The responses to Questions 1 to 8 will provide information addressing the World Bank concern about the sustainability of the institutional strengthening component expressed in the above excerpt.*			
Sustainability of the investment component			
The World Bank appraised 58 projects under three funding tranches. Only 31 projects were actually implemented. Others were cancelled for various reasons by the enterprises or as a result of the absence of timely government decision making.			
33	Of the 31 businesses that received GEF funding, which of them are not operational today?		✓
34	Why did businesses that obtained GEF finance remain in business or go out of business?		✓
35	Why did some businesses go back to ODS technology after briefly adopting ODS-free methods (backsliding)?		✓
36	Did the mandatory cofinancing from the enterprise contribute to the sustainability of businesses receiving assistance from the GEF?	MNRE	✓

No.	Question	For discussion in meeting	Written response required
37	What actions were taken to reduce the risk of the unavailability of ODS-free technology?	MNRE	✓
38	What actions were taken to reduce the risk of the continuity of supply of ODS-free technology? Please substantiate by addressing the following: • Reduced import tariffs • Expedited customs clearance • Expedited procurement • Use of local manufacture and expertise to produce ODS-free technology • Other actions	MNRE	✓
Sustainability of the Special Initiative Project			
39	Was the Special Initiative Project sustained as planned?		
Sustainability of the project implementation unit			
The World Bank assessed positively the role of Project Implementation Unit (PIU) funded by the GEF. It is noted in its ICP that the PIU capacity and associated performance had declined over the last two years of the Project, which is directly attributable to the absence of a stable environmental management responsibility in the Government at the policy level compounded by increasing counterproductive interference in routine administrative functions of the PIU.			
40	What were the reasons for the decline in PIU capacity and associated performance in the last two years of its existence?	MNRE	✓
Mitigated economic and social impacts associated with the elimination of ODS			
41	To what extent did the GEF project mitigate economic and social impacts associated with the elimination of ODS in the Russian Federation?	MNRE	✓
GEF funding/catalytic impact			
42	What was the percentage share of the ODS-based manufacturing business in the country that was financed for non-ODS conversion by the GEF investment for each key sector?		✓
43	Conversely, what was the percentage share of the ODS-based manufacturing business that was not financed for conversion by the GEF investment for each key sector?		✓
44	Did the directly financed business helped unfinanced business by sharing expertise, improving the availability of non-ODS refrigerants, and demonstrating the operational viability of ODS-free technology?	MNRE	✓
45	How important was the effort of businesses that were not directly funded in the overall transition away from ODS?		✓
Prospects of future environmental initiatives in other areas, including HCFC phaseout			
46	Is there an interest in seeking further international support to address global environmental objectives, for example, HCFCs, climate change, persistent organic pollutants, others?	MNRE	✓
47	What were specific challenges/opportunities in the implementation of the GEF project in the Russian Federation? Please list the key lessons from the implementation of the GEF ozone project that have the potential to improve future funding interventions in HCFCs and in the persistent organic pollutants and climate change focal areas.		✓

Annex C. Interview Guide: Business

This annex presents a sample semi-structured interview guide used as a basis for discussions with businesses. Questions were provided in Russian where relevant. The guide has been copyedited for consistency.

Foam Sector
Thursday, February 12: Moscow/JSC Stroidetal

No.	Question (not excluding the possibility of follow-up questions)
1	What is the quantity of Vilatherm XPS that has been produced over the past 10 years?
2	Where do you sell most of your products?
3	How does Stroidetal maintain market share relative to your major competitor, Nelidovo, and to foreign imports?
4	How did you overcome the challenges that you faced when installing the butane technology for foam blowing, for example, energy consumption, safety, deodorizing, testing of foam, operational costs?
5	Did the change to butane technology reduce or enhance your market competitiveness?
6	Please describe the safety procedures you have in place and any government inspection of the safety of the foam-producing equipment and procedures.
7	What advice would you give to improve funding and operations of the conversion program?

Annex D. Survey Questionnaire

This annex presents the survey questionnaire sent to all CEITs in English (and Russian where relevant). The questionnaire has been copyedited for consistency.

SURVEY TO NATIONAL OZONE UNITS

Thank you in advance for completing this survey. Your answers will contribute toward our report "Ozone-Depleting Substances: Impact Evaluation in Countries with Economies in Transition."

The sender of the survey form (name/country) will not be disclosed in the report or publicly. The form has been numbered to allow the consultants to confirm the return of the survey from the NOU [national ozone unit].

When completing the survey, please highlight the box that you choose in some way, e.g., ☒ or ■ or ■ . Please choose the box that is closest to your answer. Please answer all the questions.

Please complete the survey and save your changes as "Survey No. [number]." Please submit the completed survey as an attachment to an email to tom.batchelor@skynet.be or by fax to +32-2-792-4658. Please submit the completed survey no later than 31 March 2009.

Number of Form: 131

INSTITUTIONAL CAPACITY	Strongly disagree	Disagree	Slightly disagree	Agree	Strongly agree
1. You have sufficient support from other ministries and departments to effectively manage the reduction and phaseout of ODS	☐	☐	☐	☐	☐
2. You have sufficient staff available to work on new projects on ODS	☐	☐	☐	☐	☐
3. Your main source of funding for the National Ozone Unit comes from (circle or underline one choice):					
a. Central government budget					
b. Donor agency, e.g., UN agencies					
c. Contracts					
4. You have sufficient legal and policy instruments currently in place to address the reduction and phaseout of ODS	☐	☐	☐	☐	☐

5. You have legislative instruments that apply to:	
a. Licenses for any ODS imports	Yes ☐ No ☐
b. Quotas for ODS imports and/or exports	Yes ☐ No ☐
c. Taxes to discourage ODS imports	Yes ☐ No ☐
d. Subsidies to encourage ODS-free technology	Yes ☐ No ☐
e. Environmental taxes to discourage ODS use	Yes ☐ No ☐
f. Permits for any ODS use	Yes ☐ No ☐
ODS REDUCTION AND PHASEOUT MANAGEMENT	
6. Do you have a country strategy for phaseout of ODS?	Yes ☐ No ☐
7. Do you have a management plan(s) for the reduction and phase-out of ODS?	Yes ☐ No ☐
8. The ODS management plan(s) has/have been implemented for one or more of the key ODS sectors.	Yes ☐ No ☐
9. If you answered yes to Q8, what are the key sectors that have been implemented in the plan (circle or underline one or more choices):	
a. Refrigerants	
b. Halons	
c. Methyl bromide	
d. Other ODS	
TRADE ISSUES	
10. Illegal trade in ODS exists in your country	Yes ☐ No ☐
11. Customs officers have equipment in use to effectively detect illegal ODS at the border	Yes ☐ No ☐
12. You have legislation in place that allows customs to combat illegal trade in ODS	Yes ☐ No ☐
13. If you answered yes to Q12, you have:	
a. Sent back the ODS to the country of origin	Yes ☐ No ☐
b. Confiscated intercepted ODS	Yes ☐ No ☐
c. Fines or penalties for smugglers	Yes ☐ No ☐
d. Jail sentences for smugglers	Yes ☐ No ☐
14. Confiscated ODS is later destroyed	Yes ☐ No ☐
15. The customs officers have been trained to enforce laws on illegal trade in ODS?	Yes ☐ No ☐
RECOVERY AND RECYCLING OF ODS	
16. You have operations in 2007 in your country that recovered ODS	Yes ☐ No ☐
17. ODS recovered in 2007 was officially reported to the National Ozone Unit	Yes ☐ No ☐

18. If you answered yes to Q17, estimate the quantity in kilograms of ODS recovered in each of the following categories in 2007:					
a. CFCs – I estimate _____ kg					
b. HCFCs – I estimate _____ kg					
c. Halons – I estimate _____ kg					
d. Other ODS – I estimate _____ kg					
19. Most of the recovered ODS is recycled or reused	Yes ☐ No ☐				
STORAGE AND DESTRUCTION OF ODS					
20. Recovered ODS is stored for destruction	Yes ☐ No ☐				
21. In the past two years, recovered ODS that is no longer needed has been sent for destruction in my country	Yes ☐ No ☐				
22. You have ODS destruction capability available in your country?	Yes ☐ No ☐				
TRAINING					
23. Training was undertaken during the project	Yes ☐ No ☐				
24. If you answered yes to Q23, which of the following sectors were addressed in the training?					
a. Refrigeration servicing	Yes ☐ No ☐				
b. Customs	Yes ☐ No ☐				
c. Firefighting (halon)	Yes ☐ No ☐				
d. Other sector	Yes ☐ No ☐				
25. Training has been provided *in the last three years* in the following sectors:					
a. Customs	Yes ☐ No ☐				
b. Firefighting (halon)	Yes ☐ No ☐				
c. Other sector	Yes ☐ No ☐				
PROJECT DESIGN AND IMPLEMENTATION	Strongly disagree	Disagree	Slightly disagree	Agree	Strongly agree
26. The ODS project as a whole was well *formulated*	☐	☐	☐	☐	☐
27. The ODS project as a whole was well *implemented*	☐	☐	☐	☐	☐
28. All subprojects were well *formulated*	☐	☐	☐	☐	☐
29. All subprojects were well *implemented*	☐	☐	☐	☐	☐
30. National stakeholders (e.g., government, private sector recipients) were consulted when the project as a whole was being *formulated*	☐	☐	☐	☐	☐
31. National stakeholders (e.g., government, private sector recipients) were consulted when the subprojects were being *implemented*	☐	☐	☐	☐	☐
IMPLEMENTING AGENCY					
32. I would rate the performance of the Implementing Agency for the investment subprojects as:	Highly unsatisfactory	Satisfactory	Slightly unsatisfactory	Satisfactory	Highly satisfactory
	☐	☐	☐	☐	☐

33. In general, the international consultants were essential for the implementation of the subprojects	Strongly disagree ☐ Disagree ☐ Slightly disagree ☐ Agree ☐ Strongly agree ☐
34. If you disagreed (strongly disagree or slightly), which sector/area was the consultant **not** essential (circle or underline one or more answers):	
a. Refrigeration	
b. Foam	
c. Halon	
d. Customs training	
e. Other	
35. I would rate the quality of the monitoring/supervision of the project as a whole by the Implementing Agency as:	Highly unsatisfactory ☐ Satisfactory ☐ Slightly unsatisfactory ☐ Satisfactory ☐ Highly satisfactory ☐
MONITORING AND REPORTING	
36. Reporting to the Ozone Secretariat is important	Strongly disagree ☐ Disagree ☐ Slightly disagree ☐ Agree ☐ Strongly agree ☐
37. My country has submitted reports to the Ozone Secretariat on ODS consumption each year for the past five years	Yes ☐ No ☐

Annex E. Workshop Participants

This annex lists the participants in the Consultation Workshop held September 7–8, 2009, in Tashkent, Uzbekstan.

Ms. Valentina Kryukova, Director, Climate Change Coordination Centre, Kazakhstan

Mr. Syrym Nurgaliev, Project Assistant, Climate Change Coordination Centre, Kazakhstan

Ms. Maria Volosatova, Head, Air Protection and Expertise of State Policy and Regulation Department, Ministry of Natural Resources and Environment , Russian Federation

Mr. Alexey Tarasov, Iceberg Refrigeration Company, Smolensk, Russian Federation

Dr. Olga Blinova, Russian Scientific Centre, Applied Chemistry, Russian Federation

Mr. Vassily Tselikov, Advisor to Directorate, FSUE, Federal Centre of Geo-Ecological Systems, Russian Federation

Mr. Volodymyr Balashov, Chief, Department of Ecological Control on Customs Territory, Radiation Security and Export/Import of ODS, Ministry of Environment, Ukraine

Mr. Aleksandr Burmistrov, Deputy Chief, Department of Ecological Control on Customs Territory, Radiation Security and Export/Import of ODS, Ministry of Environment, Ukraine

Mrs. Nadiia Ovchynnikova, Director, Department for Air Protection and Environmental Monitoring, Ministry of Environment, Ukraine

Dr. Anatolii Gamera, Halon Expert, Ukraine

Dr. Gennady Geyyer, Deputy Director Nord Refrigeration, Donetsk, Ukraine

Mr. Khayrullo Ibragivov, Senator of the Committee of Oliy Majlik (Parliament), Uzbekistan

Mr. A'sam Ravshanov, Chief, Division of Agriculture Department, Cabinet of Ministers of Uzbekistan, Uzbekistan

Mr. Narimam Umarov, Chairman, State Committee for Nature Protection, Uzbekistan

Mr. Rakhmatulla Khabirov, First Deputy Chairman, SCNP, Uzbekistan

Mrs. Nadejda Dotsenko, Head, Main Department of Air Protection, National Coordinator, Ozone Office, SCNP, Uzbekistan

Mr. Farkhat Saydiev, Assistant Coordinator, Ozone Office, SCNP, Uzbekistan

Ms. Naila Rustamova, Main Specialist, Main Department of Air Protection, SCNP, Uzbekistan

Dr. Lyudmila Aksyonova, Head, International Cooperation and Programmes Department, SCNP, Uzbekistan

Mr. Kamaliddin Sadikov, Head, State Analytics Inspection, National Focal Point of POPs and Rotterdam Convention, SCNP, Uzbekistan

Mr. Inoyatulla Nigmatov, Head, Information Service, International Cooperation and Programmes Department, SCNP, Uzbekistan

Mr. Majit Khodjaev, Director, Centre ENV-Power, SCNP, Uzbekistan

Mr. Bahtiyor Abduganiev, Chief of Central Customs Laboratory, State Customs Committee, Uzbekistan

Mr. Abdusabir Saidov, Head of Department, Central Customs Laboratory, State Customs Committee, Uzbekistan

Mr. Alisher Usmanov, Head of Division, UNO and International Organisations Department, Ministry of Foreign Affairs, Uzbekistan

Mr. Daniyor Kamilov, Lead Economist, Coordination Department, Ministry of Finance, Uzbekistan

Mr. Bahretdin Muratov, Main Specialist, Agriculture and Water Development Division, Ministry of Economy, Uzbekistan

Mr. Uktam Ablakulov, Deputy Director, JSC Sino, Uzbekistan

Mr. Kudratulla Karimov, Tashkent State Technical University, Uzbekistan

Mr. Abdusamat Muminov, Engineer, Tashkent State Technical University, Uzbekistan

Mr. Andrey Makarov, Director, JSC Savdotekhnikamontaj, Uzbekistan

Mr. Khabibulla Nazirov, Chief of Service, JSC Shark Shaboda, Uzbekistan

Mr. Turgunbay Ergashev, Chief Engineer, JSC Yulreftrans, Uzbekistan

Mr. Sergey Myagkov, Operation of GEF Focal Point, Cabinet of Ministers of the Hydro Meteorological Service, SANIGMI, Uzbekistan

Dr. David Todd, Senior Evaluation Officer, GEF Evaluation Office

Dr. Lee Alexander Risby, Evaluation Officer, GEF Evaluation Office

Mr. Ibrahima Sow, Program Manager POPS, GEF Secretariat

Mr. Valery Smirnov, Canada, International Consultant

Mr. Iskander Buranov, Operations Officer Energy and Infrastructure, World Bank Uzbekistan

Mr. Farhod Maksudov, Programme Specialist for Environment and Energy, UNDP Uzbekistan

Dr. Tom Batchelor, Director, Touchdown Consulting Brussels

Dr. Melanie Miller, Director, Touchdown Consulting Brussels

Annex F. Workshop Comments and Recommendations

This annex presents comments and recommendations received from participants in the Consultation Workshop held September 7–8, 2009, in Tashkent, Uzbekstan, on the draft evaluation report.

Country	Comment made at consultation workshop	Action
Uzbekistan	• The GEF should be more flexible in considering funding support for countries; that is, it should include consideration of products that contain ODS (especially HCFCs), not just the ODS itself. • There is a need to strengthen awareness among stakeholders and to establish a network to facilitate discussions among key stakeholders. Uzbekistan is interested in cooperating with the GEF on persistent organic pollutants, pesticides and chemicals, waste management, and biodiversity.	Uzbekistan may wish to follow up on these points with the GEF Secretariat through its GEF focal point. The first comment was included in Conclusion 4; the second in Recommendation 2.
Ukraine	Why was Ukraine compared with Egypt in the analysis of GEF versus MLF projects?	As stated in the report, the comparison countries were matched with the CEITs on the basis of ODS consumption, population, and per capita gross national income. This information was also provided in response to the question in the workshop.
Ukraine	A draft law on regulating greenhouse gases is currently being considered by the Ukraine Parliament. It aims to integrate greenhouse gases and ODS which have a global warming potential, and to encourage closer cooperation between the Montreal Protocol and Kyoto Protocol in the management of an environmental response.	A footnote to this effect was inserted in the Ukraine country report.
Kazakhstan	• Legislation for ODS requires businesses to have equipment for ODS recovery and recycling. They must also have a license for activities related to ODS. • Ratification of the Montreal Protocol amendments is being considered in parliament at present. Kazakhstan has submitted reports and tries to comply with all protocol requirements even though ratification is lacking.	Report and relevant conclusions were updated to reflect.
Nord (Ukraine)	Following the GEF funding, NORD eliminated ODS and now uses only non-ODS and environmentally friendly refrigerants and foam-blowing agents (primarily isobutane).	No changes necessary. A Nord representative informed the meeting of information contained in volume 2.
Russian Federation	The experts in the GEF project were of high quality. Even companies that did not receive funds benefited from meeting with them.	Report was updated to reflect and a footnote added.
Uzbekistan	The representatives of the Russian Federation and Ukraine are requested to provide more details (names) on ODS and ODS-free substances and equipment.	Included in Conclusion 4 and Recommendation 2.
Russian Federation	Fines for illegal trade are included in the Russian Federation's Administrative Code.	Report and relevant conclusions were updated to reflect.

Country	Comment made at consultation workshop	Action
Ukraine	• Ukraine differs from other countries in having an environmental control service (of more than 1,500 officers) since the 1990s, as well as a customs service, which helps to control illegal trade. Inspectors are located at customs posts in Ukraine. Ukraine had discussions with manufacturers and monitored imports from China in particular. There were cases of ODS smuggling in the past, but these are now almost zero. The environmental inspectorate of Ukraine received training from the national budget, not from the GEF project. • Ukraine seeks opportunities to cooperate with the GEF in the training of customs and the inspectorate in future.	The Ukraine country report and Recommendation 2 were updated.
Kazakhstan	• There are some administrative fines and penalties for illegal trade in Kazakhstan, as stated in the survey but not in the presentation. Also, customs officers do have detector equipment. • Kazakhstan is currently introducing an "inquiry and reply" computerized system in all ministries so only authorized people will be able to grant licenses in future.	Report and relevant conclusions were updated to reflect.
Ukraine	• An update: There are plans to modernize the gas pipeline, including new equipment, without halon/ODS, with support from the European Bank for Reconstruction and Development. This year, the national legislation on ODS will be updated and is due to include halon, but it is not clear what date it will be adopted. • The halon database developed in 2002 needs to be computerized and updated. Ukraine looks forward to finding resources for this.	Footnote added to Ukraine country report. Relevant bodies in Ukraine may wish to follow up with the national GEF focal point.
Kazakhstan	• Current law prohibits halon imports. The project collected halon and did not need it because alternatives were adopted. Kazakhstan requested guidelines and instructions from UNOPS for reclamation facilities, but did not get any answers to its questions. • Kazakhstan restated that there is a problem of how to destroy unwanted stocks of halon.	Covered in volume 2, section 8.3. Kazakhstan may wish to sell halon for critical uses (those without alternatives) rather than destroy it, in light of its value on the international market.
Russian Federation	Some companies in the Russian Federation have the capability to destroy unwanted ODS. If other countries are interested, they could contact Mr. Tselikov to establish contacts between the relevant parties.	Contact details were circulated in the workshop.
Ukraine	Ukraine has systems for regulating, controlling, and inspecting ODS. A department has been established at the ministry to regulate both ODS and greenhouse gases, and will function as a national ozone unit. Two government resolutions were recently drafted on ODS. Other institutional changes are under way, such as establishing a new ozone center. Government bodies are directly involved in the import and export of ODS, and the system is operating well.	Two sentences were added to the report to reflect.
Kazakhstan	What was the basis for selecting the criteria for evaluating countries? Were the same criteria applied to all countries? Were some criteria given greater weight than others?	All the criteria were equally rated. This information was provided at the workshop and in the methodology section in volume 1.

Country	Comment made at consultation workshop	Action
Uzbekistan	The efficiency of ODS phaseout is not the final objective, which is ozone layer recovery. It would be useful to see more data on this.	Information on the recovery of the ozone layer and the complexities of its recovery due to interactions with the effects of climate change were described in the workshop. The Scientific Assessment of Ozone Depletion in 2006 reported that the total level of ODS in the atmosphere has started to decrease. However, the recovery of the ozone layer is slower than expected. The Antarctic ozone hole, for example, is expected to continue until 2060–75, roughly 10–25 years later than scientists estimated previously.
World Bank	The short version of the report mentions unwanted stocks of ODS and the lack of destruction facilities, but makes no recommendation on this point.	Provided in Recommendation 1.
Several countries	The report shows that further work is needed on ODS. What is the procedure for informing the GEF about our needs?	Countries were urged to discuss their needs with their national GEF focal point and regional representatives. Participants were informed of the GEF Secretariat meeting in Paris October 14–16, 2009, and the need to prepare appropriate statements for this meeting from the perspective of negotiations.

Annex G. Evaluation Milestones and Schedule

Task	Time frame	Responsibility
Approach paper circulated for discussion and formulation of terms of reference; cooperation with the United Nations Industrial Development Organization and UNEP Evaluation Offices discussed	May–December 2008	GEF Evaluation Office
Selection and hiring of consultants	September 2008	GEF Evaluation Office
Literature review on GEF ODS projects (evaluations and project implementation reports)	August–October 2008	GEF Evaluation Office
Consultant work plan	Early October 2008	Consultants
Desk review of MLF/Montreal Protocol literature and comparable projects	October 2008	Consultants
Statistical analyses of collated data	January–March 2009	Consultants; GEF Evaluation Office
Country fieldwork (four GEF countries): Kazakhstan, the Russian Federation, Ukraine, and Uzbekistan	February–April 2009	Consultants; GEF Evaluation Office
Country fieldwork in 11 other CEITs, and complete 3 desk study CEITs	April–June 2009	Consultants
Submission of progress information as part of the GEF Annual Report on Impact 2008 for GEF Council	November 2008	GEF Evaluation Office
Analysis and report drafting	May–July 2009	Consultants
Submission of draft report to GEF Evaluation Office for internal comments	June 2009	Consultants
Circulation of draft report to countries, GEF Secretariat, and Implementing Agencies	August 2009	GEF Evaluation Office
Regional workshop in Uzbekistan with stakeholders mainly from Kazakhstan, the Russian Federation, Ukraine, and Uzbekistan	September 2009	GEF Evaluation Office; consultants
Final report drafting	September 2009	Consultants
Editing for inclusion in the GEF Annual Report on Impact 2009	September 2009	GEF Evaluation Office
Follow-up work for publication by GEF Evaluation Office and/or externally	November 2009–February 2010	GEF Evaluation Office (no budgeted input from consultants)

Annex H. Implementing Agency Effectiveness

CEIT	IA	Start of GEF finance	Year of phase-out	Years to phase out	ODS (ODP tonnes)		Expenditure (million $)		Cost-effectiveness ($/ODP kg)	Implementation	
					To be phased out at project start	Max. consumption after GEF funding	Total	Annual		Intensity (ODP tonnes/year)	Efficiency (ODP g/year/$)
Armenia[a]	UN	2004	2010	6	110.7	110.7	2.09	0.35	18.88	18.45	8.83
Azerbaijan	UN	1999	2006	7	99.9	99.9	7.04	1.01	70.47	14.27	2.03
Belarus	WB	1997	2000	3	547.4	547.4	6.79	2.26	12.40	182.47	26.87
Bulgaria	WB	1995	1998	3	338.4	338.4	9.64	3.21	28.49	112.80	11.70
Czech Rep.	WB	1994	1998	4	516.0	516.0	2.83	0.71	5.48	129.00	45.58
Estonia	UN	2000	2002	2	15.4	15.4	0.75	0.38	48.70	7.70	10.27
Hungary	WB	1995	1996	1	566.2	566.2	6.50	6.50	11.48	566.20	87.11
Kazakhstan	UN	2000	2005	5	537.1	537.1	5.43	1.09	10.11	107.42	19.78
Latvia	UN	1998	2001	3	25.3	35.2	1.34	0.45	38.07	8.43	6.29
Lithuania	UN	1998	2001	3	103.8	103.8	4.69	1.56	45.18	34.60	7.38
Poland	WB	1996	1998	2	549.4	549.4	5.88	2.94	10.70	274.70	46.72
Russian Fed.	WB	1996	2001	5	22,075.6	25,584.2	44.58[b]	8.92	1.74	4415.12	99.04
Slovakia	WB	1995	1998	3	380.9	380.9	2.66	0.89	6.98	126.97	47.73
Slovenia	WB	1995	2000	5	353.8	353.8	5.88	1.18	16.62	70.76	12.03
Tajikistan	UN	2002	2004	2	11.8	11.8	0.82	0.41	69.49	5.90	7.20
Turkmenistan[a]	UN	1998	2010	12	25.3	58.4	0.36	0.03	6.16	2.11	5.86
Ukraine	WB	1998	2002	4	1,100.0	1,100.0	21.24	5.31	19.31	275.00	12.95
Uzbekistan	UN	1998	2002	4	119.8	119.8	3.17	0.79	26.46	29.95	9.45

Note: IA = Implementing Agency; UN = UN; WB = World Bank.

a. Reclassified as developing country, which requires zero consumption of ODS on January 1, 2010.

b. Excluding funds allocated for closure of production facilities.

Annex I. MLF-Funded Projects in Brazil, Cameroon, Egypt, and Romania

Country	Donor	Project impact (ODP tonnes)	Actually phased out (ODP tonnes)	Approved ($)	Support ($)	Total approved ($)	Support/ total (%)	Disbursed ($)	Support disbursed ($)	Total disbursed ($)	Disbursed/ approved (%)
Brazil	Canada	21	—	651,829	—	651,829		651,829	—	651,829	
Brazil	Germany	—	—	247,400	32,162	279,562		247,400	32,162	279,562	
Brazil	WB	1,086	1,086	6,900,249	573,844	7,474,093		6,900,249	573,844	7,474,093	
Brazil	UNDP	5,769	5,769	36,717,447	4,660,215	41,377,662		34,999,156	4,531,017	39,530,173	
Brazil	UNIDO	444	388	4,345,526	561,949	4,907,475		4,345,526	561,951	4,907,477	
Brazil Solv Proj CFC-113	UNDP	4	4	68,394	8,891	77,285		68,394	8,891	77,285	
Total Brazil Projects		7,321		48,862,451	5,828,170	54,690,621	11.93	47,144,160	5,698,973	52,843,133	96.62
CFC phase-out NPP											
Brazil	Germany	—	—	3,883,600	372,610	4,256,210		2,810,914	219,396	3,030,310	
Brazil	UNDP	5,727	4,801	22,916,400	1,966,776	24,883,176		10,578,053	933,810	11,511,863	
Total Brazil NPP				26,800,000	2,339,386	29,139,386	8.73	13,388,967	1,153,206	14,542,173	49.91
Brazil Grand Total		13,048		75,662,451	8,167,556	83,830,007	10.79	60,533,127	6,852,179	67,385,306	80.38
Cameroon Projects	UNIDO	645	645	4,861,458	629,355	5,490,813	12.95	4,861,458	629,354	5,490,812	
Cameroon NPP	UNIDO	27	13	735,000	55,125	790,125		274,007	20,551	294,558	
Cameroon Total		672		5,596,458	684,480	6,280,938	12.23	5,135,465	649,905	5,785,370	92.11
Egypt Projects											
Egypt	Germany	100	100	940,700	118,560	1,059,260		940,700	118,560	1,059,260	
Egypt	WB	—	—	1,856,116	—			1,856,116	—		
Egypt	UNDP	2,422	2,421	13,265,822	1,722,907	14,988,729		13,196,832	1,715,588	14,912,420	
Egypt	UNIDO	779	631	17,719,880	1,974,140	19,694,020		11,826,049	1,532,103	13,358,152	

Country	Donor	Project impact (ODP tonnes)	Actually phased out (ODP tonnes)	Approved ($)	Support ($)	Total approved ($)	Sup-port/ total (%)	Disbursed ($)	Support disbursed ($)	Total disbursed ($)	Dis-bursed/ approved (%)
Egypt Solv Proj CFC-113	UNIDO	16	16	275,736	35,846	311,582		275,736	35,845	311,581	
Total Egypt Projects		3,300		33,782,518	3,815,606	35,742,009	11.29				
Egypt NPP											
Egypt	UNIDO	472	190	2,874,967	219,746	3,094,713		1,119,734	88,104	1,207,838	
Grand Total Egypt		3,772		36,657,485	4,035,352	38,836,722	11.01	13,221,519	1,656,052	14,877,571	38.31
Romania	Austria	10	—	131,790	—			116,628	—		
Romania	UNIDO	1,279	1,276	4,389,141	559,460	4,948,601		4,372,981	558,005	4,930,986	
Total Romania Projects		1,289		4,520,931	559,460	5,080,391	12.37	4,489,609	558,005	4,930,986	97.06
Romania NPP											
Romania	Sweden	—	—	178,900	23,257	202,157		76,901	10,722	87,623	
Romania	UNIDO	65	65	434,788	32,608	467,396		43,519	3,263	46,782	
Total Romania NPP		65	65	613,688	55,865	669,553		120,420	13,985	134,405	20.07
Grand Total Romania		1,354		5,134,619	615,325	5,749,944		4,610,029	571,990	5,065,391	88.09

Note: Projects in aerosol, foam, refrigeration and halon sectors. UNIDO = United Nations Industrial Development Organization.

Annex J. Examples of Illegal Trade in ODS Reported in CEITs

CEIT	Brief description	Implied source of ODS	Substance	ODP tonnes	Tonnes	Year	Information source
Armenia	Waste ODS mixture incorrectly labeled as new HFC-134a	United Arab Emirates	CFC, HCFC			2007	UNEP 2008
	Contaminated CFC imported from Saudi Arabia incorrectly labeled as new CFC	Saudi Arabia	CFC			—	UNEP ECA 2007
Azerbaijan	Three mislabeled shipments of blends containing CFC-12; 100 CFC-12 cylinders seized from a ship in Caspian Sea		Blends with CFC-12, CFC-12	—	—	2007	Azerbaijan, see chapter 5
Belarus	Company imported and sold CFC under other names	—	CFC-12			2003	Rodichkin 2008
Czech Republic	Heat pumps containing ODS imported illegally		HCFC-22	0.02	0.37	2002	UNEP 2004
	Air conditioning units containing ODS exported illegally	Czech Republic	HCFC-22	0.001	0.01		
	Air conditioning units containing ODS imported illegally	—	HCFC-22	—	—	2003	
Estonia	10 companies fined a total of $5,000 for smuggling various types of ODS		—			—	Estonia, see chapter 5
	Owners of two ships fined for exporting halon to Russia and Georgia	Estonia	Halon	~ 2.4?	0.4	2007	
	ODS exported illegally to a Russian ship		HCFC	0.004?	0.07	2005	UNEP 2008
Kazakhstan	8 cylinders containing ODS were hidden from customs in a train coming from Russia	Russia	HCFC-22, 124, 142b	~ 0.006	0.11	2007	Rodichkin 2008
	Companies stated that cheap CFCs from Russia and China can be purchased on the market	Russia, China	CFCs	—	—	2009	Kazakhstan, see chapter 5
Poland	Illegal trade has been, detected and smugglers fined (for example, HCFCs illegally imported from Ukraine)	Ukraine	HCFCs			—	Poland, see chapter 5
	Attempted import of CFC from Ukraine in private car		CFC-12	0.15	0.15	2005	UNEP 2008
Russian Federation	Indications that some CFCs on sale did not come from local stocks but were potential illegal imports	China and other countries	CFCs	200	200	2009	Russian Fed., see chapter 5
	Attempted export of methyl chloroform to the United Arab Emirates without required documents	Russia	Methyl chloroform	6.22	62.2	2007	Rodichkin 2008

CEIT	Brief description	Implied source of ODS	Substance	ODP tonnes	Tonnes	Year	Information source
Russian Federation	Customs detected 300 cylinders containing ODS imported illegally from China	China	CFC-12?	4.08	4.08	2007	Rodichkin 2008
	False information (description and codes) for 160 barrels of CFC-113 imported from China		CFC-113	34.944	43.68		
	Container(s) transported from Germany via Smolensk region to Vladimir	Germany	—	1.113	—	2008	UNEP 2009
Slovakia	20 recorded cases of fines imposed by customs officers for illegal ODS	—		—	—	2004–09	Slovakia, see chapter 5
Tajikistan	Several cases of illegal trade, mainly smugglers carrying small quantities of ODS without licenses		Mainly CFC-12			—	Tajikistan, see chapter 5
Turkmenistan	Plentiful supply of CFC-12 at relatively low price indicates potential illegal imports		CFC-12			2009	Turkmenistan, see chapter 5
	Imported ODS detained because it exceeded permitted quota		—		1.224	2006	
Ukraine	Risk of illegal CFC imports		CFC		—	2009	Ukraine, see chapter 5
Uzbekistan	Several instances of smuggling of refrigerators containing ODS		CFC?			2002	UNEP 2007
	Instances of illegal importation of CFC and HCFC		CFC-12, HCFC-22			2003	
	Illegal imports of CFC were intercepted and destroyed		CFC-12	0.328	0.328	By 2007	
	24 cylinders of ODS bearing a Chinese trade name detected in a private vehicle	China	CFC	~ 0.024	0.024	2007	Rodichkin 2008
	Compressors for refrigerators and containers of ODS bearing a Chinese trade name found in a private vehicle		—	—	0.0001		
	Cylinders of ODS (72 liters) bearing a Chinese trade name found in a private vehicle		CFC		—		
	Attempted illegal import from Kyrgyzstan of 36 cylinders of ODS bearing a Chinese trade name	Kyrgyzstan	CFC	~ 0.036	0.036		
	30 cylinders of ODS illegally imported from Kyrgyzstan hidden in luggage area of a bus	Kyrgyzstan, made in China	—	—	0.408	2008	RILO CIS 2009
	4 cylinders of ODS illegally imported from Kyrgyzstan hidden in a car				0.054		
	Air conditioner unit containing ODS produced in China was imported illegally	China			—		
	2 cylinders of ODS imported illegally from Kyrgyzstan hidden in a car	Kyrgyzstan, made in China			0.027		
	12 cylinders of ODS with Chinese trade name were detected hidden in a car	Kyrgyzstan, possibly made in China	CFC		—		
	25 refrigerators and 4 cylinders containing ODS detected during a document check	China to Tajikistan via Uzbekistan	—		0.091		

CEIT	Brief description	Implied source of ODS	Substance	ODP tonnes	Tonnes	Year	Information source
Uzbekistan	49 liters of ODS detected hidden in a car	Uzbekistan	—	—	—	2008	RILO CIS 2009
	48 cylinders of ODS were illegally imported from Kyrgyzstan hidden in a car	Kyrgyzstan, made in China			0.048		
	12 cylinders of ODS were illegally imported from Kyrgyzstan hidden in a car				0.163		
	13.6 kg of ODS were illegally imported from Kyrgyzstan hidden in a car				0.014		
	195 cans of ODS pesticides intercepted	Kyrgyzstan	Methyl bromide		—		
	9 cylinders of ODS were illegally imported from Kyrgyzstan hidden in a car	Kyrgyzstan, made in China	—		0.122		
	6 cylinders of ODS were illegally imported from Kyrgyzstan hidden in a car				0.082		
	27 cylinders of ODS were illegally imported from Kyrgyzstan hidden in a car				0.367		

Sources: RILO CIS, "Customs Seizures of ODS in 2008 in the CIS Region," data from the CIS Regional Intelligence Liaison Office of the World Customs Organization (Paris: UNEP DTIE 2009), www.estis.net/sites/ecanetwork/default.asp?site=ecanetwork&page_id=C9568D0E-B4E0-47F1-9A1A-6E2466A7BEBB; S. Rodichkin, "Illegal Transportation of Ozone Depleting Substances in the Region of the RILO WCO for CIS Countries in 2007," Annual Meeting of the Regional Ozone Network for Europe and Central Asia ECA Network, March 25–28, 2008 (Tirana, Albania: UNEP DTIE, 2008); UNEP, "Summary of Key Issues Arising from the Dialogue on Future Challenges to Be Faced by the Montreal Protocol: Presentation of the Co-Chairs," UNEP/OzL.Pro.WG.1/27/7 (Nairobi: Ozone Secretariat, 2007); UNEP, "Report of the Twenty-ninth Meeting of the Open-ended Working Group of the Parties to the Montreal Protocol, July 2009," UNEP/OzL.Pro.WG.1/29/9 (Nairobi: Ozone Secretariat, 2009).

Note: — = not available (unknown). Bibliography for full details of information sources cited above. Additional information was also taken from Dialog Concept Note, 2009. Regional Intelligence Network Organisation (RILO) for Asia and the Pacific Region, which operates under the World Customs Organisation (WCO). Rodichkin is also reporting activities under RILO.

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GEF Evaluation Office Publications

Number	Title	Year
Evaluation Reports		
55	GEF Annual Impact Report 2009	2010
54	OPS4: Progress Toward Impact—Fourth Overall Performance Study of the GEF, Full Report	2010
53	OPS4: Progress Toward Impact—Fourth Overall Performance Study of the GEF, Full Report	2010
52	OPS4: Progress Toward Impact—Fourth Overall Performance Study of the GEF, Executive Version	2010
51	GEF Country Portfolio Evaluation: Egypt (1991–2008)	2009
50	GEF Annual Country Portfolio Evaluation Report 2009	2009
49	GEF Annual Performance Report 2008	2009
48	GEF Annual Impact Report 2008	2009
47	Midterm Review of the Resource Allocation Framework	2009
46	GEF Annual Report on Impact 2007	2009
45	GEF Country Portfolio Evaluation: Cameroon (1992–2007)	2009
44	GEF Annual Country Portfolio Evaluation Report 2008	2008
43	GEF Country Portfolio Evaluation: South Africa (1994–2007)	2008
42	GEF Country Portfolio Evaluation: Madagascar (1994–2007)	2008
41	GEF Country Portfolio Evaluation: Benin (1991–2007)	2008
40	GEF Annual Performance Report 2007	2008
39	Joint Evaluation of the GEF Small Grants Programme	2008
38	GEF Annual Performance Report 2006	2008
37	GEF Country Portfolio Evaluation: Samoa (1992–2007)	2008
36	GEF Country Portfolio Evaluation: The Philippines (1992–2007)	2008
35	Evaluation of the Experience of Executing Agencies under Expanded Opportunities in the GEF	2007
34	Evaluation of Incremental Cost Assessment	2007
33	Joint Evaluation of the GEF Activity Cycle and Modalities	2007
32	GEF Country Portfolio Evaluation: Costa Rica (1992–2005)	2007
31	GEF Annual Performance Report 2005	2006
30	The Role of Local Benefits in Global Environmental Programs	2006
29	GEF Annual Performance Report 2004	2005
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	Climate Change Program Study	2004
	International Waters Program Study	2004
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ED-2	GEF Evaluation Office Ethical Guidelines	2008
ED-1	The GEF Evaluation and Monitoring Policy	2006

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