



**REPUBLIC OF ANGOLA**  
**GOVERNMENT OF ANGOLA**

**Hydrochlorofluorocarbon**  
**Phase-out Management Plan**  
**(HPMP)**

**Lead Implementing Agency:** UNDP  
**National Executing Agency:** Ministry of Environment  
National Ozone Unit

Luanda, Angola, August 2011

<b>PROJECT COVER SHEET</b>			
<b>COUNTRY NAME</b>		<b>REPUBLIC OF ANGOLA</b>	
<b>LEAD IMPLEMENTING AGENCY</b>		<b>UNDP</b>	
<b>CO-OPERATING IMPLEMENTING AGENCY</b>			
<b>SUBMISSION OF COMPLETE DOCUMENTATION</b>			
<b>Document</b>	<b>Yes/No</b>	<b>Comments</b>	
Letter of transmittal	Yes		
HPMP	Yes		
Draft agreement	Yes		
MYA tables (on-line)	In process		
Technical review (where applicable)	n/a		
Executive summary	Yes		
<b>DATES OF RATIFICATION OF AMENDMENTS TO THE PROTOCOL</b>			
<b>Copenhagen</b>	<b>23 June 2011</b>	<b>Beijing</b>	<b>23 June 2011</b>
<b>Comments: 4 Amendments approved by National Assembly (Resolution n°5/11 March 2, 2011)</b>			
<b>HCFC REGULATIONS IN PLACE</b>			
<b>Regulation</b>	<b>Yes/No</b>	<b>Comments</b>	
HCFC regulation	Yes		
HCFC licensing system	Yes		
HCFC quota system	Yes		
<b>SUBMISSION OF ODS DATA REPORTS</b>			
<b>Report</b>	<b>Yes/No</b>	<b>Year reported data</b>	<b>Comments</b>
Country programme	Yes	2009	
Article 7 data	Yes	2009	
<b>Calculated HCFC baseline (ODP tonnes)</b>			
<b>Starting point for aggregate reductions in HCFC consumption (ODP tonnes)</b>			
<b>Explain any data discrepancies:</b>			
<b>HPMP DOCUMENT</b>			
<b>Servicing only</b>	<input checked="" type="checkbox"/>	<b>Manufacturing only</b>	<input type="checkbox"/>
<b>Servicing and manufacturing</b>	<input type="checkbox"/>		
<b>Freeze and 10%</b>	<input type="checkbox"/>	<b>Yes</b>	<b>Freeze, 10% and 35%</b>
<b>Main components included</b>			<b>Yes/No</b>
<b>Overarching strategy</b>			<b>Yes</b>
<b>Strategy and action plan for stage I</b>			<b>Yes</b>
<b>Co-financing included</b>			<b>Yes</b>
<b>Impact on the environment</b>			<b>Yes</b>
<b>Implementation work programme and timeframe included</b>			<b>Yes</b>
<b>Implementation modalities (project monitoring unit)</b>			<b>Yes</b>
<b>FUNDING</b>			
<b>Funding consistent with guidelines (servicing sector, cut-off date, second stage, HCFC-141b imported in polyols, cost effectiveness, technology upgrade, foreign ownership, export to non-Article 5 countries)</b>			<b>Yes</b>
<b>Funding of last tranche requested at the last year of implementation:</b>			<b>Yes</b>
<b>Priority given to manufacturing over servicing sector (if applicable)</b>			<b>n/a</b>
<b>Justification for not addressing first HCFC-141b (if applicable)</b>			<b>n/a</b>

## Table of Contents

<b>1</b>	<b>INTRODUCTION</b>	<b>5</b>
<b>1.1</b>	<b>BACKGROUND INFORMATION</b>	<b>5</b>
<b>1.2</b>	<b>ODS POLICY/LEGISLATIVE/REGULATORY AND INSTITUTIONAL FRAMEWORK</b>	<b>6</b>
1.2.1	STATUS OF RATIFICATION OF AMENDMENTS TO THE MONTREAL PROTOCOL	6
1.2.2	ODS LEGISLATION/REGULATIONS	6
<b>1.3</b>	<b>STAKEHOLDERS</b>	<b>7</b>
<b>1.4</b>	<b>ODS PHASE-OUT PROGRAMME</b>	<b>8</b>
1.4.1	REFRIGERATION SERVICING SECTOR	9
1.4.2	ENTERPRISES CONVERTED TO AN HCFC TECHNOLOGY	11
<b>2</b>	<b>HCFC CONSUMPTION DATA</b>	<b>12</b>
<b>2.1</b>	<b>METHODOLOGY AND VALIDATION</b>	<b>13</b>
<b>2.2</b>	<b>HCFC CONSUMPTION DATA</b>	<b>14</b>
<b>2.3</b>	<b>SECTORAL DISTRIBUTION OF HCFC</b>	<b>15</b>
2.3.1	HCFC BASED MANUFACTURING SECTOR	16
2.3.2	REFRIGERATION SERVICING SECTOR	16
<b>3</b>	<b>PHASE-OUT STRATEGY</b>	<b>19</b>
<b>3.1</b>	<b>OVERARCHING STRATEGY</b>	<b>19</b>
<b>3.2</b>	<b>FIRST STAGE IMPLEMENTATION PROGRAMME</b>	<b>20</b>
3.2.1	HCFC REFRIGERATION SERVICING SECTOR PLAN	20
3.2.2	BUDGET OF ACTIVITIES	34
	TIME TABLE	<b>ERROR! BOOKMARK NOT DEFINED.</b>
3.2.3	OTHER IMPACTS ON THE ENVIRONMENT INCLUDING ON THE CLIMATE	36
<b>4</b>	<b>PROJECT COORDINATION AND MANAGEMENT</b>	<b>37</b>
<b>5</b>	<b>ANNEXES</b>	<b>38</b>
<b>5.1</b>	<b>ANNEX 1 – DRAFT AGREEMENT</b>	<b>38</b>

## EXECUTIVE SUMMARY

This document has been prepared to define the Governments commitment and plan to meet the obligations that it has assumed as a Party to the Montreal Protocol (MP) under Decision XIX/6<sup>1</sup> of the Nineteenth Meeting of the Parties that accelerated the phase out of hydrochlorofluorocarbons (HCFCs) in both Article 5 and non-Article 5 countries. Furthermore, it is intend to fulfill the requirements of the Executive Committee (ExCom) of the Multilateral Fund for the Implementation of the MP (MLF) respecting adoption and submission of an HCFC Phase Out Management Plan (HPMP) applied to Article 5 countries seeking MLF financial support.

This HPMP has been prepared by the National Ozone Unit (NOU), with the financial support of the MLF and, with UNDP acting as implementing agency. It has been developed in accordance with the guidance issued by ExCom, specifically the document UNEP/OzL.Pro/ExCom/54/53<sup>2</sup> and ExCom Decision 54/39<sup>3</sup>.

For purposes of the HPMP, Angola is categorized as a Low Volume Country (LVC). Historically, ODS and specifically HCFC consumption has occurred almost entirely in the refrigeration servicing sector and has been almost exclusively HCFC-22. Therefore in a global context, Angola would generally be considered a “servicing only” country.

Consistent with the recommendations of draft ExCom guidance on HPMPs referenced above, a staged approach to the HPMP is taken based on a consumption baseline to be determined by the average consumption officially reported in 2009 and 2010. It involves presentation of a high level long term strategy directed to meeting the 2020 (35% baseline reduction) and 2025 (67.5% baseline reduction) phase out targets and ultimately complete elimination of HCFC consumption in 2030.

However, within this overall strategy, the primary focus of the HPMP is on the actions required to achieve the immediate phase targets of a 2013 freeze at the baseline and 2015 10% reduction of the baseline.

The strategy will focus on 3 main pillars:

- A sub project for the implementation of a regulatory framework, including implementation of a control system for ODS trade, use and handling of equipment and products, enhanced capacity of customs and strengthening of in country capacity to organize technicians;
- A sub project for sensitization of the population involving workshops and awareness campaigns;
- A sub project for RACS, including strengthening of capacities of technicians, provision of equipment and tools, and reinforcement of centers in provision of training;
- A sub project for monitoring, under which costs for consultants, equipment and other items are regrouped.

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<sup>1</sup> [http://ozone.unep.org/Meeting\\_Documents/mop/19mop/MOP-19-7E.pdf](http://ozone.unep.org/Meeting_Documents/mop/19mop/MOP-19-7E.pdf), Page 33

<sup>2</sup> <http://www.multilateralfund.org/files/54/5453.pdf>,

<sup>3</sup> <http://www.multilateralfund.org/files/54/5459.pdf>, Page 43, Annex XIX

## 1 INTRODUCTION

### 1.1 Background Information<sup>4</sup>

Angola is situated along the west coast of the African continent, between the 4.22 and 18.02 degrees Latitude as well as 11.41 and 24.05 Longitude with an area of 1,246,700 square kilometers. The country is bordered by the Democratic Republic of Congo to the North and Northwest, Zambia to the East and, Namibia to the South. In the North-South direction the Angolan territory has a maximum length of 1,277 km, with maximum West –East dimension being 1,236km. Angola’s Atlantic Coast has a length of 1,650 km.

The administration structure is based on 18 Provinces with the City of Luanda as the Capital. Angola’s population is estimated to 13 million habitants. About 70% of this population lives in rural areas and most of the people depend on subsistence agriculture for their livelihood. 69% of the Angola population lives below the poverty line as 40% are unemployed. Like most African countries, rural-urban migration has also been on the increase in Angola. The proportion of people using refrigeration equipment is mostly limited to the urban areas.

The civil war, which lasted almost 25 years, led to a significant decline in Angola’s industrial and agricultural production. However with the prevailing lasting peace, Angola’s economic performance is expected to drastically improve, consequently impact on the ODS consumption levels in the country.



<sup>4</sup> Sources used throughout this section include [www.cia.gov](http://www.cia.gov) and [www.en.wikipedia.org](http://www.en.wikipedia.org) as well as original material from National and International Consultants

## **1.2 ODS Policy/Legislative/Regulatory and Institutional Framework**

Since becoming a Party to the Montreal Protocol, the Federal Government of Angola has relied largely on existing legislation for implementing the ODS phase out programmes and meeting its obligations to the Protocol, in particular through institutional arrangements that take advantage of the relationships of the functions of organizations under those legislations.

As one of the results of the project preparation activities for this HPMP, the Government has, however, recently initiated moves to consolidate these efforts through a comprehensive legal framework that would give legal backing to the implementation mechanism of the phase out programme in accordance with all the relevant protocols.

### **1.2.1 Status of Ratification of Amendments to the Montreal Protocol**

Angola is a party to both the Vienna Convention for the Protection of the Ozone Layer and the Montreal Protocol on Substances that Deplete the Ozone Layer. These were both ratified on 17 May 2000. The National Assembly approved the adherence of Angola to the London, Copenhagen, Beijing and Montreal Amendments to the Protocol through Resolution n°5/11 of March 2<sup>nd</sup>, 2011. The official ratification instrument was forwarded to the UN on 23 June 2011.

**Table 1: Status of Ratification.**

<b>Treaty</b>	<b>Date of ratification</b>
Vienna Convention	17 <sup>th</sup> May, 2000
Montreal Protocol	17 <sup>th</sup> May, 2000
London Amendment	23 <sup>rd</sup> June, 2011
Copenhagen Amendment	23 <sup>rd</sup> June, 2011
Beijing Amendment	23 <sup>rd</sup> June, 2011
Montreal Amendment	23 <sup>rd</sup> June, 2011

### **1.2.2 ODS Legislation/Regulations**

The National Environment Directorate, under the Ministry of Environment is the coordinating institution for the project and provides the logistical and enforcement mechanisms for the regulations. The Department of Environment is the responsible body for awareness raising campaigns to the importers and the general public on ozone related issues as well as of putting regulations in place to control the import of such chemicals into the country, in particular given that Angola does not produce ODS but only imports from other countries. Although already considered successful, additional awareness-raising activities are clearly still required and must in particular be extended to the majority of the population living in the rural areas to ensure the complete phase out of ODS in Angola

The Department of Customs and Excise of the Angola Ministry of Finance is responsible for the enforcement of the regulations. Customs officers and other enforcement officers have been trained and equipped and although only true for a small number of them, skills in monitoring and

identification of ODS and ODS dependent equipment are available. The National Ozone Unit provides policy guidance on the phase out of ODS.

The Angola ODS regulations are in place and have been approved by the Government through Presidential Decree n°153/11 dated 15 June 2011 “approving the Regulations establishing rules for the production, exporting, re-exporting, and importing of substances, equipment or units containing ODS. The regulations are part of the *Environment Management Act* of the country. These regulations provide for control of imports and exports of ODS and ODS dependent equipment.

The regulations provide for a licensing and quota system on importation of ODS and ODS dependent equipment into the country  
Specifically:

**Article 7 - Jurisdiction for approval:**

1. The Ministry of Environment approves or denies applications for import, as well as the annual amount to be imported, as set by the Ministry of Commerce.
2. The Ministry of Commerce after consultation with the Ministry of Environment will set the annual amount to be imported, and will approve import license applications, depending on the amount that the person may request to import and the origin of the substances or equipment.
3. The validity of the authorization referred to in this rule is six months.

**Article 8 License to import**

1. The Ministry of Commerce issues the import license after consultation with the Ministry of Environment.

To further safeguard against projects that might use ODS in the country, the Angola Government has also adopted the Environmental Audit, Assessment and Review Regulations, which provide for the undertaking of Environmental Impact Assessments and Audits for new and existing projects respectively.

**1.3 Stakeholders**

The Ministry of the Environment has the overall responsibility for the implementation of the Montreal Protocol in Angola, and the National Ozone Unit (NOO) is established within the National Environment Directorate of the Ministry. The NOO has the responsibility for coordinating all activities for implementation of the Protocol.

The functions of the NOO include the following:

- a) Provide secretariat support for the National Advisory Committee;

- b) Liaise on behalf of the Minister with national and international organizations on matters relating to the phase-out of ozone depleting substances;
- c) Prepare and submit national reports on the consumption and phase-out of ozone depleting substances to the Ozone Secretariat and the multilateral fund secretariat set up under the protocol;
- d) Receive, process and recommend applications for permits to import and export ozone depleting substances and license to handle ozone depleting substances;
- e) Monitor and evaluate the consumption levels of ozone depleting substance in Angola;
- f) Identify end-users of controlled substances;
- g) Carry out training and capacity building programme for technicians and engineers that use ozone depleting substances on the phase-out of the controlled substances and how to switch to alternatives that are ozone friendly;
- h) Recommend to the Multilateral Fund Secretariat, set up under the Protocol, projects for conversion to ozone friendly processes and, monitor the implementation and certify the completion of such projects;
- i) Certify the destruction of equipment which used controlled substances;
- j) Carry out awareness activities on ozone layer protection matters.

#### **1.4 ODS Phase-out Programme**

Since becoming Party to the Montreal Protocol, and through the assistance from the Multilateral fund, the government, through the Ministry of the Environment (previously the Ministry of Fisheries and the Environment) and in collaboration with the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP) and Germany (GTZ) has over the years implemented ODS Phase Out projects that have assisted Angola to convert to Ozone friendly technologies.

This has resulted in total phase-out of CFCs in these sectors, in line with the Protocol's provisions and its ODS phase-out schedule. The assistance came mostly in form of direct technical support, and provision of Ozone friendly equipment.

In total, Angola has received funding for 8 projects totaling \$1,141,082 and has phased-out CFC from the respective baseline value of 114.8, as mentioned in the table below. To summarize, consumption of these substances by 2009 has gone from baseline consumption level of about 114.8 ODP tones to 0 ODP tones in 2011.



From 2011 onwards only HCFCs remain to be addressed.

**Table 1.1: Angola’s ODS Consumption in ODP tones (2003 - 2010)**

Chemical	Baseline	2003	2004	2005	2006	2007	2008	2009	2010 Customs
CFC	114.8	104.2	75.6	52.0	42.1	17.0	9.7	16.00	0.00
CTC		00.0	00.0	00.0	00.0	00.0	00.0	00.0	0.00
Halon		00.0	00.0	00.0	00.0	00.0	00.0	00.0	0.00
HCFC		5.5*	6.60*	7.5*	7.87*	9.08*	10.45*	19.25*	19.25
MBR		00.0	00.0	00.0	00.0	00.0	00.0	00.00	00.00
TCA		00.0	00.0	00.0	00.0	00.0	00.0	00.0	00.0
<b>Total</b>	<b>114.8</b>	<b>109.7</b>	<b>82.2</b>	<b>59.2</b>	<b>50</b>	<b>26.1</b>	<b>20.15</b>	<b>35.25</b>	<b>19.25</b>

All data is A7, except when followed by \*, denoting CP Data  
2010 is customs data

Of these, implementation of the RMP accounted for \$700,000, the rest being divided between institutional strengthening activities (Germany) and project preparation funds (Germany, UNEP, UNDP).

To date, the country has fully implemented an RMP and an Institutional strengthening project (UNEP). A TPMP was developed jointly by UNEP/UNDP for presentation to the 57<sup>th</sup> ExCom but was withdrawn given delayed Ratification of the Amendments. Additional IS support is being requested on behalf of the country by UNEP (64<sup>th</sup> ExCom).

Angola has been in compliance with the ODS phase out schedules set out under the Montreal Protocol and initiatives are in place to ensure that the country is in compliance with the 2010 CFC total phase out schedule as prescribed under the Montreal Protocol.

## Country Programme

The country programme (CP) for Angola was approved at the 34th ExCom Meeting in July 2001. Following this the country established a National Ozone Unit (NOU) in 2001, in what was then the Ministry of Fisheries and Environment. A number of the activities outlined in the country programme were undertaken after the establishment of the unit. These are detailed in the section below.

### 1.4.1 Refrigeration Servicing Sector

#### RMP

The Refrigerant Management Plan (RMP) for Angola was approved and has been successfully implemented with assistance from GTZ Proklima. The RMP was aimed at phasing out the use of ODS in the refrigeration and air conditioning sector, achieving the Montreal Protocol targets.

The RMP project included the following components:

- **Recovery and Recycling Project**

The recovery and recycling project for Angola was approved by the ExCom in July 2001. The project was implemented with assistance from GTZ Proklima. Under this project GTZ Proklima provided resources including 18 recovery units and 4 recycling centers to assist the country recover and recycle CFCs.

In addition, resources were provided to conduct training workshops for service technicians and two workshops were conducted and 6 recycling centre were established. The recovery units were distributed to various service institutions on condition that they would be shared free of charge. 5 identifiers were also provided to the Santa Clara province of Kunene bordering Namibia

The recovery units and recycling machines were reported to be in good condition, with the exception of those in the Luanda Training Center that were damaged due to heavy rains and subsequent flood which destroyed the center (CEFOPESCAS) in January 2007. All other equipment is reported to be in good working condition.

- **Training of Trainers and Service Technicians**

Angola has trained 95 trainers (professors and technicians) on good refrigeration practices. This includes technicians both from the “formal” and “informal” servicing sector throughout the country. Please note that formal in Angola refers to large workshops registered with the state, anything small is considered informal. Although 676 technicians were identified in the formal sector, as not all enterprises responded to the questionnaires, it is estimated that around 1,600 technicians are employed by this sector. In addition, it is estimated that approximately 3,000 technicians in the informal sector currently practice.

This high number calls for further training of service technicians to sustain the ODS phase out and the expanding refrigeration industry. In particular, given the new refrigerant blends coming into the market, as well as the push towards natural refrigerants, it is considered a priority to properly train and equip these technicians to deal with the new refrigeration fluid realities.

In Angola there exist 18 major technical institutes where training and certification of refrigeration technicians is done, and these are located in each of the 18 Provinces. However in all these training institutes the refrigeration courses are part of other programmes. There is an urgent need to upgrade the curricula of programmes in these institutes to incorporate good refrigeration practices including natural refrigerant technologies and training on newer alternative blends.

- **Customs Training**

Angola has 14 main border posts manned by an estimated 2,500 Customs officers. Out of these 15 officers have been trained. There is a high turnover of these officers due to promotion and movement to other departments. The above shows that less than 1% of the customs officers

received training hence the need to continue the training to provide them with requisite knowledge on Ozone issues and regulations, and equipment to control the movements of ODS.

Although a total of 7 portable refrigerant identifiers were procured and distributed to key border posts which have helped customs officers to identify different types of refrigerants imported into the country, up to date equipment capable of identifying new refrigerant blends and alternatives is urgently required.

- **Institutional Strengthening Project (IS)**

The project established and strengthened the National Ozone Unit and facilitated the phase out of the consumption of ODS in the country by building capacity of refrigeration service technicians, customs and other law enforcement officers.

The project has assisted the country to comply with the ODS phase out schedule set out under the Montreal Protocol. It is under this project, under the National Ozone Unit, that most stakeholders and public sensitization on various ozone issues takes place.

#### **1.4.2 Enterprises Converted to an HCFC Technology**

n/a

## **2 HCFC Consumption Data**

A survey for the HPMP preparation project was conducted in early 2010 in all the 18 Provinces of Angola. The survey was set up to investigate the current consumption of refrigerants; prices of refrigerants, number of existing equipment that are still using ODS and the capacity of refrigeration technicians. The National Ozone Unit in close collaboration with the 4 National Consultants carried out the survey. A questionnaire was developed and administered during the data collection exercise.

All known importers, distributors, customs officers, key sub-sectors including Hospitals, Government institutions, food processing industry, textile industry, servicing institutions, Supermarkets, Mobile Air Conditioning, Abattoirs in the refrigeration and air conditioning sector were surveyed to determine their ODS consumption.

The approach followed included a “Top-Down” survey that covered HCFCs supply/use scenarios collecting relevant import/export data from 2006 to 2009 for HCFCs pure or blend; and a “Bottom-up” one covering, as best as possible, actual consumption in the different sectors and sub sectors.

Information was gathered through primary data gathering in the field by a national consultant and use of secondary data sources involving desktop review of information and materials. The sources of data for determination of consumption for HCFCs in Angola were the NOO (licensing system), HCFC importers, distributors, manufacturers and end-users. All documents deemed necessary were obtained and verified for correctness, reviewed and analyzed, and results are included in the present chapter. The NOO as well as the importers, distributors, manufacturers using HCFCs and end-users of HCFCs made all relevant documents available.

The surveys carried out in Angola were as comprehensive as possible, and made best attempts to follow the chain of ODS supply from the time when the substances were ordered and imported into the country and passed to distributors, consumers (when applicable) and manufacturers.

Close collaboration with industrial associations such as that of Refrigeration Technicians was essential as many of the HCFC-using enterprises are SMEs including those in the informal sector. This collaboration made it possible to successfully identify relevant SMEs in the country.

The data collection at the national level was initiated through interactions with importers and distributors of HCFCs and Angola Customs Service and was further validated with the NOO. The consumption for HCFCs in the various HCFC-consuming sectors for 2006, 2007, 2008 and 2009 was determined during this survey.

The consumption for HCFCs at the national level and in the various HCFC-consuming sectors in Angola for 2006-2009 was determined during the surveys and data from 2010 was used as the basis for the estimations used later on in this document.

## **2.1 Methodology and Validation**

In line with Decision 53/37 (h), relevant data and information were collected to determine the consumption of HCFC at the national level and at enterprise level.

An Inception Workshop was organized at the UNDP Country Office in November of 2009 by the Environment Directorate and NOO to bring together the relevant decision makers and provide them with an overview and detailed information on the HPMP development process and requirements, and agree on best way forward to gather the pertinent information, develop a coherent national strategy for HCFC phase-out and generally develop a national HPMP in an inclusive and collaborative manner.

Following the workshop a team of 4 National Consultants was engaged to assist the NOO to collect and analyze data both at the national and enterprise level. Comprehensive data were collected at the national level through the licensing system and through surveys of importers and distributors (top-down survey) as well as at the enterprise level (bottom up survey).

The surveys were conducted based on questionnaires designed by the NOO in collaboration with the implementing agency and the International Consultant. The questionnaires were designed in such a way as to provide all information required to accurately describe the consumption, uses and trends for HCFC in the country as a whole and, in the relevant sub-sectors.

At the enterprise level relevant information including baseline equipment and materials, year of establishment of the enterprise and installation of manufacturing facilities, product type, equipment and, various issues that may affect enterprise eligibility for project funding was collected.

### **National level data**

The objective of the national level data collection survey was that of establishing a national aggregate level of HCFC consumption against which future projects and activities may be funded and from which growth expectations and other relevant data can be derived for implementing measures to achieve the targets set under the accelerated HCFCs phase out schedule. The licensing system is the primary tool for collecting data on annual import of HCFCs.

- Licensing system - In Angola a new framework has been developed to store data collected on HCFCs in the form of a centralized database, which is maintained under the supervision of the NOO in the Ministry of Environment. It is expected that as this is strengthened, this will be employed as a tool for determining and reporting the country's annual ODS consumption data in accordance with Article 7 of the Protocol.
- Top-Down data - The top-down data collection was initiated through interactions with importers of HCFCs and Angola Customs Service and was further validated with the NOO. Visits were made to importers and distributors of HCFCs across the country.

### **Enterprise level data (Bottom-Up)**

The objective of the enterprise level data survey was to identify the types and quantities of HCFCs used by various manufacturers and end users, the types of products manufactured with HCFCs and trends in the use of HCFCs and factors influencing such trends.

There are only two manufacturing enterprises in Angola, one of refrigerators, and one of cold rooms and preliminary investigation showed that there is no HCFC consumption in the foam, refrigeration manufacturing, aerosol and solvent sectors in the country. All other production capacity was destroyed during the war. Furthermore, a meeting with the two manufacturers allowed for confirmation of the fact that they are no longer using HCFC in their foam production processes.

## 2.2 HCFC Consumption Data

Angola is neither a producer nor an exporter of HCFCs hence its annual consumption is determined by the level of its annual imports of HCFCs<sup>5</sup>.

Consumption data for HCFCs (Annex C, Group 1) are summarized in Table 2.1 below as well as the breakdown of HCFCs consumption in the years of 2005 to 2010.

ODP tonnes	2005	2006	2007	2008	2009	2010
HCFC-22	7.2	7.9	9.1	10.5	19.3	19.3
HCFC-141b	0.0	0.0	0.0	0.0	0.0	0.0
Pre-mixed polyols containing 141b	n/a*	n/a	n/a	n/a	n/a	n/a

\* Not available

As can be seen from the table above, after an impressive growth in 2008 – most likely related to a combination of factors including previously unreported/unmonitored consumption and likely ongoing replacement of CFCs in service applications – current growth should taper off and might be expected to settle on around twice the GNP growth, which is customary for comfort goods in developing nations. Regarding the unreported/unmonitored consumption, from 2005 to 2007 due to the war, Angola only reported data from 7 out of 18 provinces.

GDP Growth %	Timeframe	2005	2006	2007	2008	2009	2010 Est
Angola		20.6	18.6	20.3	13.3	0.9	6.5
Average Growth	2005 to 2008	18.2					

The table above summarizes the GDP growth for Angola over the period of 2005 to 2010 and includes the latest World Bank forecasts that indicate that the Angolan economy should grow by 6.5 percent in 2010 (and 8.0 percent in 2011), after shrinking by 0.9 percent in 2009.

<sup>5</sup> Consumption = Production plus import minus export

As mentioned previously, it is expected that growth in consumption of ODS will settle at around twice the GDP growth, which is customary for the comfort goods industries in developing nations. Given that in Angola, the annual GDP growth rate is forecast to be above 7% <sup>6</sup>, and as per the previous reasoning, one can therefore reasonably argue that the increase of HCFC consumption would taper off to around 13% - 15% for coming years.

Based on above assumptions annual HCFC consumption of Angola showing the consumption for the period preceding the compliance regime 2010-2012 has been calculated as shown in Table 2.2 below to demonstrate the freeze level and the initial phase-out schedules and the impact of the lead-in years on HCFC compliance.

The Government of Angola agreed to establish as its starting point for sustained aggregate reduction in HCFC consumption the estimated baseline calculated based on the average of actual reported consumption of 19.25 ODP tonnes in 2009 and of 12.65 ODP tonnes in 2010, amounting to 15.95 ODP tonnes.

<b>HCFC Phase-out Schedule 2013-2040 for Angola (Metric tonnes)</b>				
<b>Reduction Step</b>	<b>MP Requirement</b>	<b>Allowable Consumption (Metric Tonnes)</b>	<b>Schedule Period</b>	<b>Needed Reduction</b>
Baseline	Average 2009-2010	293	2009-10	
Growth		342	2011	
Growth	Estimated peak consumption	391	2012	
Freeze	Equal to baseline	293	2013	
Step 1	10% reduction	263.7	2015	-127.3
Step 2	35% reduction	190.45	2020	-73.25
Step 3	67.5 reduction	95.23	2025	-95.22
Step 4	97.5% reduction	7.32	2030	-87.91
Step 5	Complete phase-out	0	2040	-293

### **2.3 Sectoral Distribution of HCFC**

The most commonly used HCFC in Angola is HCFC-22. Two ODS blends were also identified, R-408A and R-409A, however as these were only found in negligible amounts (individually procured cylinders for testing), for all intents and purposes HCFC consumption in Angola is only R-22.

<sup>6</sup> <http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG>

Sector	No. of units	Installed capacity (tonnes)		Service demand (tonnes)		%
		metric	ODP	metric	ODP	
Domestic	634,990	1,270	70	254	14	20
Commercial freezers, chillers	1,600	240	13	60	3	25
Semi industrial	2,960	74	4	33	2	45
<b>TOTAL</b>	<b>639,550</b>	<b>1,584</b>	<b>87</b>	<b>347</b>	<b>19</b>	

### 2.3.1 HCFC Based Manufacturing Sector

n/a

### 2.3.2 Refrigeration Servicing Sector

In order to obtain accurate and reliable estimates on the quantity of HCFC from end users/RAC service technicians and practitioners, the four main use-sectors (Domestic, Commercial, Mobile, Industrial) were surveyed to ensure the relevance of the data.

The domestic subsector survey covered usage of HCFC for servicing of domestic fridges, freezers, window/split/package air –conditioners for offices, homes, hotels, hospitals etc.

The commercial subsector survey focused on usage of HCFC for servicing of Display fridges/freezers, cold storage rooms in super markets, fishing industries, hotels etc. Also chillers used for comfort air-conditioning purposes in hotels and high-rise buildings.

The mobile subsector survey covered usage of HCFC for servicing car air-conditioners and mobile cold storage enclosures.

Finally, the industrial subsector survey covered usage of HCFC for servicing air conditioning chillers for temperature control in production processes.

The Angola Association of Refrigeration and Air Conditioning Technicians was an essential partner in the bottom-up surveys and assisted in the collection of relevant data on HCFC use in the different sub-sectors. In order to collect data from RAC service sector practitioners, 18 representative cities were visited in each of the 18 provinces.

Data was extracted from information filled into questionnaires filled out with the assistance of the 4 National Consultants and further to the analysis of the survey results, the baseline consumption obtained through extrapolation for HCFC-22 for these years was confirmed to be as follows:

<b>Year</b>	<b>Consumption in Metric Tonnes (MT)</b>
<b>2006</b>	<b>143 MT</b>
<b>2007</b>	<b>165 MT</b>
<b>2008</b>	<b>190 MT</b>



**2009**                      **350 MT**  
**2010**                      **230 MT**

The survey conducted in 2007, in the context of the preparation of the TPMP established that there are slightly over 1,500 refrigeration service technicians in the country (Formal and informal sectors). Of these 95 were trained in good refrigeration practices, but need training in handling hydrocarbon refrigerants. In addition, there are more technicians passing out of the technical institutions each year.

Survey in 2010 shows that there are currently in the formal sector alone, an estimated 700 refrigeration technicians present throughout the country

<b>REFRIGERATION TECHNICIANS</b>	
<b>Provinces</b>	<b>Nº of Technicians</b>
BENGO	15
BENGUELA	90
BIE	20
CABINDA	75
CUNENE	25
HUAMBO	34
HUILA	60
KUANDO-KUBANGO	11
KWANZA NORTE	13
KWANZA SUL	67
LUANDA	145
LUNDA NORTE	7
LUNDA SUL	9
MALANGE	13
MOXICO	12
NAMIBE	39
UIGE	27
ZAIRE	14
<b>TOTAL</b>	<b>676</b>

As a direct result of the field surveys that were carried out, it appeared that the following assumptions could be made with a high degree of certainty for Angola which relate to the average annual rate of refrigerant leakages in different sectors:

- 20% for unitary air conditioners and split-systems;
- 30% for MACs;
- 25% for industrial and large commercial refrigeration systems;
- 40% for small commercial facilities and trade-technology equipment;

- 40% for large air conditioning systems.

The average HCFC refrigerant charge and annual servicing requirements listed above are reported service frequencies and leakage rates and were derived from survey information.

Leakage rates used are consistent with published global estimates of equipment emission rates<sup>7</sup>.

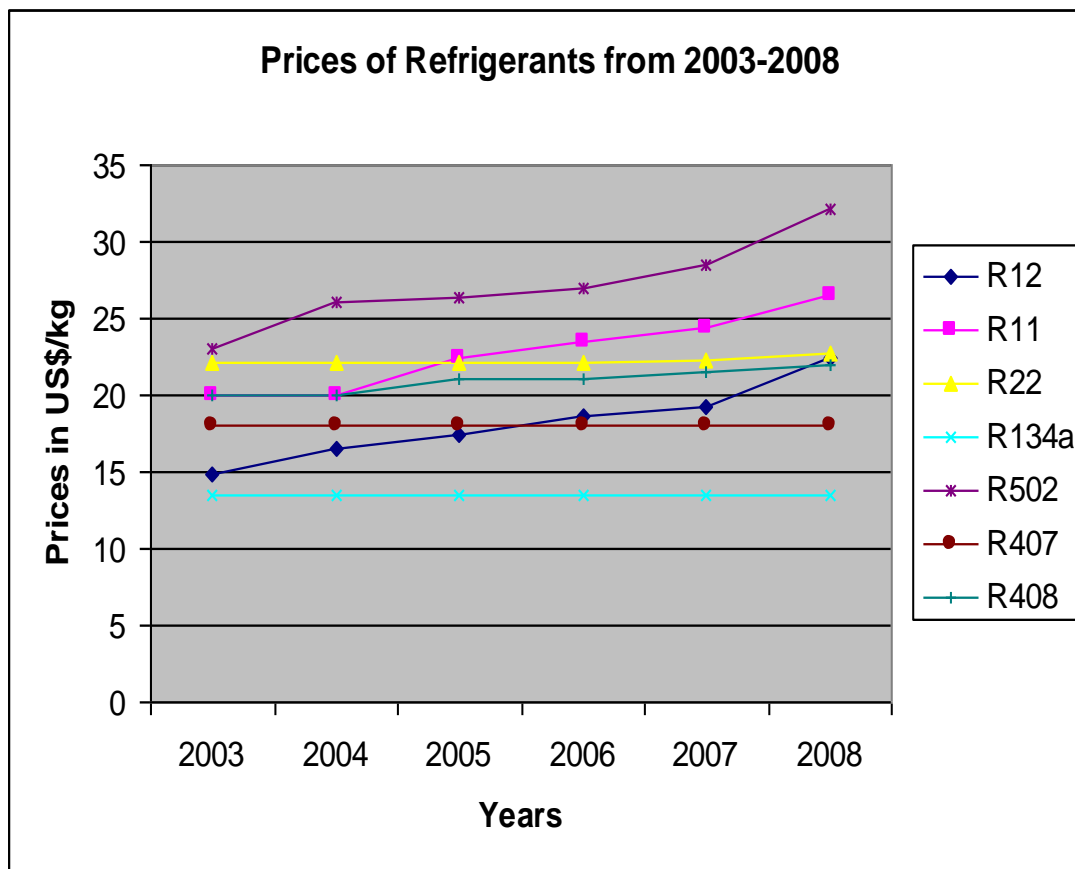
### Prices of HCFCs and Alternative Chemicals

Table 3: Average prices of refrigerants from 2003 to 2008

Refrigerants	Price (US\$ /Kg) / Year					
	2003	2004	2005	2006	2007	2008
R12	14.8	16.5	17.5	18.7	19.3	22.5
R11	20	20	22.5	23.5	24.4	26.5
R22	22.1	22.10	22.10	22.10	22.30	22.8
R134a	13.5	13.5	13.5	13.5	13.5	13.5
R502	23	26	26.4	27	28.5	32.1
R407	18	18	18	18	18	18
R408	20	20	21	21	21.5	22

Figure 2 Prices of Refrigerants in Angola from 2003 – 2008.

<sup>7</sup> IPCC/TEAP Report “Safeguarding the Ozone Layer and the Global Climate System”, 2005 - [http://www.ipcc.ch/publications\\_and\\_data/publications\\_and\\_data\\_reports\\_safeguarding\\_the\\_ozone\\_layer.htm](http://www.ipcc.ch/publications_and_data/publications_and_data_reports_safeguarding_the_ozone_layer.htm)



### 3 PHASE-OUT STRATEGY

#### 3.1 Overarching Strategy

Consistent with Decision XIX/6 of the Parties and Decision 54/39 of the Executive Committee the HPMP of Angola aims in the long term to phase out the consumption of HCFCs.

As it was with the phase out of CFC, the Government of Angola is committed to phasing-out the consumption of HCFCs in a cost-effective manner. The action plan below outlines the steps that the Government will take to meet its obligation as a party to the Montreal Protocol on Substances that Deplete the Ozone Layer. The phase-out will be conducted in accordance with the schedule specified by the Protocol.

The Parties to the Montreal Protocol -- by their Decision XIX/6 paragraph 11 -- agreed to accelerate the phase-out of production and consumption of hydrochlorofluorocarbons (HCFCs), by way of an adjustment in accordance with paragraph 9 of Article 2 of the Montreal Protocol. On that basis the Parties directed the Executive Committee, inter alia that, when developing and applying funding criteria for projects and programmes, and taking into account paragraph 6, in

providing technical and financial assistance, to give priority to cost-effective projects and programmes which focus on, inter alia:

- (a) Phasing-out first those HCFCs with higher ozone-depleting potential, taking into account national circumstances;
- (b) Substitutes and alternatives that minimize other impacts on the environment, including on the climate, taking into account global-warming potential, energy use and other relevant factors;
- (c) Small and medium-size enterprises.

In accordance with the above decision, and in light of the realities of Angola, the country will focus its efforts on elimination of HCFC-22 in the refrigeration and servicing sectors, in-line with the following main guiding principles and activities, valid for the overall HPMP throughout 2040:

- Avoidance to the extent possible of high GWP alternatives (definition proposed by TEAP: <350);
- Follow-up on legal and regulatory measures initiated during the RMP and enhancing the capacity of customs agencies to identify HCFCs and alternative refrigerants;
- Emphasizing local capacity (exploring possibility to produce refrigerant grade HC in country) to assure cost-effective availability of alternatives;
- Favoring the import of bulk refrigerant and local canisterization to better control imports;
- Focus on Hydrocarbons (HCs) for smaller RAC applications and CO<sub>2</sub> for larger ones;
- Local production of refrigerant-grade hydrocarbons as a preparatory measure for the servicing sector, thus displacing the need for increased HCFCs consumption therein;
- Inclusion of training for HC and other alternative use in the service sector including tooling and strengthening of existing relevant institutions;
- Implement a recovery / retrofit, replacement incentive programmes.

As a whole, and as detailed in paragraph 2.2.1 above, given a growth projection of 14% in 2010 and 2011 based on historical figures and current World Bank projections, it is expected that a reduction of approximately 30% of the consumption-peak will be needed in 2013 to meet the freeze, as per an unrestricted growth scenario.

This is equivalent to 133 Mt or 7.32 ODP tonnes of HCFCs.

## **3.2 First Stage Implementation Programme**

### **3.2.1 HCFC Refrigeration Servicing Sector Plan**

The implementation of this sector plan - prepared by UNDP in order to assist Angola with the HCFC phase-out in the refrigeration and air conditioning servicing sector is presented here to provide an overview of the likely needs of the country in its ongoing efforts to transition away from high ODP, high GWP alternatives. Under this component, the following sub-projects in support of the phase-out are contemplated for:

1. Further implementation of the regulatory framework for HCFC
2. Sensitization
3. Refrigeration sector, servicing and maintenance
4. Monitoring in support of RACS

Although at present there is a real need to facilitate the phase-in of alternative refrigerants, the bulk of the efforts to phase-out HCFC from equipment in a sector which is still experiencing growth are going to take place in the future, under Stage 2. The activities presented below are to be considered as seeds which will need to be continuously developed and implemented until the complete and successful phase-out of HCFC.

### Technology discussion - Alternatives to the use of HCFC in RACS

For the longer term, there appear to be only five important different groups of refrigerants, which are options for the vapour compression cycle in all refrigeration and A/C sectors (*UNEP TEAP RAC & Heat Pumps TOC 2006 Assessment Report*). These include ammonia (R-717), carbon dioxide (R-744), hydrocarbons and blends, hydrofluorocarbons (HFCs), including 400 and 500 number designation HFC blends and, water.

While a number of the refrigerants currently available for various applications are listed in the table below, it is important to note that numerous other new refrigerants, claiming wide, almost universal application (across all sub-sectors) are being developed and introduced commercially into the market, especially in non-Article 5 countries. However the generally high GWP of these alternatives are directly influencing the efforts to find new alternatives with lower climactic impact.

Other alternatives such as HFO-1234yf in replacement of HFC-134a for MAC (R-134a will be banned in Europe for MAC starting 2011), and HFO-123ze (mostly for foams, but quite possibly for some general refrigeration applications in blends as well), are being proposed/tested but are not yet commercially available. It is interesting to note for example, that in the case of 1234yf, one of the major refrigerant manufacturers announced at the end of 2009 that Japanese regulators had cleared this for use in Japan. It is expected that this might be a viable non-ODP and negligible GWP option in the near future.

Table 1 - Selection of refrigerants currently available and most common application sector

Refrigerant	Component	ODP	GWP (100y)	Suitable AC Application
HCFC-22	HCFC	0.055	1,810	All
HFC-32	HFC	0	675	Blends
HFC-134a	HFC	0	1,300	RAC
R-125	HFC	0	3,400	Blends
HFC-152a	HFC	0	120	Blends
R-290	Propane	0	<3	RAC
R-404A	HFC	0	3,780	RAC

Refrigerant	Component	ODP	GWP (100y)	Suitable AC Application
R-407A	HFC	0	1,990	RAC
R-407C	HFC	0	1,770	RAC
R-410A	HFC	0	1,980	RAC
R-421	HFC	0	3,190	RAC
R-422D	HFC/HC	0	2,730	Blend of 134a and 125 - RAC
R-507A	HFC	0	4,000	RAC
R-1234yf	HFC		4	MAC
R-1234ze(E)	HFC		4	Foams, Aerosol, possibly refrigeration
R-717	Ammonia	0	0	Screw chillers
R-744	CO2	0	1	Domestic, AC, MAC

In addition to the above, a range of alternative, 0 ODP, “service blends”, so called because they do not require, or only require a partial change of oil, are coming onto the market.

The following table lists a selection of the most commonly used service blends

Status	Substance	GWP <sup>1</sup>	COMMENTS
Baseline	HCFC-22	1,810	
HFC Service Blends or “drop-in” **	417A – HFC/HC	2,240	For small direct expansion systems
	424A – HFC/HC	2,440	
	422A – HFC/HC	3,040	R-502 and low temp R-22 replacement
	428A – HFC/HC	3,600	
	422D – HFC/HC	2,620	Replacement in chillers
	434A – HFC/HC	3,238	
	427A – HFC	2,010	
	438A – HFC/HC	2,100	Wide range of operating conditions

\*\* In general no need to replace ester oils

It must also be pointed out that although these are some of the options currently being used, not all might be easily available. However, given the large volume of R-22 on the market used in a very wide range of applications, there are a significant number of alternatives being proposed and being refined/developed. A careful technical review of the selected alternative must be carried out before any drop-in type solution is implemented.

Below a summary presenting some of the HCF and blends being used, per main sub-sector, as well as the possible 0 ODP, very low/no GWP refrigerant alternatives currently employed

Sub-Sector	HCFC Alternatives	
	HFC and blends*	Natural Refrigerants
Domestic Refrigeration	R134a	R-600 <sup>a</sup>
Split, unitary AC, display cases, small systems	R-134a, R-404A/R-507, R-407C, R-410A,	R-290, HFO blends and CO2 under investigation

Commercial AC	R-134a, R-245fa (centrifugal chillers**), R-404A, R-404A/R-507, R-407C, R-507, R-410A	R-290, R-744 (CO <sub>2</sub> ), R-1270 (Propylene)
Industrial Refrigeration	R404a, R-507	R717 (Ammonia)
Transport Refrigeration	R404A, R134a, HFO-1234yf **	CO <sub>2</sub>

\* In general for retrofits, these require change of oil to a polyol ester oil

\*\* Currently not commercially available

The successful phase-out of HCFC will not only have to rely on the alternatives presented above, evidently attempting to favour those no ODP low GWP ones as they become available, but will also have to keep constantly abreast of new developments as a generation of new substances fills in the HCFC niche. The following is a description of the activities in support of the phase-out of HCFC in Angola.

## **1 - SUB PROJECT FOR THE IMPLEMENTATION OF A REGULATORY FRAMEWORK FOR HCFCs**

### Background

In the second chapter of this document, the legal framework of Angola as regards compliance with the Montreal Protocol was presented. As explained at that time, the recently approved Presidential Decree (January 2011) has only just begun to be implemented. Although this is a comprehensive legislation covering HCFCs, implementation must be strongly supported and the existing control mechanisms must be, in the best cases strengthened, or altogether established. This is addressed in this strategy.

### Objective

To implement within the regulatory framework, the necessary control measures for HCFCs and ODSs as pure or mixed substances coming in as refrigerant fluids or in equipment. This includes the full deployment of the licensing and quota system which was developed by the country but which has not yet been implemented (legislation has only recently been approved), and strengthened control of entry of refrigerant and equipment at all levels (Customs agents, Fiscal and Economic police, and Frontier Guards) as well as the disincentives to use them through labelling and other voluntary mechanisms.

### Methodology

In order to meet the 2013 and 2015 targets, this effort is focused on the following sub-projects to facilitate implementation of different aspects of the new regulatory framework provided by the Decree. For this, training and control tools are provided for ODS imports, guaranteeing the fulfilment of the MP, and complementary management instruments are proposed as disincentives to use these substances in the following projects.

#### *Implementation of a control system for products and equipment containing HCFCs and ODSs in general*

The project proposes to contribute to the reduction of the availability and demand of products and equipment containing HCFCs and ODSs in general. For this, the licensing and quota system will be deployed, and the management instruments established in the new regulations will be implemented in association to the control and labelling of products and equipment in order to reduce their imports and their demand for maintenance in the medium term. It also proposes the implementation of a labelling system warning that, "This product damages the ozone layer", making them easily identifiable, such as aerosol sprays, refrigeration equipment and air conditioners, among other products.

Implementing Agency:	UNDP
Implementation period:	2011 - 2012
Cost:	US\$ 4,000



*Implementation of a control system for products and equipment containing HCFCs and ODSs in general*

	<b>US\$</b>
Subcontracts	2,000
Equipment	1,500
Miscellaneous	500
<b>TOTAL</b>	<b>4,000</b>

*Implementation of a control system for the trade, use and handling of HCFCs*

The objective is to control the national trade, use and handling of HCFCs by developing standards for the generation, storage, transport, treatment and recycling of ODSs as well a registry for the purchases and sales of refrigerant gases. The project also proposes strengthening of the association(s) of refrigeration technicians, as well as refrigeration technician certification and the implementation of a registry system for refrigerated installations.

Implementing Agency: UNDP  
 Implementation period: 2011 - 2012  
 Cost: US\$ 7,000

*Implementation of a control system for the trade, use and handling of HCFCs*

	<b>US\$</b>
Subcontracts	2,000
Equipment	4,500
Miscellaneous	500
<b>TOTAL</b>	<b>7,000</b>

*Training and equipment of customs agents in control for the trade, use and handling of HCFCs*

The objective is to strengthen the control of national trade by reinforcing measures in place as regards the safe handling and proper identification of HCFCs, blends and other refrigerant types, including natural ones. This will be done by developing the capacity of the customs agents through training sessions, and by providing them with proper identification equipment. It is expected that all 16 points of entry into the country will be equipped with at least one identifier, and that in addition a number of the mobile border guards (Policia Guarda Fronteriras) will also be equipped at strategic, informal, entry points.

Implementing Agency: UNDP  
 Implementation period: 2011 - 2012  
 Cost: US\$ 28,000

*Training and equipment of customs agents in control for the trade, use and handling of HCFCs*

	<b>US\$</b>
Subcontracts	2,000
Equipment	25,000
Miscellaneous	1,000
<b>TOTAL</b>	<b>28,000</b>

*Creation of an Association of Refrigeration Engineers and Technicians (ARET or AETR for it's acronym in Portuguese).*

The objective is to establish an Association whose membership would only be open to certified refrigeration engineers and technicians. For a modest contribution they would be registered in the books of the Association and would receive official identification. This official identification will be required by any resellers of refrigeration fluids.

Implementing Agency: UNDP  
 Implementation period: 2011 - 2012  
 Cost: US\$ 5,000

*Creation of an Association of Refrigeration Engineers and Technicians*

	<b>US\$</b>
Subcontracts	n/a
Equipment	4,500
Miscellaneous	500
<b>TOTAL</b>	<b>5,000</b>

*Expected project results*

As a general result for the project, the country expects to have an integral control system for HCFCs and ODSs in general, monitoring the substances from import authorization and through sale, distribution, transport, storage, treatment and recycling, among other stages. A registry for refrigerated installations that would allow the in situ monitoring of the management and handling of these substances will complement the control system, as well as a certification scheme for technicians and creation of a refrigeration engineers and technicians association whose membership would be mandatory for those wishing to purchase refrigerant fluids, and a required for those resellers of the fluids in question.

## **2 - SUB PROJECT FOR THE SENSITIZATION PROGRAM**

### Background.

The objective of the Montreal Protocol is to protect the ozone layer through activities and projects aimed at reducing and eliminating ODSs. However, in order to attain this, a high level of awareness from all sectors of the populations, as well as its active participation in the reduction of the consumption of ODSs is required.

As a result the awareness raising programs must target all levels of the population, and be specifically tailored to each depending on their involvement with the subject, ranging from decision makers and importers, to students and users of equipment and products containing ODSs. In this sense, the program proposes the implementation of a series of workshops and media campaigns to reach the above-mentioned segments of the population.

### Objective.

To raise citizen awareness about the general problems associated with the deterioration of the ozone layer, as well as of future HCFC users and technicians, and to engage them to participate in the different activities for the reduction and elimination of these gases through awareness raising and sensitization campaigns. These will look at the effects of increased UV radiation on health and the ecosystem, but will place emphasis on the availability of ozone and climate friendly alternative containing products and equipment.

### Methodology

The awareness raising and sensitizing program will be carried out at two levels, one for the general public including students, and another for a specialized and more highly educated audience.

For the general public level, the campaign design, the elaboration of material and the implementation of the said campaign are to be carefully evaluated and developed with a marketing approach aiming to reach out as far and wide as possible with very limited resources. This includes establishing the locations where sensitization actions would be most effective, and developing and widely distributing awareness raising material in Portuguese, with the support of radio and television broadcasting and press related tools.

The specialized audience level provides for more policy-level discussions to be set up and proposes to reinforce the understanding of the implications of the phase-out, in support of a mechanism that aims to link policy-control-purchasing-certification. The final objective is to create a level playing field for the “Association of Refrigeration Engineers and Technicians” by making it both compulsory for technicians to be Certified and to become members of the Association, (see below Component 3), as well as for Importers and resellers of refrigerant fluids to require proof of both of these elements before providing anyone with an option to purchase these substances.

### *Sensitization campaigns and workshops*

This project provides for the organization of meetings at the decision-making level, as well as for broadcasted campaigns in educational centres directly through teachers, media and higher-education centres for refrigeration specialists. Broadcasting to the general public is to be carried out through radio and television programs. Also, direct broadcasting campaigns will take place in community centres, union associations, business associations, etc.

Implementing Agency: UNDP  
Implementation period: 2011 - 2012  
Cost: US\$ 3,000

*Sensitization campaigns and workshops*

	<b>US\$</b>
Subcontracts	2,500
Miscellaneous	500
<b>TOTAL</b>	<b>3,000</b>

*Expected results*

For this project it is expected that the sensitization campaigns will be completed and that the target audience groups will be sensitized to the themes relevant to the HPMP.

### **3 - SUB PROJECT FOR THE REFRIGERATION SECTOR (SERVICING AND MAINTENANCE)**

*Background.*

As previously stated, the refrigeration sector with its numerous users and serviced by at least 2,000 technicians accounts for a high share of the consumption of HCFC-22. The main use corresponds to maintenance and servicing (between 80% and 90%) while the rest is used in new installations.

*Objective.*

To institute an enabling environment for the proper and safe use of refrigerants, including natural alternatives, by supporting the air conditioning and refrigeration sectors, in the reduction of the use of ODS and high GWP refrigerants through training, reconversion demonstrations, installation of storage facilities, recycling and regeneration of refrigerating gases.

*Methodology.*

Firstly, preparation of an updated teaching curricula for refrigeration technicians based on the Quick Reference Manual which will be updated and adapted to meet the Angolan realities and to include information on hydrocarbon and other natural refrigerant related technology, as well as

larger RAC equipment. This will also be shared with university level refrigeration engineering courses.

Further to this, a training and certification program in good practices in refrigeration is contemplated, which will also qualify these technicians to receive the authorization to purchase and handle these gases, linking directly to the project above on implementation of the control system for the trade and consumption of HCFCs. Additionally, storage facilities, recycling and regeneration will be implemented to ensure the decrease in the demand of new gases.

Jointly, demonstration projects with training in the main sectors will be undertaken in order to reconvert existent facilities (supermarkets, cold rooms, and building air conditioning).

### *Strengthening of provincial Centers of Reference*

Under this component two complementary activities will take place; first the Quick Reference Manual will be updated and adapted to meet the Angolan realities and to include information on hydrocarbon and other natural refrigerant related technology, as well as larger RAC equipment. This will be used as the basis for developing a new curriculum that will be fully integrated into all of the existing training institutes refrigeration-training programmes in the country.

Secondly, as the training in good practices can only be provided through a network of properly equipped and tooled training centers, well established public institutes will be upgraded with newly supplied equipment and tools. This network of professional training institutes includes at present 14 Centers in 14 provinces (basic level education), and 6 Institutes in 6 provinces (medium level education).

Standard equipment to be provided could include but not be limited to the following:

- Identifiers – Est. \$1,700 to \$4,000
- Vacuum pumps – Est. \$250
- Recovery machines – Est. \$600
- Vacuum and charging stations – Est. \$900
- Scales – Est. \$50
- Leak detectors – Est. \$100
- Clamp on multimeters – Est. \$100
- Recovery & recycling machines – Est. \$800
- Leak detectors – Est. \$150
- Recovery cylinders – Est. \$200
- Assorted tools
- Assortment of alternative refrigerants for testing

Implementing Agency:	UNDP
Implementation period:	2011 - 2012
Cost:	US\$ 59,000

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### *Strengthening of provincial Centers of Reference*

	<b>US\$</b>
Subcontracts	3,000
Equipment	55,000
Miscellaneous	1,000
<b>TOTAL</b>	<b>59,000</b>

*Training in Good Practices in Refrigeration and retrofits and certification.*

The continuity and improvement of the good practices in refrigeration training plan is proposed for technicians and technical services, in order for them to improve their practices in the use and handling of refrigerating gases, reducing HCFC consumption and minimizing emissions. Further to completing a series of requirements, trained technicians will be issued with a Certificate attesting to their newly acquired capacities.

Although the level of use of hydrocarbons currently is not as high as other refrigerants, it is fast becoming a reality that hydrocarbons are becoming a widely used refrigerant in Angola, especially in view of the fact that appliances entering the country from traditional exporters have already converted to these alternatives. At present besides informal training, no specific actions have been taken to ensure safe use of these refrigerants at all technical levels. Under this activity a core group of refrigeration engineers and technicians will be provided training in the use of hydrocarbons and other natural refrigerants such as CO<sub>2</sub> and ammonia in order to assist in enforcing the norms, regulations, and code of practice necessary for safe use of the substances.

These trained trainers will then go on to train additional numbers of technicians and it is expected that through this multiplier effect, most if not all technicians will be trained during phase 1 of the HPMP.

To do so, diffusion channels will be improved to reach the largest possible number of previously trained technicians, as well as those having received an informal education, which will be trained at low or no-cost. These activities will be complementary to the Technical Certification presented above for certification of skilled technicians. In addition, due to the nature of HCFC conversion, retraining of previously trained technicians will need to be undertaken under the HPMP.

Implementing Agency: UNDP  
 Implementation period: 2011 - 2012  
 Cost: US\$ 20,000

*Training in Good Practices in Refrigeration and retrofits and certification.*

	<b>US\$</b>
Subcontracts	3,000
Equipment	16,000
Miscellaneous	1,000
<b>TOTAL</b>	<b>20,000</b>

*Sector specific training, including demonstration, for the refrigeration sector.*

In this project specialized training sessions will take place in order to carry out reconversion of units in high HCFC consumption sectors that are not eligible to be part of a reconversion project under the Montreal Protocol framework.

Demonstrations will be carried out on refrigeration and air conditioning systems and these will be replicated in similar or equivalent units. Illustrative manuals of these training sessions will also be produced. This will allow for on-site reconversions showing the complexity and conditions in which a reconversion can take place.

Emphasis will be placed on refrigerant conservation by strengthening the ability of technicians to recover refrigerant and thus decrease dependency on virgin refrigerant.

Implementing Agency: UNDP  
Implementation period: 2011 - 2012  
Cost: US\$ 14,000

*Sector specific training, including demonstration, for the refrigeration sector.*

	<b>US\$</b>
Subcontracts	na
Equipment	12,500
Miscellaneous	1,500
<b>TOTAL</b>	<b>14,000</b>

Expected Results.

As a result, it is expected that technicians will be trained in good refrigeration practices and in the reconversion of refrigeration systems and air conditioning, and that these will then take part in the certification programme. As well a core group of trained trainers will be available to replicate this experience, and demonstrations on conversion will have been carried out.

#### **4 - MONITORING**

Management Structure

The National Ozone Office (NOO) was created within the Ministry of the Environment with the responsibility for coordinating the activities for the implementation of the Protocol.

The NOO will maintain the following functions amongst others:

- a) Provide the overall policy advice to the Minister in the implementation of the phase-out programme of ozone depleting substances;
- b) Advise the Minister on any matter relating to the ozone layer protection that may be referred to the Committee, from time to time, by the Minister;
- c) Perform such other functions as the Minister or the president may from time to time direct.

#### Implementation and monitoring procedures

To this effect, a Project Management Unit will be established to inter alia examine all applications and requests for funding for activities under the HPMP and to make recommendations to the NOO. The PMU would be supervised by the National Ozone Officer, and assisted by relevant national and international consultant(s), where applicable, in their technical review and other work. The PMU will also assist the National Ozone Unit in the monitoring of the implementation of activities under the Plan.

Monitoring of the different components of the HPMP will help to ensure the coordinated implementation and track keeping of the activities that will be developed under the HPMP, and will also provide valuable lessons on results that can be integrated into subsequent stages of the phase-out strategy.

In addition to providing the required support to ensure the successful implementation of the numerous components, the PMU will also ensure that a very high level of coordination is maintained with the public organizations and all of the relevant stakeholders that are involved with or likely to be affected by, the HCFC control measures, thus allowing the country to meet the objectives for 2013 and 2015.

Finally, rather than splitting out the international and national consultants over the various components mentioned above, all of them were grouped into this HPMP-component. This approach is taken in light of the fact that one consultant will often be covering the various components of the project. The consultants will provide the required technical support to the HPMP and carry out the relevant functions of monitoring of the activities as well as for establishing and keeping a database and monitoring system. The cost of monitoring of the Plan is elaborated below.

#### Political Commitment and co-financing

The Government is fully supportive of the NOO and the parent ministry of the Environment has ensured the passage of Regulations through which the relevant agencies will be able to further regulate imports of ODSs and ODS-containing equipment, and in particular HCFCs. To the fullest of its abilities, Angola participates at the highest level in international work related to the Montreal Protocol and intends to continue to do so for the foreseeable future.

In addition Angola has taken it upon herself to make available facilities, and provide the required utilities, within which the NOO is lodged, providing also for the time of the staff required to staff it and ensure that the country is in position to meet its obligations as specified under the Montreal Protocol.



In addition to contributions provided through co-financing, the inputs related to this component are the following and would be spread over four years (2011 – 2014):

*Project Monitoring Unit*

	<b>US\$</b>
National Consultants	10,000
International Consultants	17,000
Office and office equipment	3,000
Travel (in country)	2,000
Communications	4,000
<b>TOTAL</b>	<b>36,000</b>

### 3.2.2 Budget of Activities

Line of Action		Components	Period	Cost of the project US\$	Sub Totals	2012	2013	2014	2015
<b>1 - SUB PROJECT FOR THE IMPLEMENTATION OF A REGULATORY FRAMEWORK FOR HCFCs</b>	1.1	Implementation of a control system for products and equipment containing HCFCs and ODSs in general	1Q12 - 4Q15	4,000	44,000	2,000		1,000	1,000
	1.2	Implementation of a control system for the trade, use and handling of HCFCs	1Q12 - 4Q13	7,000		4,000	1,000		2,000
	1.3	Training and equipment of customs agents in control for the trade, use and handling of HCFCs	1Q12 - 4Q15	28,000		13,000	5,000	5,000	5,000
	1.4	Creation of an Association of Refrigeration Engineers and Technicians (ARET or AETR for it's acronym in Portuguese).	1Q12 - 4Q15	5,000		2,000	1,000	1,000	1,000
<b>2 - SUB PROJECT FOR THE SENSITIZATION PROGRAM</b>	2.1	Sensitization campaigns and workshops	1Q12 - 4Q15	3,000	3,000	2,000		1,000	
<b>3 - SUB PROJECT FOR THE REFRIGERATION SECTOR (SERVICING AND MAINTENANCE)</b>	3.1	Strengthening of provincial Centers of Reference	1Q12 - 4Q15	59,000	93,000	31,222	19,111	4,667	4,000
	3.2	Training in Good Practices in Refrigeration and retrofits and certification.	1Q12 - 4Q14	20,000		12,000	3,000	3,000	2,000
	3.3	Sector specific training, including demonstration, for the refrigeration sector.	1Q12 - 4Q14	14,000		5,000	5,000	2,000	2,000
<b>4 - SUB PROJECT FOR MONITORING</b>	4.1	National Consultants	1Q12 - 4Q15	10,000	36,000	3,000	3,000	3,000	1,000
	4.2	International Consultants	1Q12 - 4Q14	17,000		8,000	1,000	7,444	556
	4.3	Office and office equipment	1Q12 - 4Q14	3,000		2,000		1,000	
	4.4	Travel (in country)	1Q12 - 4Q14	2,000		1,000		1,000	
	4.5	Communications	1Q12 - 4Q15	4,000		1,000	1,000	1,000	1,000
	4.6	Miscellaneous	1Q12 - 4Q14						
		<b>TOTAL</b>			<b>176,000</b>				

### 3.2.3 Time Line

Components		2012				2013				2014				2015			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Implementation of a control system for products and equipment containing HCFCs and ODSs in general	1Q12 - 4Q15	X	X	X	X					X	X	X	X	X	X	X	X
Implementation of a control system for the trade, use and handling of HCFCs	1Q12 - 4Q13	X	X	X	X	X	X	X	X					X	X	X	X
Training and equipment of customs agents in control for the trade, use and handling of HCFCs	1Q12 - 4Q15	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Creation of an Association of Refrigeration Engineers and Technicians (ARET or AETR for it's acronym in Portuguese).	1Q12 - 4Q15	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sensitization campaigns and workshops	1Q12 - 4Q15	X	X	X	X					X	X	X	X				
Strengthening of provincial Centers of Reference	1Q12 - 4Q15	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Training in Good Practices in Refrigeration and retrofits and certification.	1Q12 - 4Q14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sector specific training, including demonstration, for the refrigeration sector.	1Q12 - 4Q14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
National Consultants	1Q12 - 4Q15	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
International Consultants	1Q12 - 4Q14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Office and office equipment	1Q12 - 4Q14	X	X	X	X					X	X	X	X				
Travel (in country)	1Q12 - 4Q14	X	X	X	X					X	X	X	X				
Communications	1Q12 - 4Q15	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Miscellaneous	1Q12 - 4Q14																

### **3.2.4 Other Impacts on the Environment Including on the Climate**

Decision XIX/6 encourages the project proponents to take into account the climate benefit in the accelerated phase out of HCFCs and in this sense all efforts have been made to take this into consideration and as mentioned all efforts are made in the HPMP to avoid high-GWP alternatives at all cost. As a result, the avoided CO<sub>2</sub> emissions can be equated to the amount of ODS that will be phased out.

Regarding the calculation of the climate impact of the HPMP itself, the following considerations are based on a rough estimate based on the GWP values of the chemicals involved and for HCFC-22 phase out, one can roughly estimate the carbon-emissions as follows:

Assuming a GWP of 1810 and a baseline for HCFC-22 of 351 metric tonnes, a peak at 449 metric tonnes in 2012 and an expected reduction in 2015 to a level of 316 metric tonnes, the ODP drop during stage 1 of 35 metric tonnes would translate to an avoided emission of 63,000 tCO<sub>2</sub>e per year.

If replacement in some of the sectors would use HFCs or other high-GWP alternatives, this figure would become lower. There is no way at this moment to estimate the ratio between high-GWP and low-GWP replacements, so we cannot provide a more accurate figure at this point in time. However, as mentioned above, all efforts are made in the HPMP to avoid high-GWP alternatives.

The potential to monetize these environmental services into carbon asset has not yet been envisaged at present.

## **4 PROJECT COORDINATION AND MANAGEMENT**

### Management structure for the implementation

The National Ozone Office in the Ministry of the Environment controls all the activities proposed in this programme in terms of the responsibility of the HCFC phase out and decision-making and reporting responsibilities of the different parts of the management structure.

Relevant industrial associations as well as academic institutions are assisting the Ministry in terms of communication with beneficiary enterprises as well as industrial movement towards the non HCFC technology.

In addition, national consultants and experts will be involved to provide training, technical expertise, facilitate technology transfer and capacity building in the implementation of the project.

UNDP as the implementing agency in the management and implementation of the HCFC sector phase-out proposals assist the National Ozone office in terms of fund management and procurement through international tender based on its financial rules and regulation.

UNDP is responsible for communication and reporting to the ExCom.

## **5 ANNEXES**

### **5.1 Annex 1 – Agreement**