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UNIDO and the Montreal Protocol: 15 years of partnership 1992–2007

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Abbreviations and acronyms

CASE	Centre for Advancement of Solar Energy
CFC	chlorofluorocarbon
CFC-11	trichlorofluoromethene
CFC-12	dichlorodifluoromethene
CO_2	carbon dioxide
EAEO	Executing Agency with Expanded Opportunities
FIDE	Trust Fund for Electricity Savings (Mexico)
GEF	Global Environment Facility
GHG	greenhouse gases
GWP	global warming potential
HBFB	hydrobromofluorocarbon
HCFC	hydrochlorofluorocarbon
HFC	hydrofluorocarbon
ICGEB	International Centre for Genetic Engineering and Biotechnology
ICS	International Centre for Science and High Technology
IDB	Industrial Development Board
IMLF	Interim Multilateral Fund
IOT	Industrial Operational Technology
ISED	Industrial Sectors and Environment Division
ISO	International Organization for Standardization
INISAV	Institute for Plant Health Research (Cuba)
LCD	liquid carbon dioxide
MLF	Multilateral Fund for the Implementation of the Montreal Protocol
ODP	ozone-depleting potential
ODS	ozone-depleting substance
POPs	Persistent Organic Pollutants
R-134a	tetrafluoroethane, also known as HFC-134a
SEMARNAT	Secretariat of Environment and Natural Resources (Mexico)
TÜV	Tech. Überwachungsverein (German safety monitoring agency)
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
UNCITRAL	United Nations Commission on International Trade Law

Message from the Director General

Throughout most of the twentieth century, diplomats have concentrated on questions of political and economic relations among nation states - the traditional subjects of diplomacy. As the century was closing, a new set of international problems – those relating to the health of the planet – came to the fore, presenting a new challenge to diplomacy: negotiating on environmental issues, which among other things affected the delicate relationships between the public and private sectors.

In this context, the signing of the ozone treaty on 16 September 1987 was a major breakthrough. The ozone experience offers lessons for policymakers, diplomats, multilateral bodies, and industry in confronting this new generation of global environmental challenges.

Scientific evidence has proven that some chemicals cause the depletion of the stratospheric ozone layer. It was in the light of this threat that the international community reacted and after intensive negotiations adopted the Vienna Convention and its Montreal Protocol.

Industry needed a firm sign and a stable regulatory environment, to give it the confidence to invest in new and ozone friendly technologies. This is obtained through the Montreal Protocol and, in particular through the Multilateral Fund it established.

The problem of protecting the stratospheric ozone layer presents an unusually complex challenge and thus, the success of the Montreal Protocol can be attributed to no single prime cause. Rather, a combination of key factors made the Montreal Protocol a successful environmental agreement. Key among these were the following:

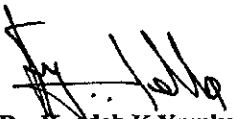
- The indispensable role of science in the negotiations, conclusions and implementation.
- The power of knowledge and of public opinion was a formidable factor in ensuring participation of all-important stakeholders, including government authorities, industry, NGOs and the public at large.
- Private sector organizations – industry and civil society groups - participated actively and engaged themselves throughout the entire cycle.
- The process involved in reaching an agreement on the Montreal Protocol, and its implementation modality including the establishment of the Multilateral Fund, was itself a determining factor.

- The agreement was deliberately designed as a flexible and dynamic instrument relying on periodic scientific, economic, investment and technological assessments.
- It was the first international environmental agreement to apply the principle of common but differentiated responsibilities between developed and developing countries.
- Developed nations accepted commitments to transfer the necessary clean technologies to developing countries and to countries with economies in transition, and to create the necessary local capacities to enable them to meet their obligations.
- Projects funded under the Multilateral Fund have contributed in many circumstances to the potential for industry to sustain and even create productive jobs.
- The Montreal Protocol was the first international environmental agreement to impose trade sanctions to achieve its goals.

UNIDO became the fourth implementing agency of the Montreal Protocol 15 years ago and is proud to be associated with its success. From the outset, UNIDO recognized the significance of meeting the global environmental challenge of ozone depletion while observing national priorities, and of making meaningful technological adjustments resulting in a better quality in peoples' lives. UNIDO has excelled particularly as a promoter of innovative technologies based on ozone-friendly chemicals and clean manufacturing processes.

However, there are still challenges to be faced. A major one is the decision taken by the 19th Meeting of the Parties of the Montreal Protocol last month, to advance the phase-out date of hydrochlorofluorocarbons (HCFCs) by ten years.

This book has the ambition to capture the most important milestones of UNIDO's path as an Implementing Agency of the Multilateral Fund for the Implementation of the Montreal Protocol.



Dr. Kandeh K. Yumkella

Foreword

Mr. Domingo Siazon, Director-General of UNIDO 1985–1993

Congratulations to the United Nations Industrial Development Organization (UNIDO) for 15 years of successful partnership with the Multilateral Fund (MLF) for the implementation of the objective of the Montreal Protocol to save the ozone layer.

I am indeed happy that this document will record the history of this meaningful partnership which has in many ways influenced for the better, the future of UNIDO while at the same time enabling many developing countries to participate in the global effort to prevent the depletion of the ozone layer.

The relations between UNIDO and the Interim Multilateral Fund (IMLF) did not come about by pure serendipity.

In the beginning, UNIDO was not part of the plan. But as a result of persistent efforts by UNIDO starting in March 1990, an Agreement Between the Executive Committee of the Interim Multilateral Fund for the Implementation of the Montreal Protocol and the United Nations Industrial Development Organization was finally signed in Montreal at 7.00 p.m. on 22 October 1992.

I am very tempted to write more about this agreement which certainly proved to be one of the most significant entered into by UNIDO during my stewardship of the organization.

Let me instead borrow the words of Dr. Omar El-Arini, Chief Officer of the Multilateral Fund from 1991-2004: "By November 2006, UNIDO had been allocated over US$470 million to help 80 countries meet their compliance obligations under the Montreal Protocol, and had contributed greatly to the global efforts to protect the ozone layer."

I would like to congratulate the past and present staff members of UNIDO for a job well done. I am happy to have shared part of my professional life with such a wonderful group of competent and dedicated international civil servants.

May you all continue in the great traditions of our organization.

DOMINGO L. SIAZON, JR.
Director General
UNIDO September 1985-January 1993

Dr. Mostafa Kamal Tolba, Executive Director of UNEP 1980–1993

Early moves to protect the ozone layer

During the past three decades governments, international agencies, and non-governmental organizations have developed increasingly effective approaches to transboundary environmental problems. The traditional, insular stance by which a nation rejected interference in its environmental policies is being rejected as governments realize that many problems can only be solved through cooperation.

In 1982, 25 years ago at the time of writing, at the first session of the Ad Hoc Working Group of Legal and Technical Experts for the Preparation of a Global Framework Convention for the Protection of the Ozone Layer in Stockholm, I said: "We are meeting to lay the groundwork for a convention that some argue may not be needed, for we cannot say with certainty that the ozone layer is being depleted. However, all the most reliable scientific evidence points to the fact that the Earth's protective ozone layer has been, is being, and, more importantly, will continue to be depleted by chlorofluorocarbons and other chemicals unless the international community takes preventive action. The urgent task of this meeting is to create a framework that will make that action effective." It took a further five years to achieve this goal with the adoption, in 1987, of the Montreal Protocol on Substances That Deplete the Ozone Layer.

Setting up the Montreal Protocol: Innovation and commitment

The sense of urgency shared by those negotiating the Montreal Protocol gave rise to a series of informal meetings between stakeholders to iron out points of contention; this was, at the time, an innovative process. The Protocol also established a number of precedents. For example, once a two-thirds majority of delegates had approved the adjusted control measures, they became binding on its signatories without the lengthy process of formal ratification. Also, the IMLF for the Implementation of the Montreal Protocol was established by a simple decision of the Conference of the Parties, although there was no legal basis for the step in either the Protocol or the Vienna Convention for the Protection of the Ozone Layer. The MLF's establishment under such circumstances was considered by international law experts to be an unprecedented step. The non-compliance provisions were similarly unprecedented. The establishment, composition and method of work of the Executive Committee of the MLF were also novel and greatly assisted implementation of the Protocol. Another lesson learned was that the designation of implementing and executing agencies, including the World Bank, the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP) and the United Nations Industrial Development Organization (UNIDO), was very effective in assisting governments, particularly those of developing countries, to make proper use of the MLF.

One of the main factors that helped the successful outcome of the negotiations for the Protocol was the abandonment by the representatives of the convening organization, UNEP, of the traditional mediator's role of non-committal neutrality; instead they actively sought solutions, taking the position that, as citizens of the world, they had a stake in the outcome. They thus used their skills to bring about compromises and find sound legal language to express them, while avoiding the appearance of favouring one party over another.

Even at this early stage it was therefore apparent that the innovative processes that brought the Montreal Protocol into existence would provide a sound basis for its future activities and help make it an internationally respected model for dealing with global environmental problems.

Preface

Dr. Omar El-Arini, Chief Officer of the Multilateral Fund 1991–2004

Organizations are similar to nations when they face decisive moments in their lives; seizing such moments can make the difference between ascendancy to the heights of success and sinking into oblivion.

UNIDO was presented in 1990 with such a fateful opportunity when it received an invitation from the Executive Committee of the then burgeoning Multilateral Fund to cooperate in the international effort to save the ozone layer. Barely a quarter of a century old, and experiencing the uncertainties of institutional metamorphosis made more acute by the birth of a new world order, UNIDO understood the significance of the invitation and decided to face the challenges it presented.

The cause-effect relationship between a widely used class of industrial chemicals and the possible deterioration of the ozone layer was first demonstrated by two U.S. scientists in 1974,[1] precipitating unprecedented worldwide action to further study and address the issue. The world community consequently adopted the Vienna Convention for the Protection of the Ozone Layer in 1985, the year in which scientists reported the first evidence of a hole in the ozone layer over Antarctica. This alarming discovery, with its attendant negative impact on all life on Earth, prompted the adoption, in 1987, of the landmark agreement known as the Montreal Protocol on Substances That Deplete the Ozone Layer. The Protocol was amended in 1990 to, among other things, accommodate the needs of developing countries for technical assistance and new technologies to ensure their full participation in controlling production and consumption of ozone-depleting substances (ODS). This amendment, known as the London Amendment, included the establishing of the first financial mechanism ever to address a single environmental issue. The mechanism included a Multilateral Fund to enable developing countries to comply with the Protocol's strict control measures.

At the time of its creation, the Parties to the Protocol spelled out specific roles for UNEP, UNDP and the World Bank, and envisioned that the latter two agencies would be primarily responsible for implementing two projects to enable developing countries to achieve compliance. However, just two years later, UNIDO would be using its unique industrial expertise to implement projects in many countries with a work programme that had reached near parity with these other founding agencies.

The 15-year story of the involvement of UNIDO in the Montreal Protocol told in this book demonstrates how the organization was able to branch out into new areas to help its traditional developing country partners while remaining true to the mission that has directed this important organization throughout its 40-year history. It is a story of vision, adjustment and consistency: vision, in seeing that participating in multilateral

[1] F. Sherwood Rowland of the University of California, Irvine, and Mario Molina of the Massachusetts Institute of Technology.

environmental compliance was consistent with its core mission, and could form the basis of a future focus of the organization; adjustment, in demonstrating that UNIDO could change its internal working practices to meet the unique needs of the Montreal Protocol (and, indeed, that the Montreal Protocol process could learn from UNIDO's unique experience); and consistency, in ensuring the dependable delivery of expert assistance to its partner countries, thereby enabling UNIDO, in only a few years time, to operate in parity with the much larger organizations of the World Bank and UNDP.

By November 2006, UNIDO had been allocated over US$470 million to help 80 countries meet their compliance obligations under the Montreal Protocol, and had contributed greatly to the global efforts to protect the ozone layer. This book celebrates that achievement.

Chapter 1

History of UNIDO

1.1 The 1960s: Early development

The seeds that later blossomed into the United Nations Industrial Development Organization (UNIDO) were sown in the early 1960s, as the United Nations increasingly recognized the need for a specialized agency for industrial development that could encourage peace and prosperity through equitable economic growth. The matter was discussed in several sessions of the General Assembly and the Economic and Social Council, and in 1961 the United Nations Committee for Industrial Development established a Centre for Industrial Development, which organized a series of regional symposiums in the mid-1960s.

In addition, an Advisory Committee of Experts was set up at the request of the Economic and Social Council to consider the role a specialized agency might play in expanding United Nations activities in the field of industrial development. Following the report of the Advisory Committee, the Economic and Social Council, at its thirty-seventh session in August 1964, declared that there was "an urgent need to establish a specialized agency for industrial development within the framework of the United Nations family". On 17 November 1966 the General Assembly passed resolution 2152 (XXI) to establish UNIDO, though the organization was not set up for business until January 1967. It was decided that the administrative and research activities of UNIDO would be financed from the United Nations regular budget, and that the Governments of Member States would finance the operational activities from voluntary contributions. The principal organ of UNIDO would be the Industrial Development Board.

The Secretariat of UNIDO availed itself of facilities in New York before being transferred to its permanent base in Vienna, Austria, in 1967. Mr. Ibrahim Helmi Abdel-Rahman, of Egypt, was appointed the first Executive Director. Under his leadership the organization soon started to develop in accordance with its mandate, and delivered its first technical assistance projects with the financial support of UNDP. The International Symposium on Industrial Development, held from 29 November to 19 December 1967 in Athens, Greece, defined the mission of UNIDO and approved a declaration of its role as an effective instrument for international cooperation in the industrialization of developing countries.

1.2 The 1970s: Expansion and readjustment

Following the birth and early development of UNIDO, it was now time to reassess the role of the organization in order to identify the best directions for the expansion of its programme. A Special General Conference held from 1 to 8 June 1971 in Vienna examined the activities, resources and finances of UNIDO, with the developing countries in particular seeking a wider scope and greater financial resourcing

for the organization to increase its capacity to foster industrial growth. At the recommendation of the Conference an expert group was formulated to look at the problems of countries in the early stages of development; its findings formed the basis of UNIDO's Least Developed Country programme. Furthermore Mr. Abdel-Rahman initiated the preparation of the Second General Conference of UNIDO.

In 1975 Mr. Abd-El Rahman Khane, of Algeria, became the second Executive Director of UNIDO. He took over the final preparation and conduct of the Second General Conference of UNIDO in Lima, Peru, hosted by the Peruvian Government in March 1975. The Lima Declaration and Plan of Action on Industrial Development and Cooperation that emanated from the conference called for an increase in the share of total world industrial production by developing countries from 6 per cent in 1974 to 25 per cent by the year 2000. Accordingly, UNIDO adjusted its structure and programmes in order to respond to this challenge, and funding from UNDP was earmarked to finance activities. Based on funds allocated, in 1975 UNIDO ranked 23rd among UNDP executing agencies; by 1980 it was placed third.

In addition, UNIDO used the voluntary funds received from Member States to promote many activities in line with the Lima Declaration by developing global and regional centres to assist the industrialization process in developing countries. Additional financial support became available in 1976 with the establishment of the United Nations Industrial Development Fund. UNIDO designed, developed and implemented over a hundred industrial institutions and pilot projects for the development and transfer of technology in support of the implementation of the Lima Declaration.

The 1970s ended in exciting fashion for UNIDO with a move in 1979 to new headquarters at the Vienna International Centre, custom built by the Austrian Government.

1.3 The 1980s: A new agency is born

The 1980s opened for UNIDO with its Third General Conference, held in New Delhi, India, in January 1980. The main themes of the Conference were captured in the New Delhi Declaration and Plan of Action on Industrialization of Developing Countries and International Cooperation, which importantly looked at innovative ways in which industrial development could be integrated with development in other sectors, including agriculture and energy. The Fourth General Conference took place in August 1984, in UNIDO's hometown of Vienna.

1985 marked an important milestone for UNIDO with the entry into force of the new constitution and the confirmation of the organization as the 16th specialized agency of the United Nations. At the first session of the General Conference of UNIDO as a specialized agency Mr. Domingo Siazon of the Philippines was appointed the first Director-General. In this capacity he presided over the adjustment of UNIDO to its new status, implementing the redefined structure and appointing new staff, including

five deputy director-generals for the five departments approved by the Industrial Development Board (IDB).

Events elsewhere added to the teething problems of the new agency. In September 1985, at the Plaza Hotel in New York City, five countries – France, Japan, the United Kingdom, the United States and West Germany – signed the Plaza Accord, by which they agreed to a depreciation of the U.S. dollar against other major currencies, including the Austrian schilling. This agreement had a profound impact on UNIDO's cash flow, which was based on the dollar, while most payments were in Austrian schillings.

In response UNIDO increased its delivery of technical assistance, which rose in value from US$90 million to US$157 million annually over the period 1985–1992. This had a major impact on the creation of industrial institutions and capacity-building in developing countries, and was an important factor in the increase in their share of global industrial output from 6 per cent in 1974 to 18 per cent in 1990.

The second and third sessions of the General Conference met in Bangkok, Thailand, in November 1987, and in Vienna, Austria, in November 1989.

1.4 The 1990s: Increasing prominence of the Montreal Protocol

Under the Director-General Mr. Siazon, an environment programme was introduced for the first time with the establishment of the Environment Coordination Unit within the Programme Development Division. The United Nations Conference on Environment and Development (the so-called Earth Summit) held in Rio de Janeiro, Brazil, in June 1992, and its groundbreaking outputs – Agenda 21 and the Rio Declaration on Environment and Development – highlighted the importance of integrating environment concerns into technical assistance delivery programmes such as those of UNIDO. It was in 1992 that UNIDO signed an agreement with the Interim Multilateral Fund (IMLF) for the Implementation of the Montreal Protocol and commenced its fruitful period as an implementing agency of the Protocol, perhaps the most striking indication of its commitment to the protection of the environment (see chapter 3).

Mr. Mauricio de Maria y Campos of Mexico became the second Director-General of UNIDO in 1993, holding the post for four years. During this period it became clear that major adjustments to the structure of the organization were needed, due to a number of factors, including the start of the Montreal Protocol programme in 1993 and its development into a major UNIDO commitment; UNDP withdrawal from UNIDO technical assistance delivery; and the adoption of the Yaoundé Declaration at the fifth session of the General Conference in Yaoundé, Cameroon, in December 1993, in which Member States requested UNIDO to adjust its structure, budget and staffing to focus delivery of technical assistance on export-oriented, competitive industrial development. During this period, in addition to its activities under the Montreal Protocol, UNIDO also made its presence felt in the areas of persistent organic pollutants, energy and climate change, and international waters.

In December 1997, at the seventh session of the General Conference in Vienna, Mr. Carlos Alfredo Magariños of Argentina was elected the third Director-General of UNIDO. He presided over a transformation of the organization in line with the Business Plan for the Future Role and Functions of UNIDO, adopted at the December Conference, which grouped activities into the two main areas of strengthening industrial capacities and cleaner, sustainable industrial development. He also recognized the importance for UNIDO of the Montreal Protocol programme, which in 1999 represented 50 per cent of UNIDO's technical assistance delivery. Accordingly, to raise the visibility and autonomy of the programme he upgraded the position of senior coordinator for the Protocol to director level and integrated all the programmes and technical staff related to the Multilateral Fund (MLF) into one branch.

1.5 2000 onwards: A widening environmental agenda

The reforms to UNIDO were greeted favourably by Member States at the Millennium Conference in New York, 2000. As the new millennium has unfolded the environmental agenda has gained increasing prominence. The Stockholm Convention on Persistent Organic Pollutants (POP's) entered into force in 2004, attracting UNIDO assistance with country implementation plans. A number of projects related to persistent organic pollutants are being undertaken in tandem with the Global Environment Facility (GEF). The growing relationship with GEF received a major boost in May 2000 when UNIDO joined the World Bank, UNDP and UNEP as an executing agency with expanded opportunities, greatly enhancing its access to GEF funding and its ability to implement projects. Other projects have been completed, or are under way, in support of the implementation of the Kyoto Protocol to the United Nations Framework Convention on Climate Change.

In December 2005 Dr. Kandeh Kolleh Yumkella of Sierra Leone became the fourth Director-General of UNIDO. In November of that year the 40th anniversary celebrations of UNIDO were attended by dignitaries from the United Nations system, the host Government, and representatives of developed and developing countries worldwide. The effort and work of UNIDO in contributing to sustainable industrialization, poverty alleviation, trade capacity-building and protection of the environment were fully recognized. The importance of the delivery of technical assistance to the economic and industrial development of developing countries was also given due recognition. An office was opened in Brussels in 2006 to raise the profile of UNIDO's activities within the European Union, thereby attracting increased financial support for the implementation of UNIDO's programmes on trade and capacity-building in developing countries.

In June 2007, UNIDO gained direct access to GEF funding as an EAEO, with regards to its comparative advantage in the fields of POPs and Energy. The Director-General is calling for UNIDO to play a larger role in Energy related matters. Projects have been completed, or are under way, in support of the implementation of the Kyoto Protocol to the United Nations Framework Convention on Climate Change.

Chapter 2

History of ozone issues and the Montreal Protocol

2.1 Chlorofluorocarbons: Promising but dangerous

Chlorofluorocarbons (CFCs) were first developed in 1928 by a U.S. scientist, Thomas Midgley Jr., as a non-toxic, non-flammable substitute for ammonia in refrigeration uses. In the decades that followed, a large variety of new uses were found for these chemicals. By the early 1970s an entire industrial system had grown up around them, in both developed and developing countries. In 1974, however, two U.S. scientists, Sherwood Rowland and Mario Molina, realized that the chemically inert CFCs could be transported high into the atmosphere, where exposure to ultraviolet light would separate them into their constituents, most notably chlorine atoms, which were able to decompose ozone catalytically. This would inevitably cause a depletion of the ozone layer, a thin layer of gas that protects the Earth and its inhabitants from the hazards of ultraviolet radiation. Rowland and Molina predicted that without strong action to abate emissions of these chemicals, the ozone layer would be at severe risk. Subsequent studies have confirmed this hypothesis and have identified a range of related substances that have the potential to deplete the ozone layer.

As concern over these chemicals grew, the world community responded with collective action. In 1985, a group of countries negotiated the Vienna Convention for the Protection of the Ozone Layer, by which they agreed to increase coordinated research and to consider the development of a protocol aimed at reducing emissions of ozone-depleting substances (ODS). With the alarming discovery of a large hole in the ozone layer above Antarctica adding impetus to the process, the Montreal Protocol on Substances that Deplete the Ozone Layer was opened for signature in September 1987 and entered into force on 1 January 1989.

2.2 Montreal Protocol and its structure

2.2.1 Background to the Montreal Protocol

The Montreal Protocol was based on an understanding that the ozone problem was a classic case of the "tragedy of the commons", whereby market-oriented production threatens the existence of a beneficial public good, just as the global community was being threatened by the production of substances that depleted the ozone layer. In light of this, the Protocol was developed with a view toward facilitating the participation of all countries of the world. It included trade provisions that were designed to encourage non-Parties who wanted to use ODS to join the Protocol and be bound by the specific requirements to reduce production and consumption of the chemicals (which, at this early date, included only CFCs and halons). In addition, it included provisions that gave developing countries additional time (a grace period of 10 years) to comply with the requirements. Thus, it was the first of many examples of the application of the concept of

common but differentiated responsibility in the drawing up of international agreements; all States have a responsibility to protect the environment, but the contributions that States make must depend on their specific circumstances. The Protocol included provisions that recognized that technology transfer and financial support were essential to enable developing countries to participate fully in protection of the ozone layer.

The Protocol's initial recognition of the need to support developing countries was not turned into specific action until 1990, when the Parties to the Protocol negotiated the London Amendment. The amendment, which also expanded the group of chemicals controlled by the Protocol, included a provision establishing the Multilateral Fund for the Implementation of the Montreal Protocol. It was designed to enable developing countries to comply with the Protocol's control measures to reduce and eventually eliminate the production and consumption of ODS. The amendment also introduced a new article on technology transfer, the aim of which was to assist the expeditious transfer of the best available environmentally safe substitutes and related technologies to developing countries.

2.2.2 Multilateral Fund: Structure and operation

The Multilateral Fund (MLF) was at the time of its creation unique in several respects. It was the first funding mechanism of its kind established to facilitate implementation of a global environmental agreement. Hence, there were no extant precedents from which the mechanism could take guidance. Second, it was run by an Executive Committee made up of seven developed countries and seven developing countries. The equitable representation in the membership of the Executive Committee was distinctly different from that of other funding entities, which tended to be donor dominated. Equity in participation was further ensured by the decision to have the chair of the Executive Committee alternate between representatives of the developed and developing countries, within a voting structure that required a two-thirds majority vote. In this regard, however, it should be noted that in the 17 years' history of the MLF, all decisions by the Executive Committee in all of its 52 meetings have been taken by consensus, with no need to call for a vote. Finally, the MLF was a pioneer in developing the concept of incremental costs – costs on countries that are beyond those strictly necessary to achieve their own development goals, but which nevertheless generate additional benefits that the world as a whole can share. This concept would become a funding guideline adopted by other environmental financial mechanisms, including the Global Environment Facility. In box 2.1 an ex-chair of the Executive Committee recounts some recollections.

Box 2.1 Recollections of a chairperson
Mr. Paul Horwitz

It was my high honour to be a member of the Executive Committee from 1992 to 2005 as head of the delegation of the United States Environmental Protection Agency, and to be Chair of the Committee during the year 2000. I have many fond memories

of this unique institution. Perhaps the most telling memory comes from 1992, when Mexico and the United States submitted a proposed country programme requesting support for Mexico. At that time, the United States was the MLF's largest donor and a representative of Mexico was serving as Chair of the Executive Committee. The Secretariat of the MLF had criticized the work and was recommending changes prior to adoption. The outcome was that the work was sent back to the United States and Mexico and was not considered again until the next meeting. This is but one example of both the fairness of the process that was established under the MLF and the independence of the MLF Secretariat, which was critical to the success of the MLF.

I also have memories of UNIDO as one of the implementing agencies of the MLF. I remember clearly the first appearance of Ms. Tcheknavorian-Asenbauer, Managing Director of UNIDO's Industrial Sectors and Environment Division, and her powerful and direct presence in the institution, which helped to enliven and focus the Executive Committee discussions. I also remember visiting many UNIDO projects and seeing at first hand the contribution that the organization was making on the ground to help phase out ODS. In many countries this had not been adequately addressed before UNIDO's participation in the Montreal Protocol.

2.2.3 Multilateral Fund Secretariat

The MLF Secretariat was established in 1991 in Montreal, Canada, and assists the Executive Committee in its daily operations. In 2007, the Secretariat comprised 11 internationally recruited professionals and 11 general staff and was headed by the Chief Officer, who reports directly to the Executive Committee.

Among other functions, the Secretariat develops budget and fund disbursement plans, manages the business plan cycle of the MLF, drafts policy papers and other documents, and monitors the activities and expenditures of the implementing agencies by reviewing and assessing investment projects and preparing country programmes and business plans. Since May 1997 the Secretariat has also undertaken monitory and evaluation tasks, a function established by the Executive Committee.

Various chief officers have played major roles in fostering close relationships between the MLF and UNIDO. Dr. Omar El-Arini, who became Chief Officer in February 1991, was a major driving force for the development and execution of the Montreal Protocol programme through the activities of the MLF, and did much to help improve policies, administrative procedures, and project evaluation and approval. He was an ardent supporter of UNIDO's efforts to become an implementing agency and respected its active role in introducing new technologies to the programme. Ms. Maria Nolan, the Chief Officer at the time of writing, was appointed in 2004, and has also supported and appreciated UNIDO's contribution to the implementation of the Montreal Protocol. The chairs of the Executive Committee, too, have done much to champion UNIDO's cause; they are listed in annex 1.

In box 2.2 Dr. Omar El-Arini, Chief Officer of the Secretariat from 1991 to 2003, describes his experiences of the collaboration between the MLF and UNIDO.

Box 2.2 MLF-UNIDO collaboration: Recollections of a Chief Officer
Dr. Omar El-Arini

The 20th century witnessed unparalleled scientific and technological discoveries, but was also marred by unprecedented human-caused disasters and suffering. The relativity theory of Albert Einstein – early in the century – started a chain reaction that is still unfolding. It redefined time and, in the process, revolutionized our thinking and shaped our future.

Later in the century Rowland and Molina published their pioneering work on the relationship between a class of household chemicals and the destruction of the stratospheric ozone layer. Like relativity, which is no longer debated in abstraction as indeed we experience in our daily lives the ramification of its proofs, the study of ozone depletion has shaped our response to the sanctity of space and modified our sense of invincibility. The two discoveries have become an integral part of our knowledge and as such are assigned an exalted place in the pantheon of discoveries that are making the planet a safer place in which to live and thrive.

Protection of the ozone layer has brought about an extraordinary spirit of cooperation among United Nations organizations, governments, scientists and technologists, non-governmental organizations and the media. The coming together of all these stakeholders has evolved into what has come to be known as the "ozone regime", which has introduced new words and phrases into our daily vocabulary, such as the "precautionary principle" and "common but differentiated responsibility", and has charted a new paradigm that has given rise to international compacts on climate, biological diversity and chemicals.

In 1990 the Interim Multilateral Fund (IMLF) for the Implementation of the Montreal Protocol was established. It became the full Multilateral Fund in 1992, a practical translation of the principle of common but differentiated responsibility (see section 2.2.1) that had been developed at the Earth Summit in Rio de Janeiro the same year. The MLF has created a unique but replicable mechanism to manage, with equity, accountability and full transparency, what is ultimately a finite financial resource to help address ozone depletion through technology transfer and other means.

The task has been monumental, given the following facts:

- The number of substances controlled by the Protocol amounts to 98 chemicals, of which 10 are used in more than 250 separate product categories. Many of the products have become vital to society and include uses in medical applications, refrigeration and air conditioning, insulation, fire protection, electronics, fumigation and safety.

- Assistance needs to be provided to 140 developing country Parties to the Protocol, all with varying economies, industrial development and technological levels.

- Four international agencies, the MLF's implementing agencies, which were used to provide loans to fund large infrastructure or investment projects or to provide technical assistance, had to modify their modus operandi to deal with the new concept of incremental costs (section 2.2.2) when implementing projects from as small as a few thousand dollars to as large as hundreds of millions of dollars.

- A strict time schedule for compliance applies simultaneously to the more than 140 countries.

- Technology transfer has to be provided for countries that could not, for political reasons, even think of accessing such technologies in the international market.

- Low priority is inevitably given to addressing global environmental issues in many developing countries compared to the more pressing needs that affect the daily lives of millions. This situation has left many countries without the local capacity to deal with a problem such as ozone depletion.

- The international community tends to be averse to the creation of new organizations to deal with emerging issues, and "donor fatigue" can set in.

These were the formidable obstacles that the MLF had to overcome in order to justify its raison d'être and continue to function successfully.

It is a fact of life that technology trade, which includes international sales of industrial rights, equipment, technical services and training, and plans and documents, is only one part of technology transfer; technology utilization or absorption by the recipient is also a crucial component.

The MLF has consistently assisted both of these aspects of technology transfer by providing funding for equipment purchase from international suppliers and for up to four years operating costs to adapt and absorb the technology. It is worth noting that the MLF was very successful in transferring cutting edge technologies that were being simultaneously applied in developed countries.

Political factors often strongly influence technology trade in developing country markets. At the most general level, long-term political relations between recipient and supplier nations shape the overall context within which technology trade occurs. Without the MLF, I am confident that some Parties would never have been able to attain the technology transfer they needed to implement the Protocol.

These were the challenges UNIDO had to face when it became the fourth implementing agency of the Montreal Protocol in 1992, more than two years after

UNDP, UNEP and the World Bank had begun their partnership with the MLF. Ms. Archalus Tcheknavorian-Asenbauer, then Managing Director of the Industrial Sectors and Environment Division, had assembled a team of experts to manage the preparation and subsequent implementation of UNIDO's first work programme under the MLF. After the MLF's Executive Committee had approved US$500,000 for the implementation of the work programme, the Managing Director explained that "the guiding principles for the preparation of the work programme had been to make full use of the experience which UNIDO had already gained in the formulation and implementation of industrial projects and in small-scale industries in developing countries. ... It was UNIDO's mandate to assist developing countries to achieve sustainable industrial development. UNIDO had established close links with industrial enterprises, institutions and associations in developing countries and they would be used to the full in addressing the problems and in implementing activities to phase out ODS."

Between March 1993 and October 1996 (the end of the grace period under the Montreal Protocol and the last Executive Committee meeting attended by the Managing Director before her retirement), UNIDO's portfolio of projects achieved the US$100 million mark, and introduced cutting edge technologies for the first time in countries that did not have access to either the financial resources or the means to adopt such technologies. A new era of international cooperation was ushered in and indeed of adopting new financial policies by the Executive Committee. UNIDO became the only implementing agency in small countries in Africa, Asia and Latin America, and was the first agency to go to some of the successor countries to the former Soviet Union and former Yugoslavia.

Hydrocarbon-based technologies were thus introduced by UNIDO in industrial sectors such as foams, domestic refrigeration (including compressor manufacture) and tobacco fluffing. UNIDO became actively and aggressively involved in all industrial sectors producing or consuming ODS. It also ventured into new sectors such as phase-out of the use of methyl bromide in soil pest control and commodity and structures fumigation. Its portfolio of projects included very small enterprises in countries consuming very low amounts of ODS, as well as multimillion dollar sectoral phase-out plans in countries consuming large amounts. A review of UNIDO's activities since 1993 would immediately show that it has been involved in both consumption and production sectors, in addition to its pivotal role in capacity-building.

On the policy side, UNIDO assisted the Executive Committee in distributing the MLF resources between the implementing agencies, in reducing the incremental operating costs of domestic refrigeration conversion from four years to six months (resulting in savings of millions of dollars that went to other projects), and in nominating industrial experts to deal with the phase-out of the CFC production sector.

On the eve of the 20th anniversary of the Montreal Protocol and nearly 15 years after UNIDO became the last implementing agency of the Montreal Protocol, UNIDO is even better equipped to deal with phasing out of the residual consumption and production of ODS in its partner countries, in the same spirit conveyed at the approval of UNIDO's first work programme.

2.2.4 Multilateral Fund mechanism

It was intended that the MLF pay the incremental costs of activities for reduction and elimination of ODS with time-based reduction targets. For example, developing countries were required to eliminate their production and consumption of CFCs by 2010.

Eliminating the consumption of CFCs in many cases necessitated converting certain industrial infrastructure in developing countries to the use of more ozone-friendly substitutes. For example, hundreds of plants in the world were producing refrigerators. In the process they were using CFCs both as a refrigerant and in the production of the insulating foam that was found in the walls of the refrigerator cabinets. The conversion of these plants could require such changes as the introduction of new designs, the engineering of a new compressor and condenser, and the replacement of machines used for charging the refrigerant and for foaming the cabinets. When originally negotiated, the related Protocol provision seemed to envision UNDP and the World Bank providing the technical assistance. However, the Protocol Parties did leave the door open for other agencies to be invited to participate in their areas of expertise. UNIDO entered through this door in 1992.

2.3 Dealing with ozone-depleting substances

2.3.1 Ozone-depleting substances (ODS): Technical background

As described in section 2.1, after the discovery that CFCs had a destructive effect on the ozone layer, with a resulting negative impact on the environment and human health, it became increasingly clear that these chemicals were widely employed in a range of diverse uses, including refrigeration, air conditioning, solvents, aerosol, foam, blowing agents and sterilants. There was a need to find a baseline for assessing the diverse chemicals and their potential to damage the ozone layer, as not all substances had the same effect. Therefore, it was necessary to establish a common benchmark, known as the ozone-depleting potential (ODP) of a particular substance.[2] The reference gas chosen for this purpose was CFC-11, which therefore has an ODP of 1.0, while more harmful substances have a higher index. A related reference is the global warming potential (GWP), a measure of the global warming effect of the emission of a given quantity of greenhouse gas relative to carbon dioxide (CO2), which has a GWP of 1.0.

[2] Ozone-depleting potential is the ratio of calculated ozone column change for each mass unit of a gas emitted into the atmosphere relative to the calculated depletion for the reference gas CFC-11.

Substances with a relatively low ODP have been recommended as alternatives to CFCs. These include hydrochlorofluorocarbons (HCFCs), used as an alternative to CFCs and carbon tetrachloride in electronic and chemical industries as a solvent; hydrobromofluorocarbons (HBFCs), used as a fire-fighting agent; and methyl bromide, used (for example) in pesticides. The search goes on, however, for substances with even lower ODP, and in recent years natural substances such as cyclopentane, isobutane and ammonia have been shown to have potential to replace HCFCs in certain uses. The use of natural substances has an economic and ecological advantage for developing countries, as it does not depend of the import of chemicals produced in developed countries, with their attendant high international transportation costs and specific storage requirements.

This search for substitutes with lower or even insignificant ODP has been a challenge for the MLF, United Nations organizations, implementing agencies and the scientific community in general. It has contributed to the enlargement of the list of substitutes and the greater range of choices available to industries in developing countries, enabling them to select alternatives according to their particular circumstances and conditions.

2.3.2 Regional framework

Developing countries whose annual per capita consumption and production of ODS is less than 0.3 kilograms, and who need assistance to comply with the control measures of the Protocol, are dealt with in Article 5 of the Protocol, and are therefore termed Article 5 countries. By the criteria applied, over 140 countries are eligible to receive assistance from the MLF to replace technologies using ODS. The MLF Secretariat became operative in 1991, and is located in Montreal. Forty-nine industrialized countries committed themselves to providing the necessary funding to make possible, by 2010, the total phase-out of CFCs, carbon tetrachloride and halons in developing countries. Since 1991 the MLF has received contributions of over US$2.2 billion, and the disbursement of these funds had enabled the elimination of 85 per cent of ODS by the end of 2006.

In order to implement the Montreal Protocol and its provision for assisting developing countries, the MLF contributed to setting up "ozone units" at national and regional levels to coordinate the ODS phase-out strategy in 131 countries. The national ozone units are the primary focal point for the flow of assistance from the MLF. In the initial stage UNEP, with support from the Government of Sweden, created Regional Networks of Ozone Officers with the objective of building the capacity of national ozone officers to help them implement their country obligations under the Protocol. The eight Regional Networks, operated by UNEP, assist countries in the effective accomplishment of their national compliance strategies and aim to establish cooperation, coordination and information exchange between national ozone units. They also act, as forums for consultation through which the MLF and implementing agencies can better understand the needs of recipient countries. In the eight Regional Networks, 148 developing countries and 14 developed countries are represented.

2.3.3 Illegal trade

A major obstacle faced by both developed and developing countries in their efforts to phase out ODS within the agreed schedule is illegal production, consumption and trade. Article 4 of the Protocol attempts to deal with this issue, for example by reinforcing the skills of customs officers so that they can more clearly recognize and understand the trade requirements of the Protocol. The term "green customs officers" has been applied to customs officers specially trained in the environmental consequences and negative impact on human health arising from the use and consumption of ODS, and the rules and regulations related to their trade. Support for the training of customs officers counts among the responsibilities of the MLF. Under the Refrigeration Management Plan, and with the support of the implementing agencies, over 90 national workshops and training programmes have been conducted.

In recognition of the fact that illegal trade threatened investment projects, the UNEP Compliance Assistance Programme set about developing other options for effective control of illegal trade in ODS. It became clear that a worldwide partnership of diverse bodies, including non-governmental organizations and other institutions, needed to be incorporated for this purpose and for the wider application of the concept of green customs through partnership and training at regional and subregional levels. The ultimate goal would be effective customs control under which the provisions of all multilateral agreements were understood and fully implemented in a cohesive manner. In pursuit of this goal UNEP has extended its collaboration with other organizations, such as the World Customs Organization, Interpol and the secretariats of various multilateral environmental agreements, in the development of trade provisions for more effective implementation of the green customs initiative.

2.3.4 Small consuming countries

The London Amendment only covered provision of funds to Article 5 countries that consumed ODS, but did not cover assistance to smaller countries that are not direct producers or users of ODS, but still imports goods containing them. These countries do not have investment-related activities but there is a need for awareness building, training, institutional strengthening and retrofitting, and the development of regulations or legislation for monitoring and law enforcement. For that reason, in 1995 a separate allocation was provided to the MLF for implementation of the above-mentioned activities. The cost-effectiveness threshold could be up to 150 per cent higher than that applied in larger countries. The implementing agencies were given the responsibility to develop and accomplish those activities in accordance with the Executive Committee guidelines.

2.3.5 Small-scale industries

As it was first constituted, the MLF principally provided assistance to larger industries in order to achieve the objectives of the Protocol. However, in the course of implementation, it became apparent that a significant amount of ODS remained in use in the small and medium industries of developing countries, especially in the sectors of refrigeration CFCs and agricultural applications for methyl bromide. In 1998, the Executive Committee took the decision to target small and medium industries for effective phase-out of ODS, providing US$10 million to assist small industries in Article 5 countries in conversion projects in the aerosol and foam sectors, with a more flexible cost-effectiveness threshold than that applied to larger industries. It has proved challenging, however, to implement this programme, as the relevant industries in developing countries are dispersed both sectorally and geographically, making it very difficult to accurately target them and to monitor the success of activities.

Chapter 3

UNIDO and the Montreal Protocol

This chapter is in two parts: the first part considers how UNIDO came to be an implementing agency of the Montreal Protocol, and the implications for the organization; the second part looks at how UNIDO's involvement with the Protocol has subsequently developed and evolved.

3.1 UNIDO and the Montreal Protocol: How it all started

3.1.1 First attendance of UNIDO at a Montreal Protocol meeting

UNIDO's involvement with the Montreal Protocol can be traced back to a meeting on technology transfer among agencies hosted by the United Nations Conference on Trade and Development (UNCTAD) in Geneva, March 1990, which the Director of Industrial Operations Technology (IOT) Division UNIDO[1] attended. In parallel with this event was a UNEP session on the Montreal Protocol in preparation for the Second Meeting of the Parties to the Montreal Protocol in London in June. At that meeting the London Amendment, which would create a mechanism for providing financial and technical assistance to developing countries, would be debated. The UNEP session was chaired by Dr. Mostafa Kamal Tolba, Executive Director of UNEP.

The representative of UNIDO took the initiative to request a bilateral meeting with Dr. Tolba, which was held in the chair's office and included a presentation by UNIDO on their capacity and potential for participating in the implementation of the Montreal Protocol. Dr. Tolba recognized the validity of the arguments; though he was puzzled that UNIDO had not shown such interest at an earlier stage, considering that UNDP, UNEP and the World Bank had been involved since 1987. It was agreed that the consultant appointed to visit those agencies would include in his schedule a visit to UNIDO to make an assessment of its capacity and potential to act as an implementing agency, presenting his report at the London meeting. In view of the tight time schedule, it was arranged that the consultant would make time to meet representatives of UNIDO in Vienna during his visit to the Austrian Ministry of Environment.

Upon the invitation of the Director of IOT, the consultant arrived in Vienna on a Sunday in May 1990 to attend a meeting with the UNIDO team in her private residency. The UNIDO team consisted of the chief of the Environment Coordination Unit, the Senior Chemical Advisor and the Director of the IOT Division. After the discussions, which lasted four hours, the consultant acknowledged that UNIDO may have the potential and the capacity to undertake projects under the Montreal Protocol. However, he said: "The train has left the station, full of passengers; maybe at a later stage UNIDO could be considered to become an implementing agency, though it seems difficult."

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[1] *Dr. Archalus Tcheknavorian-Asenbauer*

Nonetheless, he agreed to make the recommendation in his report and UNIDO was invited to the Second Meeting of the Parties to the Montreal Protocol in London, presenting an opportunity for UNIDO to advance its desire to become an implementing agency of the Protocol. The representative of UNIDO at the meeting was the Chief of the Environment Coordination Unit. While no major breakthrough resulted, it was the first time UNIDO had appeared as an invited observer at a Montreal Protocol meeting. During the conference, the Interim Multilateral Fund (IMLF) was established with its Secretariat in Montreal, headed by a Chief Officer, the first appointee being Dr. Omar El-Arini (Egypt) in December 1990.

3.1.2 Developments within UNIDO 1990–1992

Two major developments occurred in UNIDO in the period 1990–1992 that contributed indirectly to the entry of the organization into the Montreal Protocol programme. These were as follows:

- **Decision by UNDP to halt support for UNIDO's technical assistance delivery.** In 1990, UNDP announced that it was going to end financial support for a number of programmes of various United Nations agencies, including UNIDO's technical assistance delivery programme. The phase-out of support commenced in 1992, and was to have a major impact on long-term UNIDO overhead earnings, and hence its ability to deliver assistance. UNDP funding for the UNIDO technical assistance programme until 1990 was in the order of US$70 million a year, representing 44 per cent of total UNIDO technical assistance delivery. The new UNDP policy implied a 50 per cent reduction in UNIDO's project budget, overhead income and staff. The management urgently needed to identify a similar funding source in order to maintain the organization's capacity and mandate. The only promising alternative at that time was the Multilateral Fund of the Montreal Protocol.

- **Potential loss of several UNIDO Member States.** Several Member States, including Canada, expressed their intention of separating themselves from UNIDO, commencing in 1990. This would have the effect of reducing the regular budget of the organization.

The Director-General at the time, Mr. Siazon, therefore had to achieve two major tasks to stabilize UNIDO: the identification of appropriate sources of finance to replace the UNDP funding and negotiation with Canada to attempt to halt the potential loss of the Party.

During the period 1990–1992 these two tasks, though totally different in nature, became inseparable from each other. During the many missions by UNIDO's senior management to Montreal, Canada they visited the IMLF headquarters to present the organization's case for becoming an implementing agency of the Montreal Protocol. The official reports of the Executive Committee of the IMLF during that period contain records of statements of different UNIDO senior staff who visited the IMLF

headquarters, and include presentations of project concepts by UNIDO to the IMLF, with a view to eventual cooperation.

3.1.3 Visit of Mr. Siazon to Canada and IMLF headquarters

In March 1992 Mr. Siazon, Director-General of UNIDO, made an official visit to Montreal, Canada, to follow up on a potential project idea to open a UNIDO investment office in Montreal in order to assist closer cooperation between Canada's institutions and industries and UNIDO. The Canadian authorities saw the advantages of the proposal and offered UNIDO office accommodation within the premises of the IMLF headquarters. While Mr. Siazon was in Canada a visit to the IMLF headquarters was organized to assess the suitability of the allocated office space. During this visit the opportunity arose for a personal discussion between Mr. Siazon and the Chief Officer of the IMLF Secretariat.

The proposed accommodation for a UNIDO investment office at IMLF headquarters did not materialize. However, during that meeting the potential for UNIDO to become an implementing agency, and its strong desire to do so, was again discussed. The Chief Officer advised Mr. Siazon to appoint a senior focal point at UNIDO with extensive knowledge of the Montreal Protocol and of technological matters who could be invited officially, in this capacity, to the meetings of the Executive Committee of the IMLF, on whom the eventual decision regarding UNIDO's application would rest.

3.1.4 First direct contacts between UNIDO and the IMLF

Mr. Siazon, on his return from Montreal, appointed the Director of the IOT Division as the senior focal point of UNIDO for the IMLF, with full authority and support to act for the development of a proposed Montreal Protocol programme within UNIDO, and to represent the organization in the negotiations for its acceptance as an implementing agency of the Protocol.

Between April and September 1992 the UNIDO focal point corresponded with the IMLF Chief Officer regarding the Directors participation in the eighth Executive Committee meeting planned for October 1992 in Montreal, with the possibility of an agreement being signed by which UNIDO would become an implementing agency for small-scale projects. Accordingly the Chief Officer sent a draft agreement to UNIDO headquarters ahead of the meeting.

In line with the instructions of the Director-General of UNIDO regarding the clearance of the draft agreement within the organization, the focal point took all necessary steps to clear the agreement with the administration, finance, and contract sections and the development and evaluation divisions, initiating the necessary changes and adjustments required in those areas if UNIDO were to be approved as an implementing agency of the Montreal Protocol. In October 1992 the UNIDO delegation, headed by the Director of the IOT Division, the Chief of the Environment Coordination Unit and the Chief

of the environment programme of the IOT, participated in the eighth meeting of the Executive Committee of the IMLF in Montreal.

3.1.5 Eighth meeting of the IMLF Executive Committee in Montreal

The eighth meeting of the Executive Committee of the IMLF took place from 19 to 22 October 1992, with the UNIDO delegation aiming to conclude negotiations with the IMLF Secretariat on the draft agreement and, if sufficient progress were made, to sign the agreement during the meeting. Achievement of this ultimate goal did not look promising, given the negotiations that needed to take place with many different groups during a short time period.

The Director of the IOT Division negotiated with the Secretariat of the IMLF regarding the conditions of the agreement, clearing any differences in consultation with the Director-General and UNIDO's Legal Department in Vienna (with a major time difference, see below the box of legal adviser). The Director gave a presentation at the meeting highlighting UNIDO's potential and capacity to become an implementing agency of the Montreal Protocol. The presentation was well received, but some members of the Executive Committee expressed their reservations; for one thing, there were already three implementing agencies, appointed at the London meeting in 1990. The UNIDO team provided additional information to the Executive Committee members through individual contact, or in response to their queries and comments during the meeting. Before the end of the meeting all reservations had been cleared and the draft agreement finalized, and the UNIDO team were able to advance to the stage where the agreement could be finally approved and signed.

3.1. Box of Mr. Peter Neumann, Former Legal Adviser of UNIDO – His Recollection

Negotiation of the Agreement Between the Executive Committee of the Interim Multilateral Fund for the Implementation of the Montreal Protocol and the United Nations Industrial Development Organization

1. On the occasion of the Eighth Meeting of the Executive Committee of the Interim Multilateral Fund for the Implementation of the Montreal Protocol, held in Montreal from 19-22 October 1992, the Agreement was signed by the Chairman of the Executive Committee, Mr. Juan Antonio Mateos C., on behalf of the Multilateral Fund, and by Ms. A. Tcheknavorian-Asenbauer, at that time a Director in UNIDO's Department of Industrial Operations, on behalf of UNIDO. The Agreement was signed on 22 October 1992 and entered into effect immediately upon signature.

2. The Agreement assigned UNIDO as an Implementing Agency of the Multilateral Fund in addition to the three other implementing agencies, the UNDP, the World

Bank and UNEP. The Agreement also sets out the key modalities for UNIDO's formulation and implementation of projects for protection of the ozone layer, including the respective roles and legal obligations of the Parties.

3. The negotiations with the Secretariat of the Multilateral Fund, which lead to the Agreement, were conducted for UNIDO by Ms. Tcheknavorian-Asenbauer and in the decisive, final phase took place in Montreal, Canada. The fact that I had had the opportunity to review a preliminary draft of the Agreement, as the Legal Adviser of UNIDO, turned out to be useful when, unexpectedly, Ms. Tcheknavorian-Asenbauer in a telephone call from Montreal asked that I immediately discuss and clarify some legal points in the draft directly with the legal representative of the Secretariat of Multilateral Fund, who then was put on the line. I was pleased that in the course of this unscheduled inter-continental exchange by telephone we were able to agree on the final formulations. The need to explain UNIDO's procedures may have been caused by the fact that another executing agency, i.e. the World Bank, follows the procedures of a lending agency, and primarily relies on financial reporting on the disbursement of the funds it provides to a recipient government for implementation of an approved project.

4. The main issue in Montreal concerned several clauses in the draft, which reflected the need to apply UNIDO's Financial Regulations and Rules and elaborated on the relevant modalities. However, after the requested clarifications had been provided, UNIDO's draft proposals were accepted. As the purpose of the clauses is to ensure efficient, orderly and transparent implementation by UNIDO, they remain important as shown by the following comments.

5. In 1992, UNIDO had acquired considerable experience in the preparation and implementation of technical assistance projects, initially as an executing agency of the UNDP under its procedures. Gradually increased use was being made of donations by Member States to UNIDO's Industrial Development Fund or as bilateral trust fund contributions, but there was no certainty that all the existing procedures would be suitable for the new programme to be financed by the Multilateral Fund. The solution chosen lay in the establishment of a special account. Financial Regulations 6.3 and 6.4 authorize the Director-General to establish a special account on the same conditions as for trust funds, in particular that the Financial Regulations (and Rules) be applied and that "the purposes and limits of each special account shall be clearly defined." Accordingly, the Agreement not only required UNIDO to establish a special account for the funds to be provided by the Multilateral Fund and spent by UNIDO to meet expenditures arising from its role as executing agency, but the Agreement also regulates some important aspects, such as

   a) The special account and the project management shall be administered by UNIDO in accordance with its internal procedures.

b) UNIDO shall implement projects only on receipt of a sufficient contribution, in accordance with the agreed work programme and, as appropriate, the legal arrangements to be concluded between UNIDO and the recipient governments.

c) UNIDO may affect necessary changes between budget lines, provided the total budget of the project concerned is not exceeded.

d) Income of the special account not spent in a budget year may be carried forward to the next year.

e) The special account shall be audited only under UNIDO's internal and external auditing procedures.

f) Ownership of equipment, supplies and other property financed from the special account shall vest in UNIDO for the duration of the specific project or program activity and, following operational completion of each project, be transferred to the appropriate agency or institution in the recipient country.

g) Disputes between the Parties shall be settled by binding arbitration pursuant to the arbitration rules of UNCITRAL.

6. In sum, the provisions of the Agreement permits, indeed requires, UNIDO to maintain full control over the funds entrusted to it, including over the manner of expending the funds, chiefly through the procurement of goods, services or works and the retention of technical experts. Funds are controlled directly by UNIDO from the moment of transfer into UNIDO's bank account and until disbursement. UNIDO executes all phases of the formulation and implementation, from formulation of projects by technical specialists to procurement and delivery by support services, and it also holds and administers the required funds during the same phases. In this manner UNIDO integrates its financial administration and control with its management and execution of the procurement actions required for each project. The benefits of this approach lie in enhanced efficiency as well as in full transparency that effectively prevents any improper use of funds.

7. The commendable record of UNIDO's contribution for 15 years as an executing agency for the protection of the ozone layer confirms that an important key has been its comprehensive integration and control of all managerial, technical, financial and procurement aspects.

3.1.6 Final approval of the draft agreement

The Chief Officer of the IMLF, Dr. El-Arini, requested permission, at the end of the meeting, to introduce the cleared draft agreement between UNIDO, the IMLF Secretariat and the Executive Committee. Box 3.2 quotes the text of the meeting report that records this historic moment. Minor amendments were made to bring the agreement into line with those of the other implementing agencies; some last queries were dealt with; and the advent of UNIDO as the fourth implementing agency of the Montreal Protocol was finally approved.

Box 3.2 UNIDO approved as implementing agency: Extract from Executive Committee report

Draft agreement between UNIDO and the Executive Committee of the Interim Multilateral Fund for the implementation of the Montreal Protocol

58. The Chief Officer introduced the draft Agreement between UNIDO and the Executive Committee (UNEP/OzL.Pro/ExCom/8/12). In order to make that Agreement consistent with the agreements signed with the other implementing agencies, he read out two proposed amendments to the Agreement.

59. The representative of UNIDO said that an initial UNIDO work programme had been transmitted to the Secretariat and that the final version would be submitted to the next meeting of the Executive Committee. She hoped that the amount allocated would be increased so that UNIDO could do meaningful work to assist the Fund.

60. Several representatives welcomed the fact that UNIDO would be joining in the work of the Fund and expressed the hope that it would develop specialized programmes in its own field of expertise and avoid duplication of the work being done by the other agencies.

61. The representative of UNIDO replied that UNIDO would develop programmes specific to its own capacities so as to fit in best with the work of the other agencies.

62. Two representatives considered that there were policy issues involved in the agreement and the member States of UNIDO should be given an opportunity to discuss it. Other representatives did not consider that any policy issues were involved and proposed that the agreement should be signed without further delay.

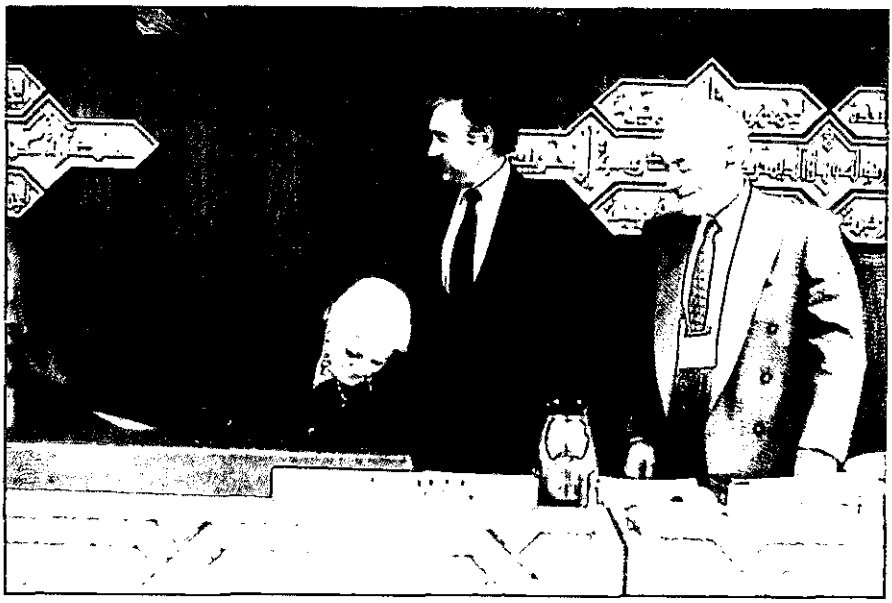
63. The representative of UNIDO, in response, stated that the Board of UNIDO had approved an environment programme in 1990 and the agreement with the Fund came within that programme.

64. The Executive Committee approved the agreement with UNIDO and authorized the Chairman to sign it on behalf of the Committee. It invited UNIDO to commence discussions with UNDP, UNEP and the World Bank with a view to coordination. It further invited UNIDO to present its work programme to the Ninth Meeting of the Executive Committee.

3.1.7 Signing ceremony for the agreement

After the Chief Officer's presentation of the finalized agreement between the IMLF and UNIDO, the Chair of the eighth meeting of the Executive Committee, Mr. Juan Antonio Mateos (Mexico), was authorized to sign on behalf of the Executive Committee. The signing ceremony took place as the meeting concluded at 7 p.m. on 22 October. Mr. Mateos and the UNIDO representative, the Director of the IOT Division, signed the agreement in the presence of the Chief Officer and the members of the Executive Committee (figure 3.1). The official signed agreement is shown in figure 3.2. For the UNIDO delegation it was the fulfilment of a dream, and the feeling of joy was shared immediately with the Director-General of UNIDO in Vienna, despite the lateness of the hour there. Neither the members of the UNIDO delegation nor the management could have imagined the importance of this act for the future of UNIDO.

Figure 3.1 Signing ceremony for agreement between UNIDO and IMLF



Dr. Tcheknavorian-Asenbauer, Mr. Mateos (Chairman), Dr. El Arini

Figure 3.2 Copy of signed agreement between UNIDO and IMLF Executive Committee

H. Effective Date of Agreement

38. This Agreement shall enter into force upon signature.

IN WITNESS WHEREOF, the undersigned, being duly authorized thereto, have signed the present Agreement in two copies in English.

For the Executive Committee:

Signature: _____ 22 October 1992

Juan Antonio Matos C., Chairman

For the United Nations Industrial Development Organization (UNIDO):

Signature: _____ 22 October 1992

A. Tcheknavorian-Asenbauer, Director, IOT/DIO

The agreement invited UNIDO to commence discussions with the IMLF to develop their cooperation programme for consideration at the ninth meeting of the Executive Committee. According to the agreement UNIDO would concentrate on the development and implementation of small-scale projects under the IMLF. The joy felt at the signing ceremony was therefore tempered by disappointment that UNIDO was unable to engage in large-scale projects, as was the case for UNDP and the World Bank. UNIDO had to find an acceptable niche in harmony with the other implementing agencies, as underlined by the members of the Executive Committee during their final statements at the eighth meeting.

The fulfilment of UNIDO's hope to be involved in a larger share of the IMLF was not fulfilled when it became the fourth implementing agency of the Montreal Protocol. It was a difficult task to change the views of the Executive Committee and the agencies on this matter. UNIDO had a weaker position than the other organizations that had preceded it as implementing agencies. UNDP and the World Bank were involved from the beginning of the development of the programme, and until the entry of UNIDO had received 100 per cent of the allocation of IMLF funding. In addition, their staff and programme managers were trained and experienced in dealing with this significant quantity of funding. In November 1992 the "interim" prefix to the Fund was dropped as the Copenhagen Amendment to the Montreal Protocol formally created the Multilateral Fund (MLF).

UNIDO decided to take this situation as a challenge, and embarked on intensive development of the programme by creating the knowledge base and the mass to advance UNIDO's vision of being allocated a larger share of the MLF. Hard work and professionalism brought about the positive result that transpired in the years to come. Recognition by the Executive Committee members and the implementing agencies of UNIDO's special and professional contribution to MLF programme delivery during 1993/1994 provided the base for changing the views of the Executive Committee and the agencies, resulting in an increase in UNIDO's share from 4 per cent as the fourth-ranked implementing agency in 1992 to 25 per cent as the third-ranked in 1995, and advanced to the second-ranking position in 2005. This progress had not been achieved easily, given that simultaneously major changes had had to be carried out in organization policy, modality of work, delivery, knowledge of the Montreal Protocol and project development, approval and delivery, all of which were totally different from the UNDP-financed programme of technical assistance delivery. The period 1992 to 1997, during which a fundamental and progressive evolution within UNIDO underlay the success of the Montreal Protocol programme, was very challenging for UNIDO and its management. This story is related in the second part of this chapter.

3.2 Evolution and development of Montreal Protocol programme

3.2.1 General changes and development at UNIDO

In 1993, Mr. Mauricio de Maria y Campos of Mexico was appointed Deputy Director-General of the Technical Department of UNIDO. During his tenure he closely followed the work of the Director of the IOT Division, noting the growing importance of the Montreal Protocol and the challenge ahead for the department and for UNIDO. The development plan prepared by the Director of the IOT Division for the implementation of MLF policies outlined the required organizational and technical capacity changes needed to respond to the challenge ahead for UNIDO; the Deputy Director-General gave strong support to the plan and, after his election as the second Director-General of UNIDO in late 1993, committed himself fully to the development of the Montreal Protocol programme within UNIDO, including the training of specialist staff. He allocated 3 per cent of the income from the MLF to implementation of the development plan during the period 1993–1997; the mechanisms and procedures developed, and the training of staff and supporting staff carried out during that time, provided the organization with a sound basis for continuity of growth of the Montreal Protocol programme.

In addition, in 1994, in his first restructuring exercise following his appointment as Director-General, he combined all environment-related activities and the IOT Division to form the new Industrial Sectors and Environment Division (ISED). For the first time, therefore, the environmental and technical components of UNIDO were merged, focusing the organization on sustainable development and raising the visibility of the environment in such areas as the Montreal Protocol, energy, clean technology, chemical safety and industry. The top management of the new division was upgraded

from director to managing director level, giving added political clout in negotiations related to the diverse environment-related programmes, treaties and conventions developed during the period 1992–1999, for example in the areas of chemicals, water and energy.

The Montreal Protocol programme was initially developed using a relatively slim management operation within the ISED, whereas the UNDP programme had involved almost the entire organization and a large Policy and Development Department created specifically for the development of the programme. Development and delivery of the Montreal Protocol programme demonstrated a new management style, integrating all activities, including, negotiation, approval and fund allocation, within one division. This new structure contributed to a more cost-effective and integrated approach to programme delivery, which was reflected in UNIDO's reports and presentations and formed the basis of the new UNIDO policy for technical assistance delivery.

3.2.2 Restructuring and capacity-building for the Montreal Protocol

Parallel to the developments within UNIDO to consolidate the Montreal Protocol during the period 1992–1999, an additional structure, policy and delivery had to be implemented simultaneously for UNDP technical assistance delivery, which was still relevant during the phase-out period (see section 3.1.2). Two distinct programmes were therefore managed and implemented in parallel by UNIDO and its ISED. A major task to secure Montreal Protocol delivery was to develop a new roster of experts, consultant and companies unknown to UNIDO prior to 1993, in addition to keeping and managing the roster of experts and companies responsible for implementing UNDP projects. The administration, in cooperation with the ISED, developed the required Montreal Protocol roster in a remarkably short time, while the Finance Division introduced the new financial rule required for Protocol project development and implementation. It was a very difficult period, with much sophisticated readjustment necessary to ensure effective delivery of the UNIDO technical assistance programme.

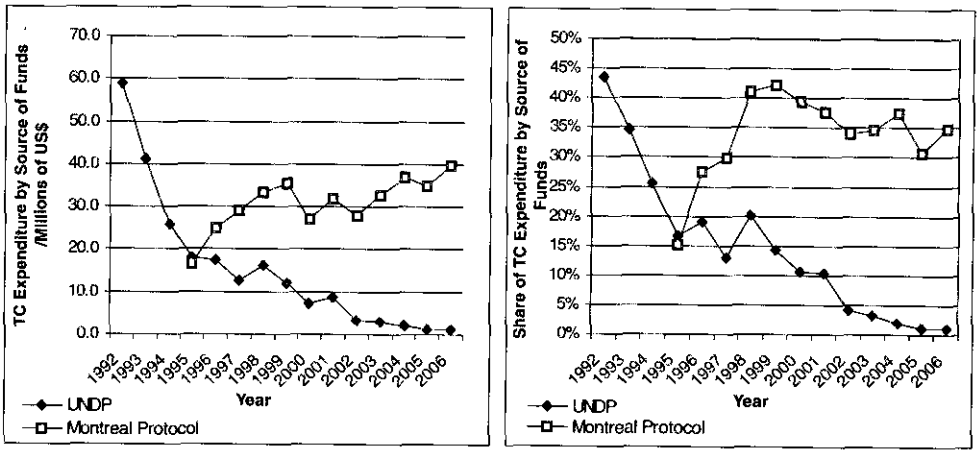
The most relevant policy to be implemented (in 1993) was development and training of the required technical staff, especially as regards the calculation of the incremental cost of Montreal Protocol projects, which was new to UNIDO and its technical staff and totally different from the system operating under the UNDP programme. Accordingly the Director of the IOT Division, in 1993, organized a training and information seminar, followed by a two-week visit to the United States by four senior technical staff for an intensive training programme. Upon their return these four assisted the Director in building a team for the development of the Montreal Protocol programme and its implementation.

From 1995 onwards increasing numbers of technical staff were trained and allocated to the Protocol programme as the UNDP programme was reduced in every calendar year, as shown in figure 3.3. However, in 1993/1994 the Montreal Protocol programme was not large enough to absorb all technical staff released by the phase-out of UNDP

projects. A difficult situation thus developed, as the ISED sought to justify in the budget the numbers of technical staff required to maintain the UNIDO technical mass for the growing Protocol programme. Parallel to this restructuring was needed in the division to ensure effective development, approval and implementation of the programme; to assist with this process the position of Senior Coordinator was created in February 1994 under the Managing Director of the Industrial Sectors and Environment Division to give full attention to the development and approval of the Montreal Protocol programme, according to the MLF agreement and by giving the Managing Director the opportunity to concentrate on policy matters.

The Senior Coordinator was appointed in May 1994, making a significant contribution to the development of the programme. His profound knowledge of the Montreal Protocol and his long experience in matters related to treaties were valuable assets as he capably took over the task of monitoring, coordinating and developing the Protocol programme, especially as regards the training of technical and administrative staff. The organization's administrative divisions and the ISED had completed their adjustment and training programme by the end of 1995. This major work of adjustment has provided UNIDO with the structure and capacity for ensuring the development and expansion of the Montreal Protocol programme and other major multilaterally financed programme delivery.

Figure 3.3 UNIDO technical expenditure by source of funds 1992–2006



3.2.3 First investment project for UNIDO

The Director of the Industrial Operations Technology Division represented the organization at the eleventh meeting of the Executive Committee in Bangkok in November 1993. During the review and approval of each agency programme the Director noted that the operational costs of the projects were calculated on a basis of three to four years, which from the Director's experience with industry was far too long for replacing an outgoing technology with a new system of operation and

management. The Director presented UNIDO's view that the calculation should be based on a reduced period; say three to six months, in accordance with industrial practice. The agencies presenting the projects could not agree to UNIDO's proposal and no compromise could be found between the two options. The Chair, in consultation with the Chief Officer of the MLF and the members of the Executive Committee, understood the positive financial impact to the MLF if the UNIDO proposal could be proven workable and acceptable to industries in developing countries, and therefore invited UNIDO, at the next meeting, to present a formulated investment project based on a six-month operational costing and accepted by an Article 5 country for the approval of the Executive Committee. The results of the project implementation could lead to some change or adjustment in the calculation of operational costs and the duration of future investment projects. UNIDO was therefore entrusted, on a trial basis, with the formulation and implementation of a first investment project. A new avenue had opened for the organization, and the success of the venture was vital for its future share in the allocation of funding for large-scale investment projects.

A trial investment project in the refrigeration sector was subsequently formulated, with operational costing based on a six-month period, with the support of a recipient Article 5 country. The project was presented by the Director of the ISED at the twelfth meeting of the Executive Committee in Montreal. After long debate and exchange of views between the agencies, Committee members, the Secretariat of the MLF and UNIDO representatives, the project received approval for implementation as the first large-scale project under UNIDO using the reduced-period operational cost calculation. The project was implemented successfully, encouraging the MLF to reduce the period of its operational cost calculation from three or four years to six months. (Please refer to Dr. El Arini's Box 2.2)

UNIDO was respected by the members of the Executive Committee for its industrial knowledge, experience in matters relating to developing country industries and practical approach. As a result the UNIDO share of MLF funding soon increased from the meagre 4 per cent of 1992, and it had become the third implementing agency (by funding allocation) by 1994.

3.2.4 Increase in UNIDO's share of MLF funding

UNIDO viewed it as important to increase its share of MLF funding in order to expand its portfolio for formulation and implementation of investment projects, especially in Africa and countries with economies in transition. One option in order to attain this goal was to negotiate with the World Bank and UNDP to decrease their share in favour of UNIDO – a seemingly impossible task, but the mutual respect and friendship between the organizations during this period, and the recognition of UNIDO's industrial experience, encouraged dialogue and fostered support for UNIDO's request to increase its share in the Montreal Protocol programme. During the thirteenth meeting of the Executive Committee, the Managing Director of the ISED invited the World Bank and UNDP to discuss the possibility of increasing UNIDO's apportionment. The

meeting was organized outside the MLF premises. The negotiation process was long and challenging, but resulted in a surprise offer by the World Bank and UNDP to reduce their shares of Investment Projects. This resulted in the following shares, 45 per cent for the World Bank and 30 per cent for UNDP in order to make room for UNIDO to increase its share to 25 per cent.

Helping to sway the decision in UNIDO's favour was an impressive portfolio, prepared by the Managing Director and the Senior Coordinator, of projects based on requests from many developing countries forming a total investment programme totalling over US$190 million. The outcome was an agreement between UNDP, UNIDO and the World Bank subject to the approval of the Executive Committee that would enable an increase in UNIDO's share of funding from 4 per cent to 25 per cent. The members of the Committee were rather taken aback when the World Bank announced these arrangements, but expressed their support for the allocation of investment projects between the three agencies according to the new agreement, which moved UNIDO from the fourth-ranked to the third-ranked implementing agency, bringing with it an allocation of US$40 million per year from 1995. As reflected in the organization's annual report for 1995, this contributed greatly to the stabilization of UNIDO's technical assistance delivery, balancing a similar reduction in funding as part of the UNDP phase-out (figure 3.3).

3.2.5 Programme for Africa and transitional economies

Once UNIDO had successfully increased its share of the Montreal Protocol funding, it took the initiative to introduce its first investment projects in Africa and countries with economies in transition. However, the quantities of CFCs being phased out were relatively low because the emphasis was on small-scale industries, which demanded from UNIDO much more intricate and time-consuming work than would have been the case for the larger-scale industries in, for example, Asia and Latin America. However, UNIDO was respected for its efforts to bring more African and transitional economy countries within the purview of the Montreal Protocol. In 2002, the United States Environmental Protection Agency presented an award to the former Managing Director of UNIDO's Industrial Sectors and Environment Division for her success in advancing the implementation of the Montreal Protocol in small consuming countries.

3.2.6 Methyl bromide programme and UNIDO

During the eighteenth meeting of the Executive Committee, UNIDO presented a study on the use of methyl bromide as a fumigant in agriculture, with adverse effects on the ozone layer. UNIDO had prepared the study to introduce itself as a potential implementing agency for the methyl bromide phase-out programme, in which it had not previously been involved. As a consequence the Executive Committee approved the offer by the Managing Director of ISED to make a technical presentation on the matter of agriculture at its nineteenth meeting, in order to create a better understanding of UNIDO's capacity in this programme. The Managing Director participated in the

meeting with two senior staff from the Agro-based Industries Branch and the Chemical Industries Branch of UNIDO. She outlined UNIDO's experience and house knowledge relevant to the phase-out of methyl bromide, while the technical staff gave a more detailed presentation. As a result of these impressive displays, UNIDO's share in the implementation of the methyl bromide programme was finalized during the twentieth meeting of the Executive Committee in October 1996. This achievement opened new avenues for UNIDO, allowing it to increase its overall share of funding, and enabling further activities for the Agro-based Industries Branch to compensate for the reduction of UNDP projects.

3.2.7 Meeting of the Parties in Vienna, December 1995

The Seventh Meeting of the Parties to the Montreal Protocol in Vienna, December 1995, gave UNIDO an additional opportunity to exhibit the work, structure and institutional capacity of the organization. The Managing Director of the ISED, appointed by the Director-General as the UNIDO focal point for the Vienna meeting, organized several briefing meetings between various delegations and the different divisions of UNIDO that were involved in developing and implementing the Montreal Protocol programme. This was the first contact that UNIDO had had with the ministries of environment of developing countries, and it brought about an understanding that bode well for future cooperation between those ministries and UNIDO.

The representatives of the ministries of the environment of developing countries were impressed by the organization's technical capacity, which compared favourably with that of other agencies within the United Nations system. UNIDO achieved through the Montreal Protocol meeting in Vienna an important step towards deepening the relationship with Member States of the Protocol and developing partnerships with ministries of environment, thereby encouraging requests for UNIDO's further participation in the implementation of the Montreal Protocol in developing countries.

3.2.8 Twentieth Executive Committee meeting, Montreal, October 1996

The UNIDO Presentation at the twentieth meeting of the Executive Committee of the MLF in Montreal, October 1996, contributed to the consideration of UNIDO as an implementing agency for methyl bromide phase-out projects supported by the Fund. UNIDO was recognized as having the internal capacity to carry out activities related to agro-based industries, and accordingly was considered to receive funding to organize one of the first demonstration projects on methyl bromide. The approval of methyl bromide activities for UNIDO was guided by Prof. Sam Ongeri (Kenya), Chair of the Executive Committee, who admired UNIDO's work for developing countries and welcomed its involvement in the methyl bromide area. He also had included in the report of the twentieth meeting of the Executive Committee an appreciation of the work of UNIDO as an implementing agency and a tribute to the Managing Director of ISED. In general the meeting was a success for UNIDO, particularly for the technical staff of the Agro-based Industries Branch, who now faced a considerable challenge.

3.2.9 Costa Rica Meeting of the Parties, 1996

Another milestone achievement for UNIDO occurred during the eighth Meeting of the Parties to the Montreal Protocol in Costa Rica, November 1996, which discussed the replenishment of the MLF. Over the retirement the Managing Director of the ISED was requested to head the UNIDO delegation and lead negotiations on the organization's involvement in the phase-out of ODS in large consuming countries. UNIDO's aim was to meet the representatives of governments of large consuming countries, including China, India, Mexico and Argentina, and discuss with them the formulation and implementation of large-scale investment projects in their countries. UNIDO adopted this policy in order to make its delivery of Montreal Protocol activities more cost effective; although UNIDO had received, in 1995, approval for 25 per cent of the Fund budget allocation, it had proved labour intensive to prepare and implement many projects for small consuming countries in order to fulfil its percentage allocation.

The Director-General of UNIDO, prior to the trip by the UNIDO delegation to Costa Rica, recognized the importance of the outcome of the meeting to the future of the organization's cost-effective delivery of assistance. Successful delivery in the major consuming countries, until then the prerogative of the other implementing agencies, would offer several positives for UNIDO: in addition to playing a major role in the accelerated phase-out of ODS, UNIDO would gain additional political weight in the Montreal Protocol programme, and would benefit from cooperation with European experts and consultancy firms. The bilateral discussions with China, India and Mexico were time consuming and sensitive (given the fact that other United Nations agencies were already involved in those countries), but were ultimately rewarding. After intensive work by the Managing Director and the Senior Coordinator, China accepted for the first time UNIDO's participation in the formulation and implementation of large-scale investment projects for the phase-out of CFCs by its large consuming and producing companies. UNIDO agreed, as requested by China, to allocate, from its budget, US$10-15 million on a yearly basis for the formulation and implementation of projects for the phase-out of CFCs in the Chinese industrial sector. This agreement was positive for UNIDO and supported the accelerated phase-out of CFCs by Chinese consuming and producing companies. UNIDO realized similar results with India and Mexico, following the bilateral discussions in Costa Rica.

Thus UNIDO joined hands with UNDP and the World Bank in harmony, to promote faster phase-out in large consuming and producing countries, contributing to the success of the Montreal Protocol in achieving its goals in a remarkably short time. In addition UNIDO was able to achieve its aim of more cost-effective delivery to a range of producing and consuming countries, while raising the technical and political profile of the organization and strengthening its role in implementing multilateral programmes. Finally, its technical staff were inspired by the new and rewarding challenge of developing phase-out programmes for large consuming and producing countries. As at the Executive Committee meeting in Montreal, Prof. Ongeri, chairing

the proceedings, praised the achievements of UNIDO and the Managing Director and recognized their contributions to the Montreal Protocol programme.

3.2.10 Overview of UNIDO's programme under the Montreal Protocol 1993–2007

On 12 March 1993, less than five months after signing the agreement with the Executive Committee (section 3.1.7), UNIDO presented its first work programme at the ninth meeting of the Executive Committee, in Montreal. The official report of the meeting outlines and explains the proposed programme (box 3.3).

Box 3.3 UNIDO work programme, 1993

1993 UNIDO work programme

85. The representative of UNIDO introduced the 1993 work programme (UNEP/OzL. Pro/ExCom/9/11). She explained that the guiding principles for the preparation of the work programme had been to make full use of the experience which UNIDO had already gained in the formulation and implementation of industrial projects and in small-scale industries in developing countries. She added that it was UNIDO's mandate to assist developing countries to achieve sustainable industrial development. UNIDO had established close links with industrial enterprises, institutions and associations in developing countries and they would be used to the full in addressing the problems and in implementing activities to phase out ODSs.

86. UNIDO only became the fourth implementing agency at the Eighth Meeting of the Executive Committee and had therefore had little time to prepare its work programme. Consequently, it would present an addendum to its programme to the tenth Meeting of the Committee.

87. Pursuant to the Agreement between the Executive Committee and UNIDO, the latter had co-operated with the other implementing agencies. It had already identified co-operation possibilities and modalities with the World Bank and hoped to reach similar co-operative arrangements with UNDP and UNEP in the near future.

88. Regarding specific projects, she said that a project in Brazil would be coordinated with the World Bank. Lastly, she stated that certain projects in China would be coordinated with UNDP and the World Bank.

89. The Executive Committee approved the 1993 UNIDO work programme for a total amount of US $491,500. This money would be spent largely on project development in several countries; it also approved the transfer of US $50,000 plus support costs from the sum of US $113,000 allocated to UNDP at the Eighth Meeting of the Executive Committee for the performance of work on a related project.

UNIDO received, for the first time, US$491,500 for project development and activities, with the full cooperation of the other implementing agencies (as stipulated in paragraph 87 in box 3.3). The work programme was prepared and presented by the Director of the IOT for the ninth meeting of the Executive Committee. With the budget approved for UNIDO at that meeting, and with the agreements achieved during the tenth to the twentieth meetings (paragraphs 3.2.3 to 3.2.8), UNIDO was increasingly recognized for its industrial, technological and operational capacities. As a consequence, after the approval of its first investment project, UNIDO's budgetary approval increased from US$491,500 to US$12 million in 1993/1994, and by 1995 had reached US$26 million. By the end of the 1994/1995 budget year, and following the successful negotiations with the World Bank and UNDP in July 1995, UNIDO's share of the MLF budget had increased from 4 per cent (1992) to 25 per cent. Furthermore, UNIDO's role in the implementation of Montreal Protocol activities in large consuming countries, as agreed during the Costa Rica Meeting of the Parties in November 1996, opened another major and viable avenue for UNIDO involvement in the work of the Protocol, assisting its rise to become second-ranked implementing agency, after the World Bank, by 2005. The budget approvals under the MLF since 1997 have represented 30 to 35 per cent of UNIDO's total approvals and delivery of technical assistance. Figure 3.4, taken from UNIDO's annual report, shows that by 1999 project approvals under the Montreal Protocol were progressively absorbing resources liberated by the phase-out of UNDP projects (see section 3.1.2), contributing positively to the stabilization of UNIDO's technical assistance programme and assisting the financing of other UNIDO programmes and its overall organizational development.

Figure 3.4 UNIDO expenditure by source of funds (from annual report 2006)

Share of TC Expenditure by Source of Funds								
	RB	UNDP	Trust Funds	MP	IDF	Others	GEF	EU
1992	0.018	0.435	0.256		0.216	0.075		
1993	0.081	0.347	0.250		0.230	0.092		
1994	0.031	0.255	0.314	Included in IDF	0.289	0.111		
1995	0.087	0.167	0.271	0.152	0.232	0.091		
1996	0.036	0.191	0.144	0.275	0.243	0.111		
1997	0.072	0.130	0.144	0.298	0.212	0.144		
1998	0.020	0.201	0.141	0.411	0.211	0.016		
1999	0.070	0.144	0.135	0.423	0.229	0.000		
2000	0.020	0.106	0.213	0.394	0.267	0.000		
2001	0.070	0.103	0.226	0.376	0.226	0.000		
2002	0.020	0.041	0.373	0.341	0.226	0.000		
2003	0.050	0.033	0.241	0.347	0.224	0.000	0.105	
2004	0.050	0.020	0.235	0.373	0.197	0.000	0.101	0.024
2005	0.046	0.010	0.281	0.308	0.177	0.000	0.125	0.051
2006	0.033	0.010	0.305	0.349	0.176	0.000	0.104	0.024

Key:
RB - UNIDO Regular Budget
UNDP - UNDP Funding
Trust Funds -
Self-financed Trust Funds
Third party financed Trust Funds
Other Trust Funds
MP - Montreal Protocol Funds
IDF - Industrial Development Fund
GEF - Global Environment Facility
EU - European Union

3.2.11 Annual reports reflect growing importance of Protocol for UNIDO

The vital and increasing importance of the Montreal Protocol in UNIDO's overall programme of technical assistance delivery is reflected in the annual reports of the organization from 1993 onwards (box 3.4). The programme reached 41 per cent of all UNIDO technical assistance delivery, and under the environment sector subprogramme, 63 per cent of total delivery. The Member States of UNIDO, during the various board meetings and conferences, expressed their appreciation and recognition of the efforts of UNIDO's managers and staff in achieving such success for the programme.

Box 3.4 Extracts from UNIDO annual reports 1993–2004

1993 Annual Report: page 57, paragraph 13

"In an environment of global change, [the Industrial Operations Technology Division] sought to identify new areas for technical cooperation and developed new programmes in response to changing demands. Activities focused particularly on aspects relevant to sustainable industrial development, with special emphasis on the implementation of the Montreal Protocol, (...) [which] is expected to generate an increasing volume of projects for UNIDO execution in the coming years as the Organization is increasingly perceived as a competent partner for the implementation of plant-level provisions of the Protocol. Total approvals for the years 1992 and1993 by the Executive Committee of the MLF for the Implementation of the Montreal Protocol amounted to US$6.9 million for UNIDO. The Office of the Director coordinated the implementation of the approved 1993 work programmes under the Montreal Protocol."

1996 Annual Report: pages 11–12, paragraphs 7–9

"Following modest increases in the previous two years, approvals of new projects increased by over US$26 million to US$100.8 million in 1996 – the first time the US$100 million mark has been reached since 1990. ... A great part of this growth is owed to the Montreal Protocol, which has become the primary funding source for new approvals for UNIDO.

(...) With the predominance of Montreal Protocol-funded approvals, 50 per cent of new approvals in 1996 in value terms concerned projects in thematic priority 2 (environment and energy). However, with the exclusion of the Montreal Protocol from the analysis, a more balanced distribution emerges. (...)

In conclusion, the year 1996 can be considered a turning point for UNIDO. In spite of dramatic budget cuts and staff reductions, implementation figures in most areas remained the same or were higher than in the previous year, pointing towards a clear rise in staff productivity. UNIDO also demonstrated flexibility in gaining access to new sources of financing for its technical cooperation activities, following the

dramatic decline in UNDP funding in recent years. Finally, for the first time since 1990, the value of project approvals surpassed the value of delivery, which can be seen as a clear signal for a sustainable upward trend in UNIDO technical cooperation programmes."

1998 Annual Report: page 66

"The share of technical cooperation delivery under the Montreal Protocol increased dramatically from 29.8 per cent in 1997 to 41.1 per cent in 1998. On the other hand, the regular budget share of total delivery decreased from 7.2 per cent in 1997 to 2 per cent in 1998. A decrease to 20.1 per cent from 25.0 per cent was also recorded in technical cooperation delivery funded by UNDP. The weight of IDF and trust funds remained virtually unchanged.

A further result of the large proportion of Montreal Protocol activities of total UNIDO delivery was a visible increase in the share of the subcontract component, from 31 per cent in 1997 to 35 per cent in 1998."

2004 Annual Report: page 23

"In 2004, 44 new Montreal Protocol projects were approved for UNIDO execution, amounting to US$37.7 million, including the core unit of US$1.5 million and support costs. 23 stand-alone projects were approved for Algeria, Bosnia and Herzegovina (2), Brazil, Cameroon, China (2), Côte d'Ivoire, Cuba, Egypt, Georgia (2), Indonesia, Iran (Islamic Republic of) (2), Mexico, Morocco, Oman, Romania (3), Serbia and Montenegro and The former Yugoslav Republic of Macedonia. New multi-year projects were approved for Nigeria for the complete ODS phase-out in the solvent sector, China for the refrigeration servicing sector CFC phase-out plan, and Sudan for the national CFC/CTC phase-out plan, as well as for Argentina, Mexico, Serbia and Montenegro and Venezuela (Bolivarian Republic of), for their national CFC phase-out plans. One project each for Cuba and Côte d'Ivoire were approved. A project was approved for Indonesia for the terminal phase-out of ODS in the solvent sector."

3.2.12 The Development of the Programme, and the Change of the MP Structure

Shortly after the election of Mr. Carlos Margarinos as Director General of UNIDO in December 1997, the Montreal Protocol coordination unit was upgraded to Branch level. This structural change was welcomed by the Executive Committee since it gave a significant focus on the Montreal Protocol programme within UNIDO. Ms. Seniz Yalcindag was appointed as the Director of the Branch in October 1999.

After her retirement in October 2003, Mr. S.M. Si Ahmed was appointed in May 2004 as the Director of the Multilateral Environmental Agreements Branch.

In 2004 the Executive Committee decided to abolish the agency shares which gave UNIDO an opportunity to expand its programme. Indeed UNIDO is presently the second implementing agency close behind the World Bank.

It also allowed UNIDO to take up another challenge on a totally new sector i.e. the replacement of CFCs in the production of metered dose inhalers a medicine used to treat respiratory diseases. To date UNIDO is implementing two large projects in Egypt and Iran while preparing activities in Algeria, China, Jordan, Mexico and Syria.

The recent historical agreement on transitional substances namely HCFCs, reached in September 2007 in Montreal will definitely be another opportunity to extend our assistance to developing countries. Indeed no less than 29 countries have already expressed their wish to cooperate with UNIDO in the phase out of HCFCs.

The Director General of UNIDO Dr. Kandeh Yumkella appointed in December 2005 has taken an important initiative by allocating funds from the regular budget to prepare surveys on HCFCs consumption in many developing countries as well as promoting new alternative technologies.

3.2.13 UNIDO's Board and the environment programme

In the initial stages of the development of the Montreal Protocol programme at UNIDO, after the departure of Mr. Siazon in 1993, it was viewed largely as an environmental activity somewhat out of line with UNIDO's mandate. This perception was shared by several members of UNIDO's Board. The Managing Director of the ISED, with the assistance of the Director of External Relations, briefed UNIDO Member States on the programme at the 1994 UNIDO Budget Committee meeting, with the aim that the Board members would support and approve the resolution confirming UNIDO's involvement in the Montreal Protocol, and the allocation of regular budget funding for the implementation of the programme. In her briefing address she said:

"The Montreal Protocol programme is an environmental programme with a clear environment mandate. However, to achieve the Montreal Protocol goals, the implementation of the programme gives a clear target for industry to change its pattern of industrialization by introducing alternative environment-friendly technologies. It invites the industry of developing countries to phase out all CFC technologies and replace them with safe technologies. The MLF was established to finance those adjustments and guarantee the sustainable growth of industry in developing countries. Therefore, almost all environmental programmes call for a change of the concept of industrial development to one that is in harmony with the environment, in line with the provisions of environmental conventions and international treaties, and in line with UNIDO's mandate of sustainable industrial development."

Mr. Ferdinand Mayrhofer-Gruenbuehl, Austrian ambassador to the United Nations and permanent representative of Austria to UNIDO, was Chair of the panel reviewing

the resolution on the Montreal Protocol during the hearing of the Budget Committee, and played a significant supportive role in its approval, which provided UNIDO with political support and funds for implementation of the Protocol.

Chapter 4

Technical and technological evolution and implementation

One of the greatest assets UNIDO has been able to bring to its work as an implementing agency has been its technological background and knowledge. As a result the organization has been at the forefront of innovation in combating ozone-depleting substances (ODS). This chapter considers how UNIDO has used this asset to adjust and adapt to new challenges in the fight to save the ozone layer.

4.1 Introduction

Because of UNIDO's internal technical capacity it has been possible for it to carry out more independent project identification and formulation than the other implementing agencies of the MLF. This technical experience, as well as its comprehensive knowledge of industry in developing countries and countries with economies in transition, enables it to grasp the real state of the situation, assisting project development and implementation. To further advance its capacity in this area UNIDO, at its own expense, gave additional training in 1993/1994 to staff members in technologies of relevance to the Montreal Protocol.[3] This knowledge and capacity has been invaluable in carrying out work under the Montreal Protocol and has allowed UNIDO to directly implement bilateral assistance projects without requiring the Secretariat's approval.

Since becoming an implementing agency, UNIDO has determinedly promoted non-transitional technology – that is, technology that does not rely on transitional substances such as HCFCs, which are less damaging than CFCs but still harm the ozone layer. This resolve was based on its eagerness to implement cost-effective projects in smaller countries in Africa and Eastern Europe, and its above-mentioned technical experience and knowledge of industry. Using its in-house capabilities, UNIDO has been able to screen and give a sound evaluation of proposed technologies from a wide range of companies. The final technologies UNIDO promoted significantly reduced the incremental operating costs of projects, thereby influencing the decision-making of the Executive Committee and the technologies the other three implementing agencies adopted for their projects.

From 1993 UNIDO started moving away from transitional substances in the preparation of its projects, which brought to the MLF Secretariat a new understanding of available technological options. UNIDO was thus the first agency to introduce hydrocarbon technologies in the refrigeration sector, particularly in the area of foam blowing for insulation purposes.

UNIDO has actively promoted the use of natural substances, particularly hydrocarbon technologies in the refrigeration and foam sectors. In the manufacture of refrigeration

[3] This included sending five senior staff members to an institute located near Detroit, which was world famous for polyurethane technology. Experts from this institute had previously been active on UNIDO-implemented projects.

appliances, UNIDO has promoted the use of cyclopentane as an insulation foam-blowing agent and the use of isobutane and R-134a as refrigerants.[4] These are typical non-transitional options.

UNIDO has pioneered that part of the Montreal Protocol programme that is directed at phasing out the use of methyl bromide as a soil and storage fumigant. The conclusions drawn from its demonstration projects carried out in 22 countries have been used as guidelines for the implementation of investment projects in the sector. The organization has predominantly applied steam pasteurization, soilless cultivation and grafting as feasible and efficient alternatives to methyl bromide. Examples of applications of these alternatives and technologies are elaborated later in this chapter and in chapter 5.

To ensure a smooth and efficient transition from old to new technologies the UNIDO team, together with various partners in industry, has addressed training of operators and maintenance in addition to technical issues, thus ensuring optimal performance of new equipment. This was a formidable challenge that required innovative approaches and dedication in assisting enterprises in developing countries. While large enterprises could rapidly benefit from these new alternative technologies, it soon became apparent that small and medium enterprises required a different approach.

In that respect UNIDO participated in UNEP missions to low ODS-consuming countries in order to help design new strategies for small and medium enterprises, while preparing jointly with the United States Environmental Protection Agency a manual on strategies applicable to low ODS-consuming countries.

The success of these initiatives encouraged the Executive Committee of the MLF to agree on a new approach, particularly in the application of different cost-effectiveness thresholds. This has in no doubt enabled UNIDO to assist a great number of small and medium enterprises in different countries, particularly in Africa, presenting a unique opportunity for low ODS-consuming countries to benefit from the MLF and to claim their responsibility in protecting the ozone layer in compliance with their obligations under the Protocol.

The pioneering work of UNIDO in the development of non-ODS technologies meant that first-hand expertise could be used for the development of projects. New alternative technologies are mostly unknown to recipient enterprises, so the technical advisory services of UNIDO experts are a major factor in the success of the design and implementation of a project.

UNIDO's role in combating ozone depletion has taken on a new dimension, in terms of helping developing countries to benefit from globalization through increased trade.

[4] R-134a is a HFC but has zero ODP and a low GWP. In foam production, UNIDO has applied n-pentane and liquid carbon dioxide (LCD) technology. In the case of hydrocarbon technology, for example cyclopentane, isobutane and n-pentane technology, safety aspects have to be considered to mitigate the flammable characteristics of hydrocarbons. UNIDO weighs safety concerns heavily and has implemented strict safety measures in its projects.

The ability of industries to comply with environmental export requirements has opened up new markets for their industrial goods, thus encouraging the growth of selected manufacturing sectors.

In addition to its technological contribution, UNIDO has also introduced new approaches to operational issues. Soon after the entry of UNIDO into the Montreal Protocol as the fourth implementing agency in 1992, UNIDO introduced a new scheme aimed at reducing the operational costs of industry investment projects by shortening the period for CFC phase-out from the previous norm of three to four years, which was used for project formulation and approval by the agencies, to a maximum period of six months, which was in accordance with practice in industry. One of the reasons why this was possible was that with its in-house technical expertise UNIDO did not have to spend much time selecting experts and contractors before starting to implement most projects. This contribution of UNIDO had a tremendous impact on the accelerated phase-out of CFCs from industry and enabled considerable savings for the MLF and Member States who were financing the phase-out of CFCs from industries in developing countries, which in turn made possible an increase in the number of Article 5 countries receiving assistance for project preparation and implementation.

The following section describes some of the areas where UNIDO has been a leader in developing innovative technologies that have contributed significantly to the phase-out of ODS.

4.2 Technological innovation by UNIDO

4.2.1 Hydrocarbons

UNIDO was the first implementing agency to bring forward projects with the new hydrocarbon technology in the domestic refrigeration sector, and was catalytic in determining the transition period for operating costs in this important sector. UNIDO started to actively advocate hydrocarbon technologies and already in 1994 projects in Cameroon, Egypt, the Islamic Republic of Iran, Jordan and the Syrian Arab Republic were rapidly redesigned for cyclopentane foaming technology.

In 1995 UNIDO formulated two hydrocarbon technology-based projects (cyclopentane and isobutane) for manufacturing domestic refrigeration appliances. In Iran (Pars Appliance Manufacturing Company) the conversion of domestic refrigerator production facilities to technologies not using CFC-11 and CFC-12 led to a phase-out of 193 tonnes of ODP (see section 5.3). The international market potential of the products manufactured increased and productivity rose by 20 per cent.

UNIDO has cooperated closely with government and industry in order to find refrigerant alternatives providing a beneficial solution for compressor suppliers and refrigerator end-user manufacturers. Work undertaken with the Huari Group (producing refrigerators) in China led to the development of long-term hydrocarbon alternatives (see section

5.1.2). During the transition phase premises were upgraded and the manufacturing process was rationalized. The Huari Group erected a new building designed to fit the requirements of the new technology. The outcome was the elimination of 338 tonnes of CFCs, and increases in annual production and worker productivity of 5 per cent and 30 per cent respectively. UNIDO was able to transfer the latest technologies to developing countries within two years of their introduction in Western Europe, a feat unprecedented in any other field of industrial technology.

UNIDO's team assisted enterprises in gaining the necessary knowledge on available and most up-to-date alternative technologies, helping in the selection of those that were most suitable, taking into consideration the specific conditions of the enterprise and its market. UNIDO provided assistance in the selection and procurement of new machinery and equipment and in the redesign, reconstruction, prototype manufacturing and testing of new refrigerators and freezers. It also participated with suppliers in installation commissioning, trial operation, start-up and on-the-job operational training.

New training in maintenance and safety techniques and procedures were established due to the very nature of the new substances, which are explosive and inflammable. Safety inspection and certification of the manufacturing technologies and products were required from the suppliers of equipment. This meant that the whole production cycle had to be based on a safe system. In that respect UNIDO investigated institutions that could design high-quality safety inspection and certification services, thus enabling foaming and refrigeration equipment suppliers to sign cooperation agreements with recipient enterprises and UNIDO. Thanks to their long-standing experience and worldwide reputation, the German technical safety association Technische Überwachungs Verein (TÜV) was selected. It is worth noting that thanks to strict adherence to safety measures specified by this famous institution, there have so far been no safety problems at any of the recipient enterprises.

4.2.2 Liquid carbon dioxide (LCD)

UNIDO took the lead in promoting liquid carbon dioxide (LCD) blowing technology as the most advanced alternative solution for flexible polyurethane foam. Patent owners cooperated with UNIDO experts to promote its acceptance as an eligible alternative, elaborating a guidance document that included a section on licensing the technology as part of an investment project. The organization's expertise and experience over many years in providing technical assistance to developing countries in the polymer processing and plastic transformation industries, coupled with LCD's zero GWP, convinced the MLF Executive Committee to adopt the technology as an eligible alternative for flexible polyurethane foams.

UNIDO's involvement in the flexible foam sector spreads over 18 projects in six countries using LCD blowing technology for the production of foam slabs. Projects were implemented in the following companies: Urosan and Isbir (Turkey), USC and Mashad foams (Islamic Republic of Iran), National Polyurethane Company (Syrian

Arab Republic), Sonopol (Cameroon), Mousse du Sud (Algeria) and Sud Intermousse (Tunisia).

UNIDO assisted each firm to license LCD technology and to assess production costs. New markets for products were analysed in order to optimize production programmes and training of operational and managerial personnel was supported. This resulted in 174 tonnes of ODS being eliminated and a production capacity increase from 15 to 20 per cent, and opened up the opportunity for new domestic markets for soft, low-density foams.

UNIDO's share of LCD projects in the foam sector of the MLF represents 32 per cent in terms of ODP, 28 per cent in terms of number of LCD projects and 31 per cent in terms of funding.

4.2.3 Specific approach for introducing alternatives to methyl bromide

In answer to a request from the Executive Committee, UNIDO presented, at its eighteenth meeting, a report on the work then in progress on alternatives to methyl bromide, a strong disinfectant substance used in soil and storage fumigation.

Shortly after this presentation UNIDO became the driving force in designing procedures for demonstration projects involving farmers, research institutes and government authorities. The first step in the transfer of know-how was the introduction to the farmers themselves through practical demonstrations of the applicability of various alternatives. The organization played a major role in convincing farmers in developing countries to adopt alternative technologies in replacing methyl bromide. Demonstration projects helped to select the most suitable alternative while taking into account climatic conditions, crops and the mode of operation. The process of project implementation helped to transfer technology and knowledge to farmers with the goal of eliminating their dependence on methyl bromide. Phase-out projects involved purchase of equipment, contracting of consultants, organization of farmer training sessions and monitoring of projects.

A successful example of a phase-out project occurred in Morocco. The project helped producers of strawberries move away from use of methyl bromide, which had been deemed crucial to maintaining exports to the European Union. After a careful review of the alternatives tested in the UNIDO demonstration project, soil steam pasteurization, solarization in combination with 1,3-dichloropropene or metam sodium (sodium methyldithiocarbamate) and biofumigation[5] were the technologies selected. UNIDO assisted in supplying steam generator, injection and safety equipment. The farmers received training in the use of boilers, injection equipment and the safe use of chemicals.

[5] Biofumigation is the suppression of soil-borne pests and pathogens by combining the direct effect of toxic substances released in soil during the decomposition of organic matter (chicken and cow manure and other organic waste) and increase in soil temperature.

Based on the data and the results of the demonstration projects collected in the field, UNIDO significantly contributed to the establishment by the Executive Committee of guidelines in the methyl bromide sector. Today a great majority of Article 5 countries have committed themselves to a total phase-out of methyl bromide, years ahead of the official phase-out date (2015).

The phase-out of methyl bromide for tobacco seedlings in Brazil through the use of soilless floating tray cultivation led to the elimination of 20 per cent (84.4 tonnes) of ODP ahead of schedule. Training in the new technology was given to 140,000 farmers, who acquired modern techniques and were thus able to meet the higher standards of quality required by the tobacco multinationals, thus integrating them into agro-industrial processing. A significant reduction in the area dedicated to tobacco seedlings meant that land was released for other activities, with a consequent increase in incomes. For protection of seeds during storage methyl bromide was replaced by phosphine, supplied in the form of tablets that slowly release the gas over a period of 6 to 24 hours.

UNIDO helps growers and companies to cut down their dependence on pesticide imports, helping them adopt and adjust to new technologies, making them more competitive in the international market place.

4.3 UNIDO's implementation of Montreal Protocol Projects

Over the years, continuous negotiations with prominent Members of the Executive Committee have led to the expansion of UNIDO's business plans. This may be partly owed to UNIDO's distinctive approach when formulating project proposals, taking both technical and political considerations into account, sometimes going against the norm for the advancement of the Montreal Protocol and the beneficiary country. UNIDO has, for example, submitted projects for Cuba, the Democratic People's Republic of Korea, the Islamic Republic of Iran, and the Libyan Arab Jamahiriya, all countries that have in the past been the subject of United Nations or United States embargoes.

UNIDO has implemented more than 930 projects in 80 countries[6] over the last 15 years as an implementing agency of the Multilateral Fund. UNIDO has implemented projects covering a wide range of sectors, including refrigeration, foams, aerosols, solvents, halons, fumigants and process agents. Today, all countries UNIDO has assisted are in compliance with the Montreal Protocol, though these nations need further guidance to meet the final targets and schedules of the Protocol. Therefore UNIDO is currently involved in over 150 projects, focusing on the implementation of phase-out plans at the national and sectoral levels.

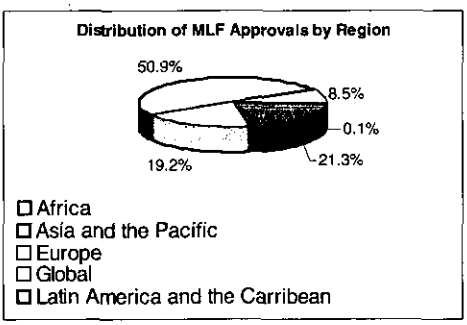
When implementing a project, UNIDO's priority is to take the country's special needs into consideration by selecting the technology most suited to its industrial capacity and outlook. As suggested by the charts in figure 4.3 below, approximately 50 per

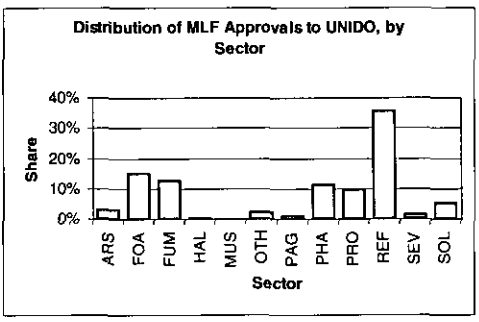
[5] Data presented in this chapter valid up to end of 2006, unless otherwise stated

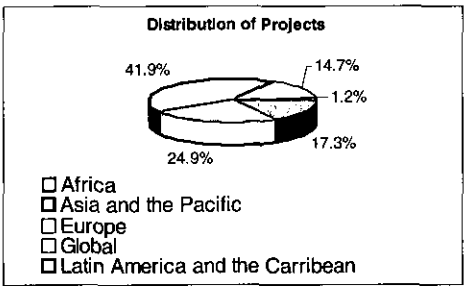
cent of the total funds approved over the last 15 years, around US$422 million, are understandably dedicated to Asia and the Pacific, the region with the largest ODS consumption. However, UNIDO has sought to increase the implementation of projects in Africa and countries with economies in transition. Looking at the distribution of the number of projects implemented, 25 per cent of projects implemented by UNIDO are in Africa. On average, UNIDO has predominantly implemented more large-scale projects in Asia and the Pacific and Latin America and the Caribbean, and smaller-scale projects in Africa and Europe, particularly attending to the small and medium enterprises in these regions.

The largest sector UNIDO is involved with is the refrigeration sector, accounting for a third of UNIDO Montreal Protocol projects, followed by the foam sector with 18 per cent of the projects. UNIDO's focus on industry has enabled it to assist some 1250 manufacturing firms, employing around 146,000 workers. Conversion to ozone-friendly technologies has allowed enterprises to build the capacity of their employees as well as improve the quality of their products. UNIDO has introduced ISO certification and eco-labelling to further assist manufacturers in gaining a wider and stable market access. Actual examples of UNIDO's work in these sectors are described in chapter 5.

Figure 4.3 UNIDO: Distribution of approvals and projects by region and sector (up to end of 2006)







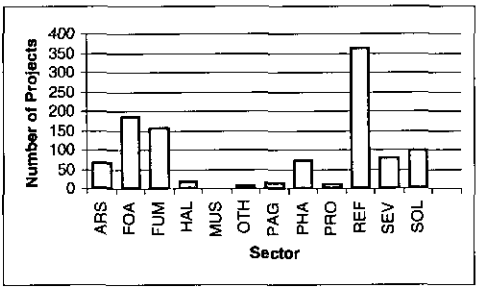


Fig. 4.2.1 (top-left) Distribution of MLF Approvals by Region; (top-right) Distribution of MLF Approvals by Sector; (bottom-left) Distribution of projects by Region; (bottom-right) Distribution of Projects by Sector

4.3.1 UNIDO's contribution to total phase-out

UNIDO has phased out a total of 45,600 ODP-tonnes,[7] representing 28 per cent of the total phase-out achieved in developing countries. The organization has phased out 28,300 ODP-tonnes in Asia and the Pacific, 16 per cent of the total phase-out achieved in the region; 7,450 ODP-tonnes in Latin America and the Caribbean, 12 per cent of the regional total; 6,200 ODP-tonnes in Africa, 35 per cent of the total; and 3,650 ODP-tonnes in Europe, 46 per cent of the total.

In addition to this direct contribution to saving the ozone layer, UNIDO's activities have also had an indirect impact on another issue of major current concern – climate change. Given that many ODS are also greenhouse gases, their phase-out has undoubtedly assisted efforts to combat global warming. Increasingly, linkages are being recognized between the work being carried out under the Montreal Protocol and that being done under the Kyoto Protocol to the United Nations Framework Convention on Climate Change. Annex 3 The Summary of the number of projects, ODP Phase-out and funding by year.

4.3.2 The indirect impact of CFC phase-out to climate change

By phasing-out CFCs, the Montreal Protocol programme has contributed to the reduction of greenhouse gas emissions, which had a significant impact on the Climate Change Convention. The Vienna Convention for the Protection of the Ozone Layer has confirmed the reduction of GHGs in the atmosphere, thus decreased the foreseen amount under the Climate Change Convention and its Kyoto Protocol. Synergies of these two conventions have been formed in an attempt to work towards the joint prevention of ozone depletion and climate change.

4.3.3 Internal technical capacity of UNIDO

UNIDO's internal technical capacity has proven to be one of the organization's greatest assets when implementing Montreal Protocol projects. It allows UNIDO to take a more independent approach when formulating projects, often making possible a reduction in the time allocated to project preparation and implementation. This asset has been advantageous when negotiating with the MLF Secretariat; UNIDO proved itself to the Secretariat by reducing the operating costs of its first projects in 1993, setting a guideline for the costing of MLF projects thereafter. Moreover, UNIDO has been able to maintain its neutrality in project formulation, allowing it to make independent and unbiased technical assessments when selecting equipment and service suppliers. UNIDO's technical capacity also means that it can often use its own staff rather than employing consultants, with positive results for the quality of its after sales services.

UNIDO's internal technical capacity has allowed the organization to gradually increase the scope of its expertise within each of the sectors covered by the MLF. UNIDO's

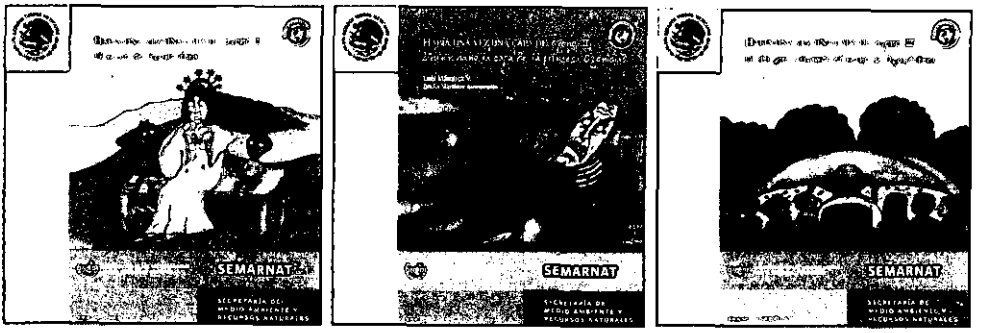
[7] An ODP-tonne is a metric tonne multiplied by the ozone-depleting potential of a substance.

first projects as an implementing agency of the Montreal Protocol in 1993 were in the refrigeration, foams, solvents, halons and aerosol sectors. From 1996, UNIDO took the lead in phasing out the use of methyl bromide for soil fumigation and treatment of commodities and structures (section 4.2.3). UNIDO launched demonstration projects in 22 countries, presenting the most appropriate alternatives to over 150,000 farmers. In 1997, it implemented projects in the refrigeration servicing sector, promoting the development of refrigeration management plans (section 4.2.1). Then, in 2002, UNIDO became involved in the process agents sector. More recently, in 2006, the organization ventured into a further sector, the manufacture of pharmaceutical metered-dose inhalers, assisting in the conversion of production to CFC-free alternatives. Looking to the future, UNIDO plans to be engaged in the phasing out of HCFCs in favour of substances that have zero ODP and the disposal of obsolete ODS-based equipment, areas that are well suited to its technical capacity.

4.4 Awareness building in the population

The sustainability of the ODS phase-out process requires wide-scale participation of the population. UNIDO's Montreal Protocol institutional strengthening and investment projects include various forms of awareness raising activities. They reach out to many groups of the public using a variety of media, including brochures and calendars, press conferences, television, and newspaper advertisements. One of the most innovative creations has been a tale for children, originally produced in Mexico, about the Ozone Prince, whose veil became damaged and was subsequently repaired by the positive actions of young people. The three volumes were printed in 15,000 copies in Spanish and are now being translated by UNIDO for distribution in many other countries.

Children's books in Spanish: "Había una vez una capa de ozono" by Luis Márquez V.



Chapter 5

Selected success stories using relevant technologies

UNIDO has implemented many projects in a range of sectors in various countries, and some selected success stories are given below.

5.1 China: Phase-out of CFCs in entire domestic refrigeration sector

UNIDO has played an important role in the conversion of the domestic refrigeration sector of China to the use of ozone-friendly technologies. As early as 1994, UNIDO initiated the introduction of novel refrigerator manufacturing technologies using hydrocarbon foaming agents and refrigerants in China. Hydrocarbons (cyclopentane and isobutane) have no ODP and almost zero GWP. They are natural substances as opposed to the other replacement alternatives, which are manufactured chemicals. These new chemicals were first applied in Germany at the beginning of the 1990s, thus the foresight shown by the Chinese stakeholders matched well with the initiative taken by UNIDO.

There were several technical hurdles to overcome, especially in view of the flammable nature of the hydrocarbons. At that time, suitable technologies were not yet readily available. Some of the leading compressor and domestic refrigerator producers were selected to partner the Government of China in the first projects. Experts and leading companies from Germany and Italy were invited to help the process. The success of the first conversion projects was convincing – the production costs were lower compared to non-hydrocarbon technologies, the energy efficiency of appliances was improved and the technical and safety problems in the manufacturing process were overcome and kept under control.

UNIDO worked hand in hand with the Government and industry to reach an understanding between the compressor suppliers and their end-users – the refrigerator manufacturers – with regard to the various refrigerant alternatives selected. This complex approach worked well and the balance between the manufacturers of compressors and domestic refrigerators using the same type of refrigerants has been maintained.

As a final phase of the conversion process UNIDO is implementing the refrigeration service sector CFC phase-out plan. This will round up the CFC phase-out process in the entire sector, encompassing the manufacturing of components (compressors), appliances (refrigerators and freezers) and the after sales servicing needs of the appliances.

5.1.1 Jiaxipera compressor factory: Conversion to hydrocarbon technology

Jiaxipera employs 900 staff in the production of six different compressor models used in domestic refrigerators. In 1994, the last year before the project was formulated, the annual production of compressors amounted to 600,000 units, accounting for 10 per cent of the market share in China. There were no exports.

As the producer of good-quality refrigeration compressors, Jiaxipera responded to the demand of their main costumers, namely advanced refrigerator manufacturers, who understood the strong marketing potential of fully environmentally benign and energy-efficient products. The company, following UNIDO's advice, redesigned its compressor products to accommodate isobutane as the new refrigerant, replacing CFC-12.

UNIDO supported the training of Jiaxipera engineers in redesign techniques. Thus, with the assistance of an Italian consulting firm, Jiaxipera engineers reduced the noise and vibration and improved the efficiency of the compressors through design modifications to several compressor parts. The resulting products met the latest customer requirements and international standards.

Jiaxipera was one of the first companies in a developing country to produce the latest environmentally friendly hydrocarbon compressors, phasing out approximately 200 tonnes of CFCs in the process. Jiaxipera could establish long-term, mutually beneficial strategic partnerships with their major customers, offering them a reliable core component supply and establishing a stable market for themselves. Since Jiaxipera was able to target users of isobutane compressors in both the local and export markets its sales increased. In 2000, Jiaxipera was already producing 1 million compressors annually, and production has since quadrupled.

5.1.2 Zhejiang Huari Group: Conversion to hydrocarbon technology

The Zhejiang Huari Group employs 720 staff to manufacture some 40 refrigerator and freezer models, the main product being high-end refrigerators with fuzzy electronic controls. When its MLF project was formulated in 1995, the company was producing around 312,000 units making up 4 per cent of China's market. There were almost no exports.

The Huari Group understood the strong marketing potential of fully environmentally benign and energy-efficient products. Thus, heeding UNIDO's technical advice, the company pioneered the application of long-term hydrocarbon alternatives: CFC-11 was replaced by cyclopentane as the foam-blowing agent and CFC-12 was substituted by isobutane as the refrigerant.

During the conversion process, the Group seized the opportunity to upgrade its premises and rationalize the manufacturing process. It consolidated four assembly

lines into two and invested heavily in a new building in an industrial zone, designing around the requirements of the new technologies. All new equipment and the complete manufacturing line were inspected and their conformity tested with the latest industrial safety standards certified by TÜV Germany.

The first batch of appliances was redesigned with the assistance of German experts, who trained Huari engineers so that they could redesign and finalize conversion of the remaining models on their own and have them certified for safety. The basic manufacturing equipment came from Denmark, Italy and Germany.

The Huari Group was one of the first companies outside Europe to apply cutting edge hydrocarbon technologies. Through this, the Group was able to phase out 338 tonnes of CFC per year, increase its production and raise its labour productivity by 30 per cent. Exports in the first years after project completion increased from US$50,000 to US$2 million, and the company is now manufacturing most of its products for a significant multinational company.

In addition, working conditions, occupational health and safety also improved, as at Jiaxipera (see previous section). Long-term employment of the companies' staff through better business opportunities and human resource development was secured in a very competitive climate, despite the extensive industrial consolidation in this sector of China.

5.1.3 Phase-out of CFCs in the refrigeration-servicing sector

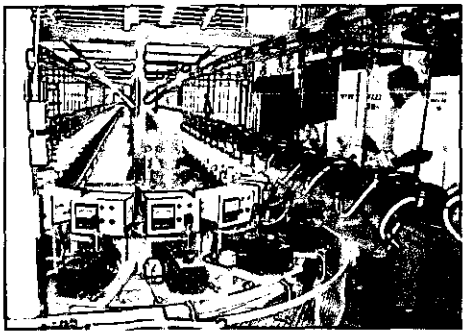
Completion of the conversion of the refrigerator and compressor manufacturing enterprises through various individual projects, and preparation of a final sector plan, did not mean the complete cessation of use of CFCs in the sector. In 1995, all of the 76 million refrigerators and 7.2 million freezers in China were CFC-12 based. Already by 2001, as the conversion of the manufacturing sector progressed, refrigerators using CFC-12 constituted only 75.7 per cent of the total, while those using HFC-134a and R-600a accounted for 11 per cent and 10.2 per cent respectively. Other refrigerants were used in the remaining 3.1 per cent of the total appliance population. However, due to the fast market penetration of refrigerators in the country, there were around 99.1 million refrigerators and 27.3 million freezers using CFC-12 technology by 2001. The annual CFC consumption in the servicing sector amounted to some 450 tonnes.

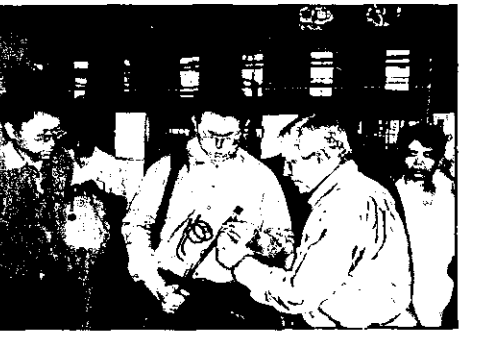
As the supply of CFCs will be much tighter in the near future – the production of CFCs was due to cease in China by July 2007 – it was imperative to take the necessary measures to reduce the demand by introducing appropriate servicing practices, including reuse of refrigerants rather than venting them into the atmosphere, supported by appropriate legislative measures.

The following proposals are part of the ongoing servicing sector CFC phase-out strategy:

- Strengthening national vocational schools;
- Training of some 5,000 service technicians;
- Designing codes of good service practice;
- Public awareness generation;
- Setting up a national recovery, reclamation and destruction network for the servicing and final disposal of appliances;
- Policy development;
- Management and monitoring of CFC consumption.

All these measures will not only be beneficial for the ozone layer but they will also enable the use of appliances until the end of their useful lifetime.





Photos (left) Production of new refrigerators and compressors in Baixue Company, China; (right) Monitoring of project implementation and training at Little Swan Refrigerator Company, China

5.2 Mexico: Harmonized phase-out of national CFC consumption

In past decades, Mexico has been a major CFC producer and consumer. In 2003, the country decided to embark on an ambitious accelerated closure of its CFC production. Traditionally, most of the CFC was consumed in the production of foam products and refrigeration appliances. Converting the manufacturing enterprises to new technologies prior to 2003 cut the demand in these manufacturing sectors. However, the demand in the refrigeration service sector continued, since early disposal of the refrigeration equipment would have inflicted undue economic hardship on the low-income population and some small and medium enterprises. To help Mexico accommodate its national needs while complying with the provisions of the Montreal Protocol, UNIDO more or less simultaneously launched two programmes, one for the closure of production and another for the phased elimination of the use of CFCs in the country. By harmonizing the two projects, CFC production was phased out to an agreed schedule without creating a shortage of CFCs required for servicing the existing CFC-containing refrigeration equipment and appliances.

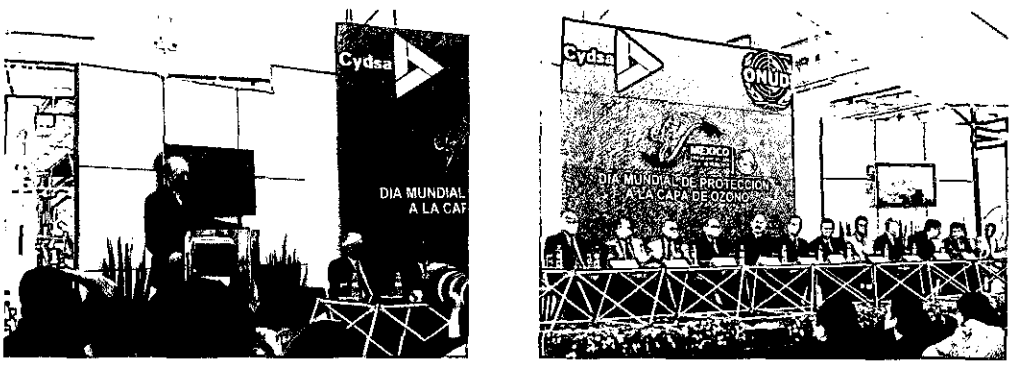
5.2.1 Permanent closure of CFC production facility in Mexico

In 2003 UNIDO, following a request from the Government of Mexico, received a grant from the MLF to assist in the closure of the largest Latin American CFC production

plant, Cydsa Quimobasicos, which had been one of the main CFC exporters in the developing world.

The US$31.8 million project provided funds for development of government policy and awareness measures to reduce consumption and to control and regulate internal and external trade of ODS, and compensation of profit forgone by the enterprise. The compensation received was used by Cydsa to convert its CFC production facilities to the production of new types of chemicals not banned under the Protocol. This ensured reliable supply of new refrigerants to the domestic and export markets and maintained employment in the company. The excellent cooperation between the Government, Cydsa and UNIDO, and the financial and technical assistance provided throughout the project, enabled Mexico to cease production of CFCs as early as August 2005.

Through this project, Mexico was able to comply with its international obligations more than four years ahead of schedule and became the first developing country to completely phase out the production of CFCs. These inspirational and pioneering efforts contributed to the tightening of the global CFC market and the accelerated phase-out of ODS all over the world. This achievement of Mexico and UNIDO in effectively underpinning international efforts to protect the environment was commended by the Executive Committee in November 2005.



Photos Closure ceremony of CFC-Production in Mexico

5.2.2 Phase-out of national CFC consumption

In June 2004, UNIDO helped initiate the implementation of Mexico's national CFC phase-out plan, which will ensure the permanent elimination of CFC consumption in the country. The plan incorporates a series of investment, non-investment and technical support activities over the six years leading to the 2010 phase-out deadline.

In 2004 national CFC consumption amounted to 1,188 ODP-tonnes. A year later the consumption level was reduced to 640 ODP-tonnes, a significant 46 per cent decrease, 1,027 ODP-tonnes below the 2005 target and 1,672 ODP-tonnes lower than Mexico's obligation under the Montreal Protocol. The consumption was further reduced in

2006 without any disruption in the supply of CFCs for priority needs. The continued reduction of CFC consumption demonstrated the sustainable nature of the programme and the good planning and harmonized implementation of the cessation of production and phase-out of consumption of CFCs.

The National Ozone Unit, located at the Secretariat of Environment and Natural Resources (La Secretaría del Medio Ambiente y Recursos Naturales; SEMARNAT), has been using its skilled staff to effectively monitor the phase-out programme. The National Ozone Unit experts have been honing their project management abilities and have independently undertaken the necessary corrective measures when required within the framework of the National Phase-out Programme.

The training of customs and law enforcement officers is another notable constituent of the National Phase-out Programme, and a special training programme took place in 2005. With the provision of refrigerant identifier tools, customs offices have been able to successfully monitor the import and export of CFCs and prevent, to the extent feasible, illegal trade in regulated products.

As part of the national recovery and recycling programme, the Trust Fund for Electricity Savings (Fideicomiso para el Ahorro de Energia Electrica; FIDE), in cooperation with UNIDO, has set up a very successful incentive programme aimed at accelerating the replacement of old CFC-based refrigeration and air conditioning appliances that would otherwise have been used beyond 2010. The obsolete, energy-wasting appliances, which tend to be characterized by high levels of CFC leakage, are replaced with CFC-free energy-efficient appliances on preferential terms. Eighty FIDE centres were equipped and converted to CFC recovery centres, an additional 10 serving as storage units. Technicians running these 90 FIDE centres were trained through the project. By mid-2006 around 730,000 refrigeration units had been replaced and destroyed, saving a significant 1,000 million kilowatt-hours per year.

The present CFC Phase-out Programme will enable Mexico to completely phase out CFC consumption by 1 January 2010.

Photo: Workshop on good practises in refrigeration and air conditioning systems in Mexico

5.3 Islamic Republic of Iran: Domestic refrigerator project

Pars Appliance Manufacturing is a private Iranian-owned enterprise, originally established and operated in 1975 by General Electric, of the United States. Pars is the largest manufacturer of home appliances in Iran, employing around 700 people in one shift and producing approximately ten models of domestic refrigerators and freezers. When project formulation started in 1993, its annual production of all models amounted to 160,000 units. Prior to the start of the project, CFC-12 was used as a refrigerant and CFC-11 as a foaming agent for the insulation of the refrigerators and freezers.

Approved in 1993, the Pars project was the first financed by the MLF to apply (on UNIDO technical advice) a hydrocarbon alternative, namely cyclopentane, as a foam-blowing agent to replace CFC-11. Lacking (at the time) information on the application of isobutane, including safety aspects, the company chose a hydrofluorocarbon, HFC-134a, as the refrigerant.

Following project approval, the company was reconstructed. New production leak detectors, charging stations and recovery pumps, all designed for use with HFC-134a, were installed through the UNIDO project. Since the redesign of two old foaming machines would have been too costly, a new cyclopentane foaming machine, along with a mixing unit and cyclopentane storage facility, replaced them. Safety precautions regarding the flammability and explosiveness of cyclopentane required a gas detector system, an exhaust and ventilation system and a fire protection system in the foaming area. All equipment in the hazardous parts of the foaming lines was made explosion proof. All foaming jigs and plugs were equipped with good earth connections to avoid the creation of static electricity. Nitrogen was provided in the whole piping system for neutralization. After the conversion, the complete manufacturing line was inspected and certified by TÜV Germany for its conformity with the latest industrial safety standards.

UNIDO contracted experts to assist the company in development, redesign, prototype manufacture and testing of the refrigerators and freezers using HFC-134a refrigerant. Personnel from Pars received training on the use of the new equipment both on the job and in Europe. The company management was trained in production control, functionality, performance testing and quality assurance, taking into account the new safety requirements.

The company built a second production hall for the assembly of refrigerator bodies at its own expense, designing the new facilities and layout for the extremely sensitive HFC-134a and cyclopentane technologies. Consumption equivalent to 193 ODP-tonnes was phased out, productivity rose by approximately 20 per cent and the annual production increased to the design capacity of 195,000 units per year.

The use of environmentally friendly technology increased the international market potential of the products manufactured and the company started to export. At the time of project formulation, the company had reported no exports. Well-trained staff,

increased safety measures, better production processes and enhanced research and development facilities also contributed to a better and more competitive business. Pars itself made substantial financial inputs, without which the project could not have been successfully implemented. Close cooperation, active participation and full involvement of the management of Pars and the support of the Government enabled UNIDO to complete the project with significant results.

Photo: Monitoring of project implementation at Pars Appliance Manufacturing Company in Iran

5.4 Indonesia: Phase-out of CFC-11 by shoe manufacturer

Indonesian company P.T. Trias Rantai Mas, founded in 1988, produces polyurethane integral skin shoe soles. With UNIDO's support, the company chose to replace CFC-11 by a 100 per cent water-blowing technology for the production of its foam shoe soles.

The highest production level reached before the conversion in 1997 was 183,583 pairs of shoe soles in one month. After the conversion to new technology, the production capacity reached 360,000 pairs per month, and then increased to 450,000 pairs in the peak season (May through August), doubling the production levels of the company. Moreover, the company expanded its market through exports to Australia and the European Union, whilst maintaining its sales in the local market.

Hence, the company was able to widen the variety of its products, producing in-shoe and out-shoe soles, and pump valve, automotive and printing machine components. This diversified production contributes up to 5 per cent of the production value of the company.

5.5 Romania: Phase-out of CFCs in extruded foam industry

In 1997, the privately owned company Romcarbon S.A., in Buzau, Romania, produced 370 tonnes of extruded polyethylene foam and 360 tonnes of polystyrene foam, with densities varying from 32 to 45 kgm-3 and thicknesses in the range of 2 to 6 millimetres, depending on the specific requirements needed for further processing or application. The CFC consumption that year totalled 130.7 tonnes – 67.2 tonnes of CFC-12 and 63.5 tonnes of CFC-11.

Butane was chosen as the alternative to CFC-11 and CFC-12 as the blowing agent. As the technology was completely new for Romania, several problems arose during the preparation of the project site. Further problems surfaced in the issuance of the necessary local approvals for newly introduced technology, especially from the fire-fighting department, given butane's flammability.

Nonetheless, UNIDO was able to implement the projects successfully, applying the necessary safety precaution measures. A total of 132.4 ODP-tonnes were eliminated from Romania's plastic foam sector. The project cost a total of US$516,500, with a project cost-effectiveness of US$3.9 per kilogram of ODP. Moreover, the project was an exemplar that facilitated the implementation of similar projects in the sector. The company maintained the sustainable and standard quality of their products, with an output capacity at the same level of the market demand. More importantly, the adoption of the new technology enabled the company to meet European industrial and environmental standards, assisting Romania's application to join the European Union.

Photos Butane blowing technology. New extrusion line for expanded polyethylene and polystyrene. (left) Head of extrusion line, (right) Overall extrusion line

5.6 Bosnia and Herzegovina: Elimination of CFC-11 in foam production

Bosnia and Herzegovina successfully completed an investment project, funded to an amount of US$364,650 by the MLF, for the substitution of CFC-11 by n-pentane as a blowing agent in the manufacture of rigid polyurethane foam boards and blocks for insulating purposes at Stirokart Co., Srbac. This UNIDO project was approved in April 2003 at the thirty-ninth meeting of the Executive Committee and was completed in December 2006, eliminating 33 ODP-tonnes through conversion to new technology. The conversion involved installation of a new foaming machine, with accessories and spare parts, by the Italian company Impianti OMS. Training and technical assistance were also given. The conversion to a technology using n-pentane as the blowing agent with zero ODP was the first project of its type in the rigid polyurethane foam sector in Bosnia and Herzegovina, and assisted the country in complying with its obligations under the Montreal Protocol and with stringent European environmental and industrial standards.

Photo: Stirokart Company, Bosnia and Herzegovina

5.7 Cuba: Phasing out methyl bromide from tobacco production

Tobacco production plays an essential role in the economy of Cuba, and the product has a reputation for fine quality. The area dedicated to tobacco seedbeds is estimated at 3,450 hectares. Due to shortages of chemicals and other inputs to treat weeds and soil-borne diseases (including those due to fungi and nematodes), Cuba had already introduced alternative environment-friendly techniques such as tilling and biological control. In 1998, Cuba submitted a project through UNIDO for total phase-out of methyl bromide for soil pest control in the cultivation of tobacco seedlings. The US$1.7 million project was the first approved by the Executive Committee of the MLF for elimination of methyl bromide in the tobacco sector.

Two alternatives to methyl bromide were tested by the Ministry of Agriculture: use of Trichoderma harzianum, a naturally occurring fungus that protects crops against certain diseases, combined with low doses of chemicals as part of an integrated pest management system; and use of the floating tray system. The first alternative did not meet the zero default standard and was hindered by a shortage of chemicals. The floating tray system, a soilless cultivation alternative, was found to be highly efficient as it relied on a substrate produced locally and the resulting tobacco fully complied with the zero default standard. This option was therefore selected and UNIDO was requested to prepare a phase-out project in order to generalize it as an alternative technology.

Training sessions were conducted on erecting microtunnels and large greenhouses, handling and cleaning seeders and mowers, monitoring water conductivity and pruning seedlings. Through the services of the Institute for Plant Health Research (Instituto de Investigaciones de Sanidad Vegetal; INISAV), the Government of Cuba contributed the construction work for the installation of the greenhouses, the technical staff for erection and commissioning of the greenhouses, and the internal transportation costs for the equipment purchased.

Cuba's annual methyl bromide consumption was reduced from 100 tonnes (baseline consumption) to 20 tonnes, a reduction of 80 tonnes (or 48 OPD-tonnes) of methyl bromide being imported (at a cost of US$2 per kilogram). It enabled Cuba to fully

comply with the phase-out schedule agreed for Article 5 countries. The new technology enables production of an environmentally friendly product, thus benefiting the export trade, and also saves US$160,000 annually on imported chemicals through use of a local substrate.

Photo: Tobacco production in Cuba

5.8 Macedonia: Phase-out of methyl bromide for tobacco seedlings

The use of methyl bromide as a soil fumigant has been phased out completely in Macedonia's tobacco sector. Tobacco is a major crop in Macedonia, with an annual production of more than 34,680 tonnes of tobacco leaves. In 1998, the cultivated surface area totalled 22,000 hectares (average yield 1,580 kilograms per hectare). More than half of the total tobacco production is exported at an approximate value of US$80 million. This constitutes considerable revenue for farmers, estimated at US$2,000 per hectare. Approximately 10 per cent of Macedonia's working population is employed in the tobacco industry.

Macedonia grows two types of tobacco. The Oriental variety accounts for 94 per cent of total production, and the Virginia variety for the remaining 6 per cent. More than twice the numbers of leaves are harvested from the Oriental plant than from the Virginia type. Based on the excellent results of the demonstration project, tobacco farmers chose to adopt soilless cultivation using the floating tray system. UNIDO had to adapt the established floating tray technology to the predominantly grown Oriental plant, which is considerably smaller in size. The number of transplants for the Oriental type varies from 150,000 to 200,000 plants per hectare, depending on whether transplanting is carried out mechanically or by hand. This is ten times more than the plant density used when transplanting the Virginia type.

The project proved to be a success. A total of 41.3 tonnes of methyl bromide (24.78 ODP-tonnes) was phased out, corresponding to a complete phase-out in Macedonia's tobacco industry. Moreover, the implementation of the floating tray technology yielded the same production levels as the baseline, but with higher-quality plants.

Chapter 6

Conclusion

6.1 Programme readjustment and the role of Member States

Through its role as an implementing agency of the Montreal Protocol, UNIDO significantly raised its profile. A public sector organization such as UNIDO requires a certain period of time to change its mode of operation and procedures in order to accommodate any new programme such as the Montreal Protocol. The important political decisions and procedural adjustments that need to be made when a programme of this scale is introduced inevitably take time, and bottlenecks can result during the period of overlap between the phasing in of one programme and the phasing out of another, when each programme still has to operate according to its specific procedures and policies. Such a complex transition requires tremendous effort by the staff and the organization as a whole, as was the case between 1992 and 1997 when the advent of the Montreal Protocol within UNIDO coincided with the phase-out of UNDP funding (section 3.1.2). In a sense the transition is still not complete, with 1 per cent of UNIDO technical assistance still sourced from UNDP (figure 3.4) in 2006. During its 15 years of implementation of the Montreal Protocol, however, UNIDO has succeeded in developing a more rational and simple management approach. Parallel to the integrated approval, implementation and evaluation activities of the Montreal Protocol under the technical division and the MLF policy, UNIDO has overall existing policy mechanisms, such as administration, finance and contract and the development and evaluation divisions (section 3.2.1).

This approach has resulted in a more cost-effective delivery system and enhanced UNIDO's comparative advantage in the area of technical assistance delivery.

This experience of introducing new programmes will hold UNIDO in good stead in a world of dynamic economic and industrial changes. No programme can remain forever; it is the duty of an organization to adjust its programme and delivery in accordance with the policies and needs of its clients, particularly Governments. Such adjustments may imply funding decisions that can have a tremendous impact on an organization's structure and capacity to deliver.

It is important that Member States fully appreciate this potentially volatile relationship between programme implementation, funding, organizational structure and the time frame of assistance delivery. The Member States are the most important partners of UNIDO, guiding, advising and supporting the readjustments necessary to respond to new challenges, as was the case when the organization became an implementing agency of the Montreal Protocol. That UNIDO was able to make the huge effort necessary to ensure success in this role was due in no small measure to the support it received from its Member States.

6.2 Montreal Protocol and the rise of UNIDO

It may be the destiny of UNIDO to rise from a position of being the youngest agency to become one of the most experienced senior partners. UNIDO started to receive funding from UNDP in 1970, as its 23rd executing agency, for the delivery of technical assistance; by 1985, it had advanced to third-ranked executing agency (by funds allocated) of UNDP. History repeated itself in the case of the Montreal Protocol, with the arrival of UNIDO as the fourth implementing agency in 1992 soon being succeeded by its ascent to third-ranked agency in 1995 and second-ranked in 2004, close behind the World Bank. UNIDO's double achievement demonstrates its dynamism and professionalism, and the devotion of the staff to the organization and to the assistance of developing countries. All sections have played a role in this outcome, including the technical, administrative and contractual sections. The success of the Montreal Protocol programme is the success of the organization and its capable staff.

In 1990, UNIDO was an unknown organization as regards the implementation of environmental protocols and treaties. Today, through its contribution to the phase-out of CFCs, it is recognized as an important organization on the world stage with extensive experience of working with industry in developing countries. Its agenda is widening, with a number of projects related to persistent organic pollutants being undertaken in tandem with the Global Environment Facility (GEF), and the possibility of further work in the area of the Kyoto Protocol and related energy activities.

The implementation of the Montreal Protocol displayed UNIDO's knowledge and capacity to respond to industrial and institutional change in developing countries, not only during the project implementation period but also after project completion, with its technical staff providing assistance and advice beyond the project life cycle. UNIDO has time and again demonstrated its comparative advantage over other United Nations agencies, in that the majority of projects have been formulated through its own internal technical staff rather than hired consultants. This has enabled greater understanding of the details of projects at all stages – negotiation, approval, implementation and follow-up. The implementation of the Montreal Protocol has brought to UNIDO much more than a source of funding. It has opened new avenues and possibilities to assist developing countries in multilateral financing, and while the work has apparently been focused on the phase-out of ODS, it has enabled many countries to adopt a range of clean, advanced technologies and management systems that have brought benefits throughout their economies. Thus, it can be stated that UNIDO is an organization within the United Nations system, which uses its own understanding and capacity to respond to the interests of developing countries and the world community.

Annex 1. Chairs of the Executive Committee 1990–2007

No. of meeting	Name of Chair
1-4	Mr. Ilkka Ristimaki, Finland
5-8	Mr. Juan Antonio Mateos, Mexico*
9-11	Ms. Eileen Claussen, United States*
12-14	Mr. Tan Meng Leng, Malaysia*
15-18	Mr. John Whitelaw, Australia
19-20	Mr. Sam Ongeri, Kenya*
21-23	Mr. David Turner, United Kingdom
24-26	Mr. Marco Antonio Gonzalez, Costa Rica
27-29	Mr. Paul Horwitz, United States*
30-31	Mr. Vishwanath Anand, India
32	Mr. P.V. Jayakrishnan, India
33-35	Mr. Heinrich Kraus, Germany
36-38	Mr. Oladapo Afolabi, Nigeria
39-41	Mr. Tadanori Inomata, Japan
42-44	Ms. Marcia Levaggi, Argentina
45-47	Mr. Paul Krajnik, Austria*
48-50	Mr. Khaled Klaly, Syrian Arab Republic*

* During the chairmanship of these specific chairmen, the entry of UNIDO and major developments of the UNIDO programme took place.

ANNEX 2. SUMMARY OF THE NUMBER OF PROJECTS, ODP PHASE-OUT AND FUNDING BY YEAR

Year Approved/ Implementation Characteristic	Number of Approvals*	Number Completed	Per Cent Completed	Consumption ODP to be Phased Out*	Consumption ODP Phased Out	Per Cent of Consumption ODP Phased Out	Production ODP to be Phased Out*	Production ODP Phased Out	Per Cent of Production ODP Phased Out	Approved Funding (US $)	Adjustment (US $)	Funds Disbursed (US $)	Per Cent of Funds Disbursed	Balance (US $)	Estimated Disbursement in Current Year (US $)	Administrative Support (US$)	Administrative Support Adjustment (US$)	Interest earned & reported (US$)
Disbursement during Implementation																		
1991	0	0	0%	0	0	0%	0	0	0%	0	0	0	0%	0	0	0	0	
1992	0	0	0%	0	0	0%	0	0	0%	0	0	0	0%	0	0	0	0	
1993	20	20	100%	994	981	99%	0	0	0%	5,601,270	5,714,734	11,316,004	100%	0	0	728,165	742,916	82,813
1994	52	52	100%	2,793	3,209	115%	0	0	0%	31,434,516	-829,184	30,605,332	100%	0	0	4,086,488	-107,794	597,192
1995	56	56	100%	4,210	4,210	100%	0	0	0%	25,716,623	-1,389,587	24,327,036	100%	0	0	3,343,164	-180,645	2,486,948
1996	45	45	100%	2,764	2,883	104%	0	0	0%	20,408,498	-760,130	19,648,368	100%	0	0	2,653,106	-98,818	3,550,981
1997	127	127	100%	6,617	6,617	100%	0	0	0%	43,809,669	-2,620,034	41,077,500	100%	112,135	1	5,695,254	-345,139	3,147,059
1998	85	85	100%	2,526	2,526	100%	0	0	0%	23,871,778	-1,150,796	22,720,982	100%	0	0	3,051,781	-143,859	4,418,655
1999	120	118	98%	4,041	4,042	100%	0	0	0%	35,759,199	-2,378,274	33,238,464	100%	142,461	101,385	4,322,006	-291,612	3,844,716
2000	93	90	97%	3,510	3,347	95%	0	0	0%	28,496,650	1,150,753	28,293,592	95%	1,353,811	132,118	3,367,464	123,290	2,431,724
2001	115	108	94%	3,678	3,589	98%	0	0	0%	24,703,735	-790,595	22,075,129	92%	1,838,011	1,373,132	3,095,347	-99,695	2,308,795
2002	73	67	92%	4,310	4,256	99%	0	0	0%	31,913,225	2,479,881	30,080,111	87%	4,312,995	1,827,086	5,141,848	310,752	682,967
2003	47	35	74%	1,950	2,633	135%	0	0	0%	27,888,690	1,954,240	24,761,884	83%	5,081,046	3,043,189	3,661,942	145,437	581,257
2004	41	24	59%	1,454	1,151	79%	1,250	1,250	100%	33,314,748	-452,170	26,113,039	79%	6,749,539	2,735,730	3,990,389	-33,913	813,953
2005	74	27	36%	4,740	2,352	50%	12,591	12,381	98%	53,210,599	-716	27,046,776	51%	26,163,107	8,639,148	5,712,224	-54	1,123,410
2006	44	6	14%	2,525	150	6%	2,877	2,530	88%	21,366,237	0	729,811	3%	20,636,426	7,536,002	3,349,734	0	2,887,492
Sub-Total	**992**	**860**	**87%**	**46,111**	**41,946**	**91%**	**16,718**	**16,161**	**97%**	**407,495,437**	**928,122**	**342,034,028**	**84%**	**66,389,531**	**25,387,791**	**52,198,912**	**20,866**	**28,957,962**
Disbursement after Completion																		
Sub-Total	0	0	0%	0	0	0%	0	0	0%	0	0	0	0%	0	0	0	0	
Retroactively Funded	10	10	100%	517	517	100%	500	500	100%	5,224,410	-208,579	5,015,831	100%	0	0	518,960	-26,884	
Time-sensitive Accounts	27	19	70%	39	39	100%	0	0	0%	3,767,300	61,864	3,074,156	80%	755,008	318,701	415,967	8,043	
GRAND TOTAL	**1,029**	**889**	**86%**	**46,667**	**42,502**	**91%**	**17,218**	**16,661**	**97%**	**416,487,147**	**781,407**	**350,124,015**	**84%**	**67,144,539**	**25,706,492**	**53,133,839**	**2,025**	**28,957,962**

* Does not include transferred and closed projects.

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