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OZONE PROTECTION & CHEMICALS SERIES

PHASING OUT OZONE-DEPLETING SUBSTANCES: **PROTECTING THE OZONE LAYER AND SAFEGUARDING THE GLOBAL CLIMATE**

UNDP Environment & Energy Group

The **Montreal Protocol** *& Climate Change Mitigation*

Activities undertaken in support of the Montreal Protocol have resulted in greenhouse gas reductions equivalent to several billion tonnes of CO_2, making the Protocol a key contributor to the global fight against climate change.

The 1987 Montreal Protocol on Substances that Deplete the Ozone Layer, which sets targets for eliminating by 2010 the production and consumption of a range of ozone depleting substances (ODS), principally the chlorofluorocarbons (CFCs), has contributed to reversing the damage done to the ozone layer. Although challenges remain, the Montreal Protocol has been recognized as a global success, demonstrated by the massive reductions in ODS use worldwide since it came into force. By its 20th anniversary in September 2007, the Montreal Protocol had succeeded in facilitating the sustainable phase-out of over 95 percent of the ozone depleting substances it was designed to control.

In addition to depleting the ozone layer, most ozone depleting substances controlled by the Montreal Protocol are also powerful greenhouse gases. For example, the Global Warming Potential (GWP) of the most commonly used CFCs is 4,000-10,000 times greater than for carbon dioxide (CO_2) (See table 1). As a result, technical and scientific assessment panels under the ozone protection and climate change regimes have noted that the global decline in ODS emissions, as a result of activities undertaken in support of the Montreal Protocol, have resulted in greenhouse gas reductions equivalent to several billion tonnes of CO_2 (CO_2e). These significant reductions make the Montreal Protocol a key contributor to the global fight against climate change.

However, challenges still remain, as many of the chemicals used as substitutes for CFCs also have high Global Warming Potential. Some hydrochloroflorocarbons (HCFCs), the most common substitutes for CFCs, have up to 2000 times greater Global Warming potential than CO_2 (See Table 1). At the time the substitutes were introduced it was acknowledged that they contribute to climate change, but given their significantly lower ozone

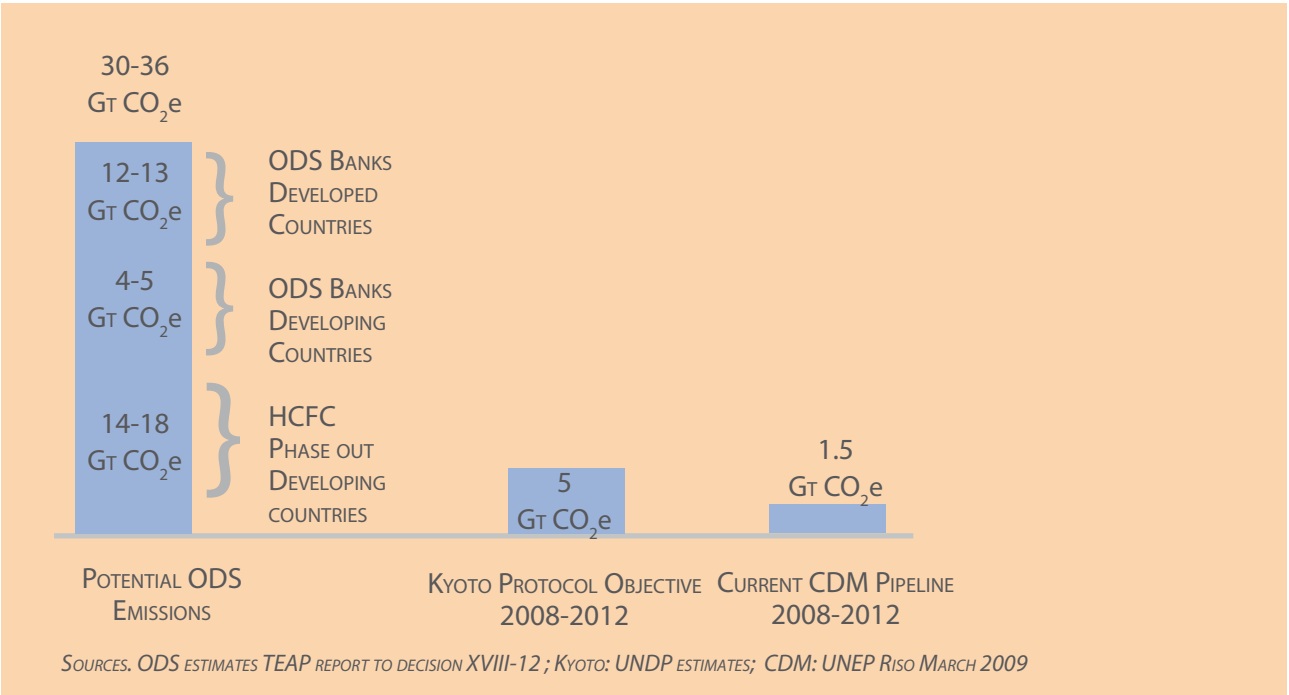
Table 1: GWP and ODP of the most commonly used ODS (compared to CO_2)[2]

Substance	Global Warming Potential (GWP, 100Yr)	Ozone Depleting Potential (ODP)
CO_2	1	0
CFC-11	4,750	1
CFC-12	10,900	1
HCFC-22	1,810	0.055
HCFC-141b	725	0.11
HCFC-142b	2,310	0.065

depleting- and global warming potential they were critical to ensuring a smooth transition away from CFCs. With the dramatic increase in the production and consumption of HCFCs over the past two decades, the threat from these chemicals to the ozone layer and climate change has become more imminent. In addition, the ODS in existing stockpiles of chemicals and products that are being discarded because they are no longer useful or replaced in connection with energy efficiency programs, so called 'ODS banks[1]', threaten to leak into the atmosphere, potentially jeopardizing the repair of the ozone layer and posing significant threats to the global climate.

These challenges moved the Parties to the Montreal Protocol to accelerate the phase-out schedule for HCFCs in 2007 (Decision XIX/6) and to instruct the Multilateral Fund (MLF) to finance pilot projects in developing countries for the destruction of ODS banks.

Figure 1: The Potential GHG Impact of Ozone Depleting Substances (ODS)



Sources. ODS estimates TEAP report to decision XVIII-12 ; Kyoto: UNDP estimates; CDM: UNEP Riso March 2009

[1] "Banks are the total amount of substances, contained in existing equipment, chemical stockpiles, foams and other products, not yet released to the atmosphere." Source: IPCC/TEAP, 2005: *Safeguarding the Ozone Layer and the Global Climate System: Issues Related to Hydrofluorocarbons and Perfluorocarbons.*

[2] Sources: IPCC, 2007: *Climate Change 2007: The Physical Science Basis*. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, and UNEP, 2000: *Handbook for the International Treaties for the Protection of the Ozone Layer*. Fifth Edition.

The adjustment to the Montreal Protocol to accelerate the phase-out of HCFCs will not only contribute to ozone layer protection but will also result in the mitigation of 14-18 billion tonnes of CO_2e, assuming that alternatives with low, or no, climate impact can be found. The Technology and Economic Assessment Panel (TEAP) estimated that 4 to 5 billion tonnes of CO_2e are currently contained in ODS banks in developing countries with an additional 12-13 billion tonnes of CO_2e in ODS banks in developed countries.

Consequently the phase-out of HCFCs and destruction of ODS banks has the potential to reduce 30-36 billion tonnes of CO_2e emissions over the next two to three decades as illustrated in Figure 1. By comparison the Kyoto Protocol is targeted to result in reduced emissions of 5 billion tonnes CO_2e over the period 2008-2012, and the Clean Development Mechanism (CDM) currently has a pipeline totaling 1.5 billion tonnes CO_2e. The impact on climate change mitigation from actions taken under the Montreal Protocol is clear and striking.

UNDP's Role in Phasing Out HCFCs

HCFCs were due to be phased out in developed and developing countries by 2030 and 2040, respectively. Under the adjusted Montreal Protocol from 2007, HCFCs will be fully phased out in 2020 by developed countries and in 2030 by developing countries, allowing only a small percentage to be used for servicing purposes until 2040 (see Table 2).

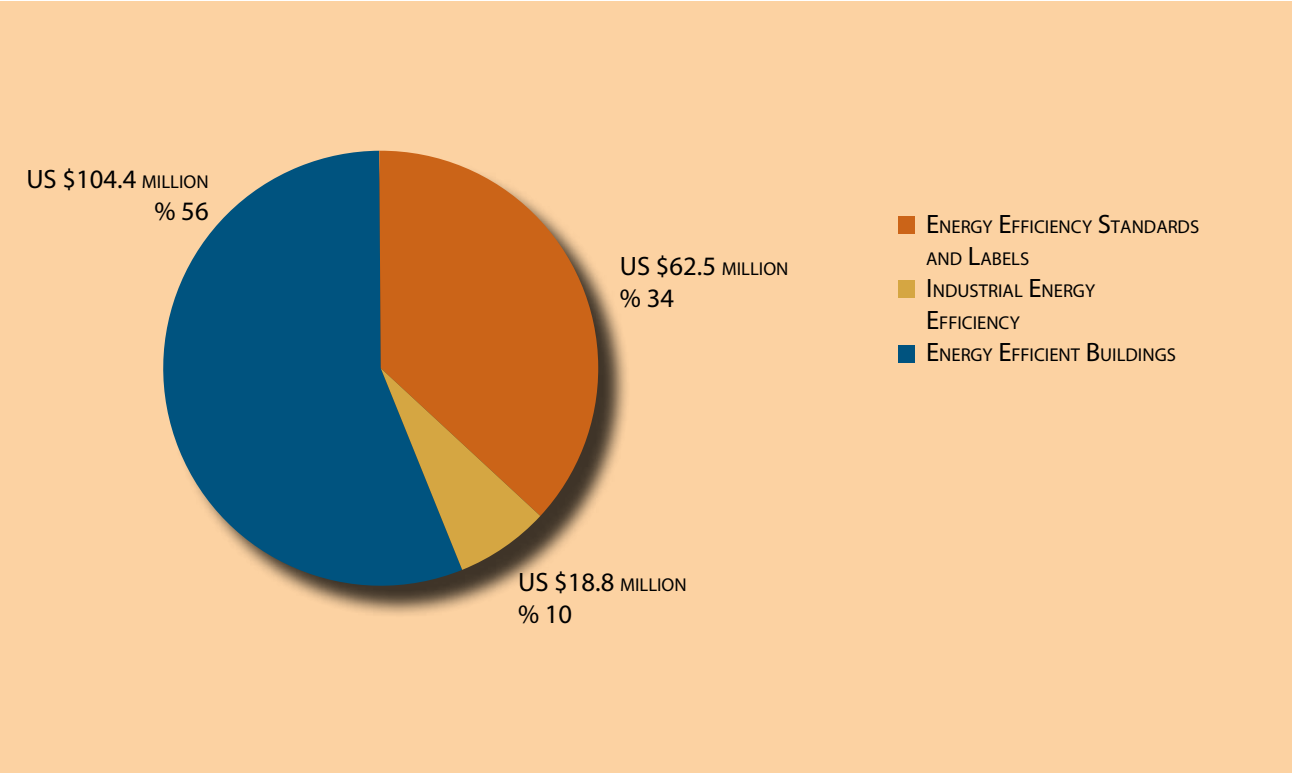
For developing countries the first two HCFC control steps are a 2013 "freeze" of HCFC production and consumption (the baseline being the average of 2009 and 2010 levels) and a subsequent reduction of 10% by 2015 (See Table 2). This will be a significant challenge as the consumption of HCFCs is expected to increase over the next few years in many developing countries before it must start to decline.

In order to achieve these reductions, the Montreal Protocol implementing and bilateral agencies are helping developing countries to prepare and implement their HCFC Phase-Out Management Plans (HPMPs), with financial assistance from the Multilateral Fund (MLF) - the financial mechanism set up to assist developing countries to meet Montreal Protocol compliance targets. UNDP is the lead agency for preparation of the HPMPs in 30 developing countries. The consumption of HCFCs in these 30 countries represents 77% of the total consumption of HCFCs globally. UNDP is also preparing HPMP investment components for the conversion of products to non-HCFC alternatives in several manufacturing sectors, including the foam, refrigeration and air-conditioning, and solvents sectors.

Table 2: Phase-Out Schedule for HCFCs for Developed and Developing Countries

HCFC Phase-Out Dates (2013 and beyond)	Non-Article 5 Countries (Developed Countries)	Article 5 Countries (Developing Countries)
2013	n/a	Freeze production and consumption based on the average of the 2009 and 2010 levels
2015	Reduce HCFCs by 90%	Reduce HCFCs by 10%
2020	Complete phase out of HCFCs, allowing 0.5% for servicing purposes during the period 2020-2030	Reduce HCFCs by 35%
2025	n/a	Reduce HCFCs by 67.5%
2030	n/a	Complete phase out of HCFCs, allowing 2.5% for servicing purposes during the period 2030-2040

Figure 2: UNDP-GEF's Active Portfolio on Energy Efficient Appliances , Industrial Energy Efficiency and Energy Efficient Buildings (Total: US $185.7 million (excluding co-finance) for 47 projects in 39 Countries)



Note: The portfolio numbers shown here only include projects that target refrigerators, air conditioners, chillers etc. and deliberately exclude projects focusing on other appliances (such as energy efficient lighting, motors etc.).

UNDP's Role in Managing ODS banks and Financing Opportunities

In response to the instruction from the Parties to the Montreal Protocol, the Multilateral Fund approved six pilot projects for ODS bank destruction at its 57th meeting in March 2009. UNDP will be implementing two of these, one in South America (Brazil) and one in Africa (Ghana). These pilot projects will be instrumental in helping to determine the economic feasibility of collection and destruction strategies, and their results will help identify and secure funding necessary to collect and destroy ODS banks on a larger scale.

Opportunities for Financing ODS Destruction Projects

ODS destruction projects/programmes involve a range of stakeholders from both the public and private sectors and, depending on the scope, can be quite complex, with a multitude of new challenges to be overcome. In addition, some countries are also pursuing early retirement programmes aimed at energy savings through the replacement of older appliances for more energy efficient ones, which may accelerate the accumulation of ODS banks, which require sound management. When financing an ODS destruction project/programme, it is therefore critical to identify other ongoing related programmes and associated sources of funding. The Global Environment Facility is one source of additional funding, through its programme to remove barriers to transform the market for energy efficient products/ buildings (see Figure 2 for a summary of UNDP-GEF's active portfolio in this area). There is also a possibility to combine and sequence this GEF financing with carbon finance credits generated from ODS destruction through the voluntary carbon market. Other sources of funding can include tax cuts, subsidies from power distribution

companies, private and public sector investments, loans, national budgetary sources and funds from non-governmental organizations, foundations etc.

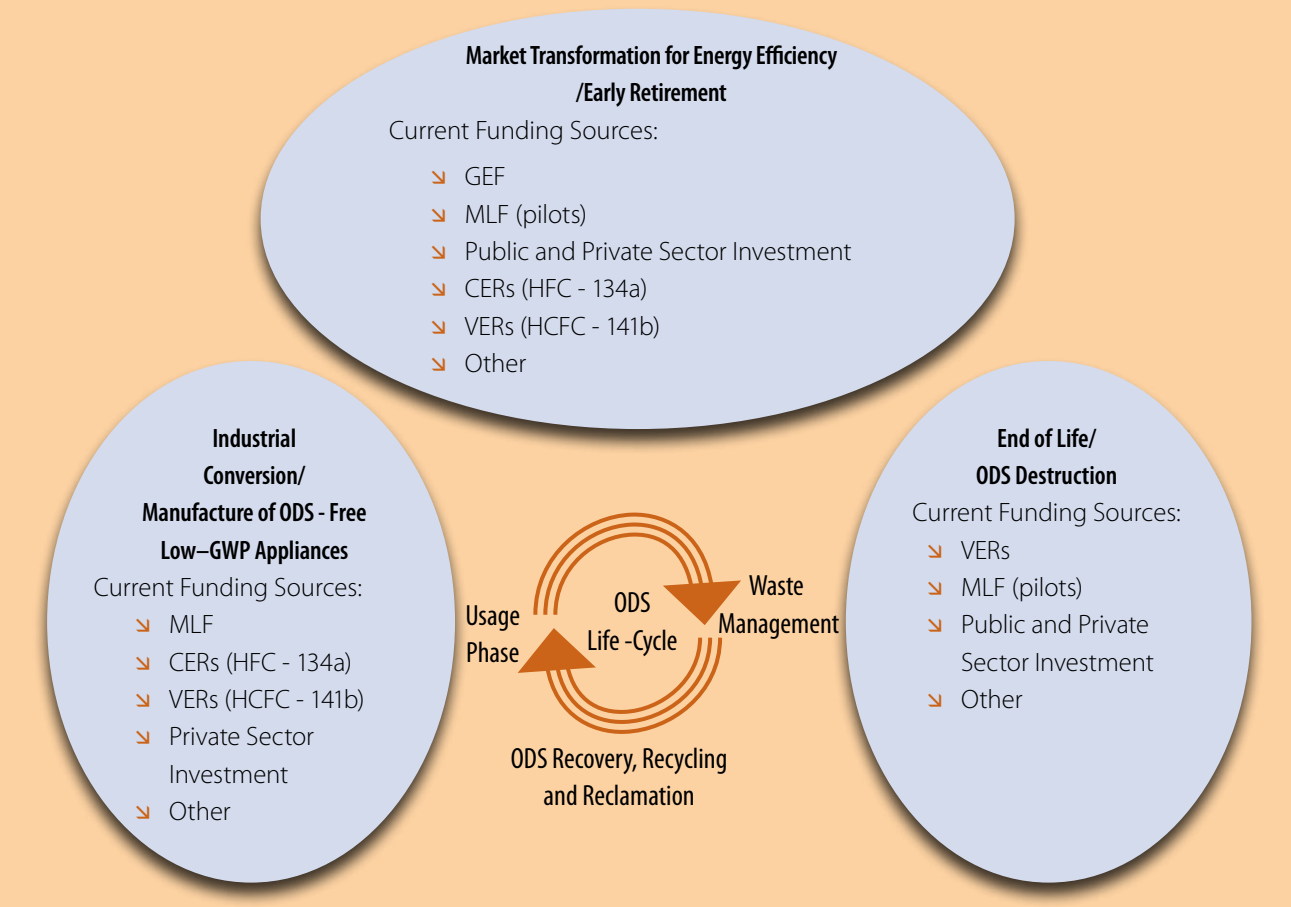
If these various sources of funds are properly combined and sequenced, the recovery and destruction of ODS can become financially viable with significant benefits to the climate change regime.

Combining & Sequencing Environmental Finance in the Life-Cycle of ODS Products

Various sources of funds need to be identified and harnessed throughout the entire ODS product life cycle (just as required for the ODS destruction pilots described in the previous section). Figure 3 depicts how funds can be combined and sequenced throughout the full domestic refrigeration sector product life-cycle, from manufacture to the end-of-life.

The figure highlights the important role of MLF financial assistance in this process. As for the conversion away from CFCs, the MLF continues to be critical for financing the industrial conversion away from HCFCs. For instance, in the manufacturing phase, the MLF has funded the incremental cost of the technology conversion of refrigeration products such as fridges; in the usage phase the MLF funds were used for the recovery, recycling and reclamation schemes associated with the servicing of those products; in the equipment replacement phase, the MLF has funded end-user incentives projects and chillers demonstration projects and finally in the disposal/end-of-life phase, the MLF recently approved funding for pilot destruction projects. Complimented with other sources of funds, MLF investments are

FIGURE 3: COMBINING & SEQUENCING ENVIRONMENTAL FINANCE IN THE LIFE CYCLE OF A DOMESTIC REFRIGERATOR



Acronyms ODS, Ozone Depleting Substance; MLF, Multilateral Fund for the Implementation of the Montreal Protocol; GEF, Global Environment Facility; CERs, Certified Emission Reductions (carbon finance compliance market); VERs, Verified Emission Reductions (carbon finance voluntary market) ; GWP, global warming potential

very important catalysts for change and on many occasions have helped mobilize additional sources of funding for the components of the conversion process that were not-eligible for funding under the MLF. MLF funds are therefore critical in ensuring the smooth phase-out of HCFCs, just as they were in the phase-out of CFCs.

The GEF provides an important source of financing for countries with economies in transition, where it assumes the task of the MLF. GEF funding is also more flexible and can provide additional finance for enabling projects and feasibility studies, which would not qualify for MLF funding.

Leveraging carbon finance is more complex. It is important to note that CFCs and HCFCs are not regulated under the Kyoto Protocol (KP). Hence, except for energy efficiency-related emission reductions, CFC and HCFC based emission reductions cannot be traded in the compliance market under the Kyoto Protocol (they do not qualify for "Certified Emission Reductions" (CERs) under the CDM or "Emission Reduction Units" (ERUs) under JI). While CFC and HCFC emission reductions could potentially be traded in the voluntary carbon market (CFC and HCFC emission reductions can qualify for "Verified Emission Reductions" (VERs)), the purchase prices offered for VERs are generally much lower than those offered for CERs. Furthermore, VERs cannot secure upfront payment to cover capital, operation or transaction costs. It is therefore necessary to explore the potential combination and sequencing of different funding sources to cover immediate and deferred costs.

Examples of how UNDP is helping countries combine and sequence funds, for the implementation of ODS pilot destruction projects, can be downloaded from our website at: www.undp.org/chemicals

UNDP Assistance to Combine and Sequence Finance for Ozone Layer and Climate Protection

UNDP aims to assist relevant stakeholders in combining and sequencing various sources of finance to support ozone layer protection and climate mitigation efforts. Through the provision of financial and technical solutions UNDP assists governments in transforming the markets, removing barriers for the introduction of energy efficient, ozone and climate friendly products and helps enterprises avoid job losses. UNDP does this by drawing on its expertise in a number of related areas:

- **Multilateral Fund for the Implementation of the Montreal Protocol (MLF)**. UNDP is one of the implementing agencies (along with the World Bank, UNEP, UNIDO and bilateral agencies). UNDP has a US$ 500 million programme funded by the MLF and has successfully assisted countries and their enterprises, large, medium and small, in their technology conversion processes, by providing the required technical assistance and policy advice. www.undp.org/chemicals

- **Global Environment Facility (GEF).** UNDP is one of the implementing agencies of the GEF and has a portfolio of climate change mitigation/ energy efficiency projects funded through the GEF. UNDP-GEF's Active Portfolio on Energy Efficient Appliances, Industrial Energy Efficiency and Energy Efficient Buildings totals US $185.7 million (excluding co-finance) and includes 47 projects in 39 Countries (see Figure 2). www.undp.org/gef/portfolio/cc.html

- **UNDP MDG Carbon Facility.** UNDP has direct experience in developing and commercializing carbon finance projects under the Clean Development Mechanism (CDM) through the MDG Carbon Facility, and is currently piloting projects in the voluntary market. www.mdgcarbonfacility.org

- **UN-REDD:** UNDP is one of the partner agencies implementing pilot projects, and providing support to the international dialogue on the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UN-REDD Programme). There are a number of parallels between UN REDD, with a fund-based model, and possible developments for ODS carbon finance activities. www.un-redd.org