

# **Past Successes and Future Opportunities**

## **Case Studies from the UNDP Portfolio and Innovative Approaches to Cooling without Warming**

**Montreal, 20 Nov. 2017**

# TOPICS

- **30-Year MP Retrospective**
- **Impact of UNDP's MP programme**
- **The MP and the SDGs**
- **Technology Demonstration Projects**
- **Technology Advancement**
- **Agriculture/Fisheries/Health**
- **District Cooling**
- **Technician Training & Certification**
- **South-South Cooperation and Gender Aspects**
- **Promoting Energy Efficiency & ODS Phaseout across Funds and Agencies**
- **Looking Forward**

# **30-Year MP Retrospective (1)**

## **Why has the MP been so Special?**

- **Focused**
- **New area of work and scientific consensus**
- **Speed of technological innovation amazing!**
- **Chemical suppliers on board, so win-win outcomes**
- **Stress on - and funding for - capacity building, training & institutional development ensured sustainability**
- **Developed-Developing country cooperation**
- **Special handling for SMEs**

# **30-Year MP Retrospective (2)**

## **MP, Climate Change, Kigali Amendment**

- **ODS have high GWPs - eliminating them helps mitigate climate change. The Economist (Sept. 2014) reported that during 1989-2013 the MP had reduced cumulative CO2 eq. emissions by 130-135 billion tonnes – a significant achievement!**
- **197 countries adopted the Kigali Amendment on HFCs at MOP-28 (Oct. 2016) which would eliminate 80 bn tonnes of CO2 eq. emissions from HFCs by 2050. Increased energy efficiency of appliances and equipment a key operational modality.**
- **Fast start funding (\$27 mln), K-CEP (\$52 mln). MLF ExCom (July 2017) approved EAs to support early ratification, will consider stand-alone inv. projects.**

# **30-Year MP Retrospective (3)**

## **Reflections on the HPMP Process**

- **HPMPs are performance-based agreements between countries & MLF ExCom comprising technology & policy interventions to phase out HCFCs as per MP control targets.**
- **UNDP is implementing 47 HPMPs in larger, mid-size & smaller ODS consuming countries.**
- **In LVCs policy interventions include legislation, licensing/quotas, customs control, and targeting the ref. servicing sector.**
- **For larger ODS consumers, low-GWP options in the foam, ref. and solvent sectors are also critical.**

# UNDP MP Portfolio



**Multilateral Fund**  
for the Implementation of the Montreal Protocol



**gef** GLOBAL ENVIRONMENT FACILITY  
INVESTING IN OUR PLANET

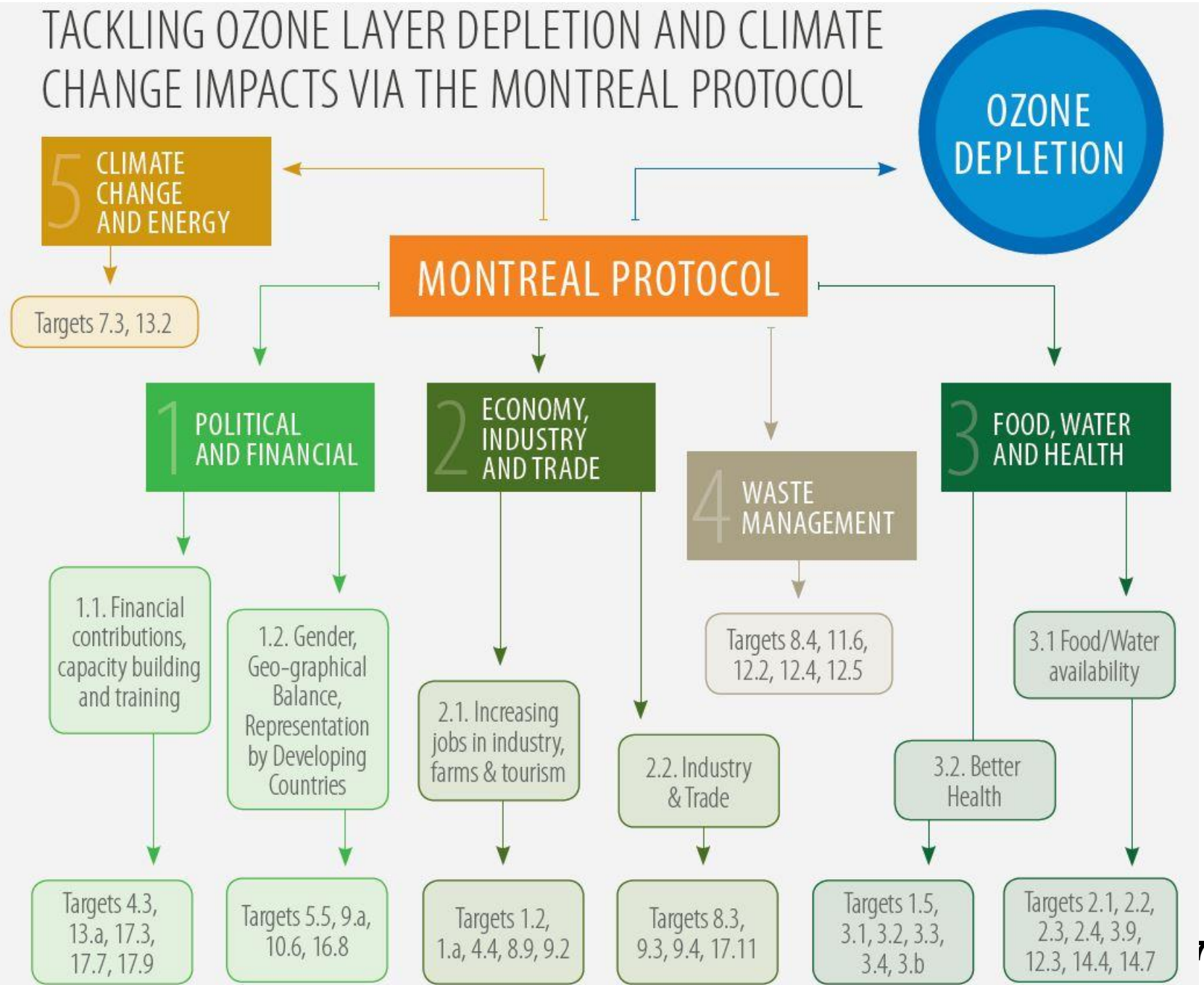
PROJECTS, no.	<b>1,981</b>	<b>40</b>
COUNTRIES, no.	<b>105</b>	<b>15</b>
GRANT VALUE, \$ mln.	<b>632</b>	<b>43</b>

**52,679.90  
ODP tonnes  
eliminated**



**6.48 billion  
tonnes of CO2-  
eq. reduced**

# TACKLING OZONE LAYER DEPLETION AND CLIMATE CHANGE IMPACTS VIA THE MONTREAL PROTOCOL



# OVERALL IMPACT OF THE MONTREAL PROTOCOL



## HEALTH

The following health benefits for those born between 1890 and 2100 in the United States<sup>9</sup>:



**283 MILLION**

cases of skin cancer prevented,  
8.3 million of which are melanoma.



**1.6 MILLION**

deaths from skin cancer prevented.



**46 MILLION**

cases of cataracts prevented.

At a global level, up to 2 million cases of skin cancer may be prevented each year by 2030, along with additional avoided cataracts cases.



## CLIMATE

The Montreal Protocol has so far averted estimated emission of around **130-135 BILLION** tonnes of CO<sub>2</sub> equivalent<sup>10</sup>.



## ECONOMY

Among the economic benefits of the Montreal Protocol are savings in healthcare costs. Reducing the number of skin cancer cases could save billions of dollars across the globe. In the United States alone, research published by the Centers for Disease Control and Prevention in November 2014 revealed that the average cost of treating **4.9 MILLION** adults for any skin cancer each year reached \$8.1 billion between 2007 and 2011.<sup>9</sup>



# Technology Demonstration Projects

## Replacing HCFC-22 with Ammonia/CO2

- **Yantai Moon - the first Chinese company to carry out CO2 subcritical R&D – completed its transition in 2013 with MLF financing and UNDP assistance. Significant energy efficiency savings, 250t of HCFC-22 eliminated and GHG emissions reduced by 425,000t CO2 eq.**
- **Pre-Mezclas industrials de Panaderia (Costa Rica) used a 2-stage process with a reduced ammonia charge in the primary cooling circuit and liquid CO2 circulated as secondary cooling at subcritical pressure with MLF funding and UNDP assistance.**
- **Even with reduced risks, ammonia is a toxic substance and both companies have adopted strict standards to ensure safe operation.**

# Technology Demonstration Projects

## Conversion from HFC-134a to Isobutane

- **Walton Hi-Tech Industries (Bangladesh) had a bilateral project with the USA with UNDP assistance to convert a HFC-134a ref. production line to isobutane in 2015.**
- **In 2017, Walton is working with UNDP on a request to the MLF/ExCom to do a similar conversion for three domestic ref. manufacturing lines and a compressor manufacturing facility.**
- **The project will phaseout 197.3t of HFC-134a in mfg. and 33.3t in servicing. Emission reduction of 282,000t of CO<sub>2</sub> eq.**
- **Walton is making a special effort to increase the number of female technicians employed in the project.**

# Technology Demonstration Projects

## Testing HFO/CO<sub>2</sub>/Water in Foam Applications

- In **Colombia**, Espumlatex (system house) and ABC Poliuretanos (SME) teamed with UNDP to test various HFO/Water/CO<sub>2</sub> combinations to optimize the cost/performance balance for discontinuous foam panels in ref. trying to match previous foam thermal performance using HCFC-141b.
- Two HFO molecules – 1233zd(E) from Honeywell or Arkema and 1336maam(z) from Chemours - were tested with HFO and water going from 100% to zero and with CO<sub>2</sub> derived from the water-isocyanate reaction as a co-blowing agent.
- The testing will end Dec. 2017 and the results and findings will be shared in an international workshop.

# Technology Demonstration Projects

## Testing Ammonia Semi-Hermetic Compressors

- **Fujian Snowman (China) and UNDP are testing the use of lower ammonia charge (under 50 kg) with CO<sub>2</sub> as a secondary refrigerant for semi-hermetic frequency screw ref. compressors.**
- **The product is being redesigned to fit the smaller discharge compressors for low-temp applications and redesign of all components is required. This is the first demonstration for this particular application, so full testing and documentation, training and market promotion are essential.**
- **The project will eliminate 359t of HCFC-22 and reduce GHG emissions by 1.04 million tonnes of CO<sub>2</sub> eq.**

# Technology Demonstration Projects

## Transcritical CO2 Refrigeration Systems

- **Chile** is a CCAC (Climate & Clear Air Coalition) partner and received a \$482,790 CCAC grant to test the adoption of transcritical CO2 ref. systems as alternatives to HFC use in supermarkets in Chile.
- UNDP trained ref. technicians in use of transcritical CO2 ref. systems for supermarkets, and organized a study tour to Italy for hands-on practical training.
- The first transcritical CO2 ref. system was installed at Jumbo supermarket in Valdivia, Chile, followed by a second one. 8 new supermarkets should be running similar CO2 systems in 2018.

# Technology Advancement

## Replacing HCFC-141b with Cyclopentane in Ref.

- **Palfridge is Swaziland's premier ref. manufacturing company and exports to other SADC countries also. The MLF first financed the conversion of foam ref. panels from HCFC-141b to cyclopentane as blowing agent through UNDP. Safety issues were a problem for this small, landlocked LVC but were overcome with safety training and appropriate equipment.**
- **Palfridge – with GIZ/Proklima support – then converted their full line of refrigerators to use hydrocarbon refrigerants.**
- **By 2015 Palfridge was 100% ODS-free and has expanded the number of green jobs in Swaziland.**

# Technology Advancement

## Low-cost, small capacity foam machines for SMEs

- **India** has hundreds of foam SMEs who used CFC-11 as blowing agent on old, inefficient foaming machines producing jugs, flasks, hot/cold cases, etc.
- **UNDP** developed an umbrella project for 122 SMEs working with a local foam machine manufacturer to design low-cost, small-capacity, simple and efficient CFC-free foaming machines and trained SME staff on technical issues and operational use.
- This helped the SMEs remain viable entities, saved over 2,000 jobs and received an Exemplary Project Award at the MP 20th Anniversary in Sept. 2007.

# Technology Advancement in foam conversion projects

- **Since 2007, UNDP demo projects have validated the use of methyl formate and methylal as alternatives. In **LAC**, to reach downstream SME foamers, UNDP pioneered the use of System Houses which develop, test and sell foam systems and provide technical advice. This has been very cost-effective and works well in the 12 LAC countries and Egypt as described.**
- **To eliminate remaining HCFC use in **Mexico's** XPS foam sector, HFO-1234ze was found to be the most viable option (lowest climate impact, acceptable physical properties). Final choice was 60% HFO-1234ze & 40% DME (emulsifier for proper blending). As DME is moderately flammable, safety precautions were introduced. This project eliminated 168t HCFC-142b, helping Mexico on its HCFC phaseout efforts.**



# Technology Advancement

## ODS phaseout in China's solvent sector

- **China's** solvent sector has some larger enterprises and thousands of SMEs, covering electronics, medical appliances, aviation, textiles, automobiles, etc.
- **After eliminating CFC-113 in 18 larger units, UNDP helped China develop the Solvent Sector ODS Phaseout Plan covering 3,200 users (many SMEs) through 14 group projects including quotas, policies, training and technical assistance. 4,031 tonnes ODP eliminated during 2000-2010 meeting ExCom targets.**
- **From 2011 under HPMP Stages 1 and II, HCFC use is being replaced with non-ODS alternatives and will reduce GHG emissions by 11.3 million tonnes CO<sub>2</sub> eq.**

# Agriculture/Fisheries/Health

- **Maldives:** UNDP is assisting Maldives test HCFC-free low-GWP alternatives in its fishing fleet, and the results of this project could provide valuable experiences for fishing fleets in other SIDS.
- **Sri Lanka:** UNDP assisted Sri Lanka eliminate use of methyl bromide for eradication of tea nematodes through a combination of ozone-friendly alternatives, resulting in the “Ozone Friendly Pure Ceylon Tea” logo.
- **Bangladesh and India:** Replacing CFC-based MDIs (metered dose inhalers) with HFA (hydrofluoroalkane) MDIs after extensive testing by UNDP for several million asthma and COPD patients. A total of 780 ODP tonnes of CFCs were eliminated, productivity increased and health safeguarded, especially in rural areas.

# District Cooling

- **District Cooling distributes cooling energy from a central source for a/c in a district and could be an important component under the MP Kigali Amendment.**
- **UNDP is assisting three countries in their district cooling feasibility studies:**
  - **Dominican Republic: Punta Cana District Cooling Feasibility Study**
  - **Maldives: Hulhumale District Cooling Feasibility Study**
  - **Colombia: District Cooling is the “La Alpujarra” District in Medellin.**
- **Costa Rica and UNDP organized a District Cooling Workshop (May 2017) with 60 participants and presentations by DEVCCO (Sweden), K-CEP & UNDP.**

# Technician Training & Certification

- **Malaysia:** with UNDP assistance developed the e-Certification Service Technician Programme under HPMP Stage I in 2016. The online reference system provides training, exams and details the qualifications and experience of RAC service technicians.
- **Trinidad & Tobago:** with UNDP assistance, the National Training Agency developed a Professional Certification Course for RAC Technicians and the certification scheme is described online.
- **Uzbekistan:** with UNDP assistance and GEF funding, over 700 RAC technicians have been trained in servicing, 5 recovery/recycling centers established, handbooks translated into the Uzbek language, and those trained now acting as trainers themselves.

# South-South Cooperation

- **India and China:** In Aug. 2017, UNDP's China & India Offices arranged for 14 Indian SMEs to attend a workshop in Beijing with FECO/MEP and then visit 5 foam enterprises in Zhejiang province for hands-on practice spraying/cutting foam blocks using alternative technologies and learning from China's experience.
- **LAC:** at the 2013 Brazilian RAC Technical Congress, UNDP sponsored NOU officers from 7 LAC countries and UNEP sponsored Portuguese-speaking Africa NOUs to learn about HCFC-22 replacement technologies (e.g. CO<sub>2</sub>, ammonia and hydrocarbons). Field visits to local companies using the alternatives were arranged.
- **Malaysia:** A Consultative Foams Workshop was held in Aug. 2017 in Kuala Lumpur with presentations to raise awareness on alternative technologies and with site visits to 20 enterprises using alternative technologies<sub>21</sub>

# Gender Aspects

- **Peru:** Since 2016, Peru has conducted workshops for RAC technicians but few women participated since only males were depicted in promotional materials. So the NOU and UNDP conducted a training workshop in 2017 for 35 female RAC technicians. The instructor felt they were more dedicated and careful than the men, especially when dealing with flammable substances.
- **El Salvador:** At RAC Technician Training Workshops, the NOU found that men were often accompanied by their wives who ran the business part of the operation. So the NOU and UNDP designed a training programme in Oct. 2017 for the spouses on the Montreal Protocol, financial matters and basic marketing to increase the profitability of their micro enterprises.

# Energy Efficiency & ODS Phaseout (1)

- **Ghana (MLF, GEF, UNDP):** This project promoted energy efficiency while transforming the ref. appliances market. The MLF financed a demo project to replace CFC-using refrigerators/freezers while GEF and the govt. had a old ref. turn-in and get a rebate on a new one aspect. Collected ODS were destroyed. Good example of MLF and GEF working efficiently together.
- **Belarus (GEF, UNDP):** Santa Bremor – a large producer of high-quality food products – substituted HCFC-22 use by using an ARM (absorption refrigerating machine) which transforms waste heat from the factory into cold air used for food processing and storage.
- **Tajikistan (GEF, UNDP):** Working with Tajik mobile operators (Babilon-Mobile, Megafon, Tcell), the new equipment significantly improved energy efficiency and decreased HCFC leakages.

## Energy Efficiency & ODS Phaseout (2)

- **Cuba (MLF, Canada, UNDP):** 9 very old, inefficient CFC chillers were replaced with new efficient CFC-free chillers from Canada (Smardt) at key institutions including hospitals and laboratories. Smardt provided training and maintenance instructions. Hospital surgery and intensive care rooms now have reliable cool air benefitting patient health.
- **Indonesia (MLF, Australia, UNDP):** Phase I of the HPMP has a bilateral component “Product Stewardship Programme” where the refrigerant handling code of practice of Australia and New Zealand was translated into Bahasa Indonesia, a safety guide was also translated, national ref. standards developed, and a web-based Refrigerant Monitoring Tool (MAWAS) created. UNDP worked closely with Australia and the Govt. in developing all the above products.



## **Looking Forward UNDP will:**

- **Continue supporting recipient countries meet their 2020 and 2025 HCFC phaseout targets.**
- **Continue working with both MLF and GEF countries as well as countries covered under other funding arrangements (e.g. CCAC, K-CEP).**
- **Assist recipient countries in utilizing the newer technologies (e.g. safety standards, special-order parts, innovative approaches, low-GWP approaches).**
- **For the Kigali Amendment, assist countries, on request, in development of national strategies, continue HFC alternative demo projects, continue the energy efficiency thrust, help countries integrate HFC phaseout with energy efficiency plans, work with other funding partners, promote South-South and Gender issues, and follow developments in the A/C sector.**