



*Empowered lives.  
Resilient nations.*



# PROTECTING THE OZONE LAYER AND REDUCING GLOBAL WARMING

Results, Case Studies and Lessons Learned from  
UNDP's Montreal Protocol Programme



# FOREWORD



**Nik Sekhran**

Director/Chief of Profession  
Sustainable Development Cluster  
Bureau for Policy and  
Programme Support  
UNDP

The Montreal Protocol has very rightly been termed the world's most successful environmental convention. Soon after the discovery of the Antarctic ozone hole, countries not only ratified the Montreal Protocol, but the Multilateral Fund (MLF) was established, and developing countries began receiving technical assistance and grants to help them eliminate ozone depleting substances. UNDP was selected in 1991 as one of the original MLF implementing agencies and has played a key role in the technology transfer process. While UNDP has worked with over a thousand private sector enterprises, given our main focus on sustainable development, UNDP pioneered the “umbrella” approach to dealing with small and medium enterprises (SMEs). This has included, for example, local manufacture of inexpensive, low maintenance equipment with low operational costs that SMEs could afford. As a result, SMEs were able to successfully transition to new non-ozone depleting technologies and maintain market share and high employment numbers, thereby safeguarding livelihoods. As UNDP supports the HCFC phase-out currently underway, it will maintain its focus on the needs of SMEs and as such, there is no doubt that the Montreal Protocol will continue to be one of UNDP's flagship programmes.

## INTRODUCTION



**Jacques Van Engel**

Director  
Montreal Protocol/Chemicals Unit  
Sustainable Development Cluster  
Bureau for Policy and  
Programme Support  
UNDP

The effort to protect the earth's ozone layer has been the first occasion where humanity has come together to tackle a serious global environmental threat. These actions have in the long run probably saved millions of lives, not only because of the reduction of harmful UV rays due to thinning of the ozone layer, but also due to the huge positive impact on climate change by phasing out high-GWP Ozone Depleting Substances. One can only hope that the success of the Montreal Protocol and its Multilateral Fund will be replicated in other conventions for the sake of future generations. An article in the September 2014 Economist mentioned that during the period 1989-2013, the Montreal Protocol had reduced CO<sub>2</sub> equivalent emissions as big as the 11 other global policy actions combined at a fraction of the cost. We are proud that UNDP has assisted 120 countries eliminate 67,870 tonnes of ODS while simultaneously reducing 5.08 billion tonnes of CO<sub>2</sub>-equivalent greenhouse gas emissions. We have also started preparing partner countries for their 35% HCFC reduction targets to be achieved by 2020.

# TABLE OF CONTENTS

|  |    |
|--|----|
| Why has the Montreal Protocol been so successful?  | 2  |
| The Montreal Protocol and climate change   | 4  |
| UNDP's work on ozone layer protection and programme impact   | 5  |
| UNDP/MPU supports sustainable development  | 10 |
| UNDP/MPU and emerging work under the CCAC  | 12 |
| Linkages with the UNDP Strategic Plan 2014-2017  | 13 |
| The importance of demonstration projects   | 13 |
| Recent Case Studies: Results and Lessons Learned   | 15 |
| 1. Conversion from HCFC-141b to cyclopentane technology in manufacturing refrigeration equipment insulation foam at Walton Hi-Tech Industries Limited, Dhaka, Bangladesh.                                | 15 |
| 2. Integrated implementation approach for polyurethane foam investment projects through South-South cooperation between Mexico, Jamaica and Trinidad & Tobago  | 16 |
| 3. Pilot demonstration project on ODS waste management and disposal in Georgia   | 17 |
| 4. Landlocked LDC makes excellent progress – the Swaziland HCFC Phaseout Management Plan and Palfridge refrigeration manufacturing company   | 18 |
| 5. Phaseout of CFCs in the manufacture of pharmaceutical Metered Dose Inhalers (MDI) in India  | 20 |
| 6. Adoption of a sustainable green technology approach in shoe sole production in Guanajuato, Mexico   | 21 |
| 7. Demonstration project using HFC-32 technology in the manufacture of small-sized commercial air-source chillers and heat pumps at Tsinghua Tong Fang Artificial Environment Co., Ltd., Beijing, China. | 22 |
| 8. South-South cooperation to promote low-carbon technologies in the refrigeration sector in Latin America   | 23 |
| 9. Technology transfer and capacity building to accelerate HCFC phaseout in Countries with Economies in Transition (CEITs)   | 24 |
| Looking Forward  | 25 |



# WHY HAS THE MONTREAL PROTOCOL BEEN SO SUCCESSFUL?



The Montreal Protocol on the protection of the global ozone layer is a somewhat unique example of how the world can respond when faced with a serious environmental threat. The 1974 Rowland-Molina hypothesis was that CFCs in the stratosphere – when bombarded by UV radiation – could result in chlorine radicals that could destroy large numbers of ozone molecules and lead to ozone layer depletion. This in turn would lead to more UV radiation reaching the earth, contributing to increasing levels of skin cancer as well as slower plant growth and negative effects on marine phytoplankton.

This hypothesis was ignored until the discovery of the Antarctic “ozone hole” in 1985 that shocked the world, proving the Rowland-Molina hypothesis was correct. Action was immediate. In 1985 itself, the Vienna Convention was adopted and in 1987, the Montreal Protocol (MP) was agreed upon. This was the fastest response - ever - of the international community to a severe international environmental problem. And in 1991, the Montreal Protocol Multilateral Fund (MP-MLF) was established to assist developing countries transition away from ozone-depleting substances (ODS).

The question is often asked why the world moved so quickly in dealing with ozone layer depletion, yet has moved so slowly in addressing the equally critical problem of climate change. There are several reasons:<sup>1</sup>

- The MP was set up to eliminate ozone-depleting substances (ODS). It has focused on that main objective, and in recent years has also ensured that ODS replacements have low global warming potentials (GWPs) so as not to impact climate change.
- This was a brand new area of research and work, unlike the climate change/energy area which has a long history and many vested interests. So there was no treading on others “turf”.
- Skeptics had long said that CFCs were irreplaceable. However, industrialized countries took the lead in technical innovation. Developing countries under the MP-MLF and its four implementing agencies (UNDP, UNEP, UNIDO, World Bank) - often with bilateral partners - followed rapidly with applied technical innovation almost every year – from 50% reduced CFCs during 1991-92 to even lower CFC alternatives during 1993-94 to the introduction of hydrocarbons in 1994 and the introduction during 1995-96 of HCFC-22 in refrigeration and other low-ODS in the foams, solvents and halons sectors. The speed of this technical innovation has not been matched by any other environmental convention/protocol.

<sup>1</sup> Frank Pinto, *Environment Initiatives by the United Nations Including RIO+20*, presentation to the visiting Vienna University student group to the United Nations, New York, 15 February 2012.

- The major ODS chemical producers worldwide – instead of fighting this development – decided to join it even though they would be giving up on a very lucrative business. They led the search for non-ODS alternatives and were able to develop new lines of business to replace those they had lost. So industry was supportive of the Montreal Protocol and never against it - very different from what happens in the climate change arena.
- The MP-MLF Executive Committee (ExCom) decided early in the process to give priority to and allocate funding for capacity building, training and institutional development in recipient developing countries to ensure long-term success. National Ozone Units were created and strengthened, and this paid immense dividends when national compliance mechanisms had to be formulated, and these National Ozone Units were able to take the lead in developing national legislation and supporting compliance mechanisms.
- The MP also adopted very clear prohibitions on ODS trade with non-Parties to the Protocol. This resulted in 197 Parties to the Protocol ratifying it in record time, so that recipient countries would have access to ODS during the transition process to new technologies. And these policies were strictly enforced, stopping the trade in illegal ODS and thus facilitating the conversion process. It demonstrates that difficult environmental issues can be tackled and resolved successfully in an equitable and sustainable manner.<sup>2</sup>
- During its first five years (1991-96), the MP-MLF ExCom focused on conversion of the larger ODS producing and consuming enterprises in recipient countries, given the need to show results and tackle the largest units first. It was, however, soon recognized that there were thousands of small and medium sized enterprises (SMEs) whose ODS consumption individually may have been small but which were labour-intensive, employing a large number of workers. With larger enterprises converting to non-ODS technologies, SMEs faced the prospect of being driven out of business with the loss of thousands of jobs. So the MP-MLF ExCom developed guidelines to facilitate the ODS transition process in SMEs, with UNDP taking the lead in developing new and innovative processes under umbrella projects which comprised local manufacture of inexpensive, low maintenance equipment which had low operational costs which the SMEs could afford. As a result, SMEs were able to successfully transition to the new non-ODS technologies and maintain their market shares as well as high employment numbers, thereby preventing job losses and safeguarding livelihoods. This approach proved to be invaluable when dealing with MP-MLF ExCom approved sector (e.g. aerosols, foam, halons, solvents, refrigeration) ODS phaseout programmes followed by national ODS phaseout programmes.



<sup>2</sup> Suely Carvalho, *Partnerships for Change: 25<sup>th</sup> Anniversary of the Montreal Protocol (1987-2012)*, UNDP, September 2012.



# THE MONTREAL PROTOCOL AND CLIMATE CHANGE



The MP was established to eliminate ODS which often had high Global Warming Potentials (GWP). For instance CFC-11 has a GWP of 4,750 (compared to 1.0 for CO<sub>2</sub>) and CFC-12 has a GWP of 10,900. As the MP continued eliminating ODS, it was also able to reduce their global warming potential significantly, since global ODS consumption was over one million tonnes/year.

A recent article in *The Economist*,<sup>3</sup> citing UNEP sources, showed that the Montreal Protocol had, during the period 1989-2013, reduced cumulative CO<sub>2</sub> eq. emissions by 135 billion tonnes – nearly as big as all the 11 other global policy actions including energy efficiency, hydropower, nuclear power, forest preservation, fuel efficiency standards, etc. Others have postulated that the first commitment period (2008-2012) of the Kyoto Protocol would only eliminate 5 billion tonnes of CO<sub>2</sub> eq. which was only 4% of the impact of the MP. So the MP has in effect eliminated 25 times more CO<sub>2</sub> emissions than the Kyoto Protocol as of end-2013 and at a fraction of the cost.

Some of the ODS-replacement chemicals also had significant GWPs. For example, HCFCs have GWPs in the 725-2,310 range and HFCs have GWPs in the 675-2,088 range. HCFCs are already in the process of being phased out. Proposals to include HFC phaseout under the MP (even though they do not affect the ozone layer) are being discussed since they relate to the same sectors as those addressed under the MP, due to the proven success of the MP, and since it can be done cheaper under the MP than under other options.

Given the huge quantities of HFCs already in use, it has been argued that if the Montreal Protocol was quickly amended to include them, it might be possible for the MP to eliminate the CO<sub>2</sub> equivalent of as much greenhouse gas emissions in the next 35 years as the MP did during 1990-2010.<sup>4</sup> However, political negotiations are still ongoing, and UNDP will be ready to assist developing countries when these negotiations are finalized.

<sup>3</sup> *The Economist, Curbing Climate Change: The Deepest Cuts: Our guide to the actions that have done the most to slow global warming*, pgs 21-23, 20 Sept. 2014 (print edition).

<sup>4</sup> Statement by Durwood Zaelke of the Institute for Governance and Sustainable Development, cited in *The Economist* article above.

# UNDP'S WORK ON OZONE LAYER PROTECTION AND PROGRAMME IMPACT

UNDP established a dedicated Montreal Protocol Unit (MPU) in 1991 to spearhead and coordinate its efforts to support Article 5 developing countries as one of the implementing agencies of the MP-MLF. MPU is the focal point for UNDP's global MP programme, responsible for strategic planning, policy, programme and financial oversight, and reporting to the MP-MLF Secretariat and ExCom. MPU has a small team at UNDP/HQ in New York and technical teams based at UNDP Regional Centres in Bangkok (Asia-Pacific), Istanbul (Europe, Arab States, Africa), and Panama (Latin America & Caribbean).

MPU regional teams work with UNDP Country Offices in their regions to assist government counterparts develop projects and programmes to eliminate ODS to be funded under the MP-MLF. The MPU central unit at HQ coordinates these activities, produces periodic progress reports and the annual business plan for submission to the MP-MLF Secretariat and ExCom, and liaises with the Regional Bureaux at UNDP/HQ.

UNDP provides a variety of services to support developing countries in their efforts to comply with Montreal Protocol provisions. These services include technology transfer and technical assistance, formulation and implementation of country and sector strategies, capacity building, accessing funding from different sources, and facilitating public and private partnerships.

While a significant part of UNDP's effort during 1991-2000 was on assisting private and public sector enterprises in their ODS elimination efforts, since 2001 the focus has been more on sector and national ODS phaseout programmes especially covering SMEs.

MP-MLF programmes undergo intense scrutiny by the MP-MLF Secretariat and ExCom. The performance of each of the four implementing agencies of the Montreal Protocol<sup>5</sup> as well as bilateral programmes are monitored and assessed on a yearly basis through eight performance indicators in three areas: approval, implementation, and administration.

ODS elimination programmes for non-Article 5 countries are funded under the GEF which uses approval criteria similar to those followed by the MP-MLF Secretariat and ExCom.



TOP ROW: CFC-12 RECOVERY-RECYCLING CYLINDERS IN BRAZIL. PHOTO BY ANDERSON ALVES, UNDP/MPU.

BOTTOM ROW: TESTING OF CFC RECYCLING BAGS. PHOTO BY BRAZIL NATIONAL OZONE OFFICE.

<sup>5</sup> UNDP, UNEP, UNIDO and the World Bank.



## Programme Impact

By September 2014, UNDP had assisted partner countries access \$690.6 million in funding from the MP-MLF (for Article 5 developing countries) and \$42.5 million from the GEF (for non-Article 5 countries) to eliminate ozone depleting chemicals. UNDP support has assisted 120 countries eliminate 67,870 tonnes of ozone-depleting substances while simultaneously reducing 5.08 billion tonnes of CO<sub>2</sub>-equivalent greenhouse gas emissions as Table 1 shows:

**Table 1: UNDP's Montreal Protocol Programme Impact (1991-2014)**

| Funding Source | ODP Tonnes Eliminated | Projects | Countries | Total Grant Value (\$ million) | Cumulative Climate Benefits (billion tonnes of CO <sub>2</sub> -eq reduction) |
|----------------|-----------------------|----------|-----------|--------------------------------|---|
| MLF            | 65,975.9              | 2291     | 105       | 690.61                         | 4.93  |
| GEF            | 1,894.0               | 40       | 15        | 42.5                           | 0.15  |
| Total          | 67,869.9              | 2,331.0  | 120       | 733.1                          | 5.08  |

In 2013, MPU mobilized approximately \$35 million in funding from the MP-MLF. Of UNDP's 2,291 MP-MLF funded projects, 2,130 have been completed and 161 projects valued at \$177 million are ongoing.

A detailed list of all Article 5 developing countries that UNDP's MP programme has been active in under the MP-MLF along with number of approved projects, grants received and ODP tonnes eliminated is shown in Table 2.

A detailed list of all non-Article 5 countries that UNDP's MP programme has been active in under the GEF along with number of approved projects, grants received and ODP tonnes eliminated is shown in Table 3.

预览已结束，完整报告链接和二维码如下：

[https://www.yunbaogao.cn/report/index/report?reportId=5\\_11962](https://www.yunbaogao.cn/report/index/report?reportId=5_11962)

