

# United Nations Development Programme



## Malaysia PROJECT DOCUMENT

<b>Project Title:</b>	HCFC Phase-out Management Plan (HPMP) Stage-I for compliance with the 2013 and 2015 control targets for Annex-C, Group-I substances (HCFCs) in Malaysia (MLF Project Numbers: MAL/PHA/65/TAS/168, MAL/PHA/65/INV/169, MAL/PHA/65/TAS/170)
<b>UNDAF Outcome(s):</b>	N/A
<b>Expected CP Outcome(s):</b>	Improved environmental stewardship through sustainable energy development and environmental management (Outcome 3, Country Programme (CP) 2008-2012)
<b>Expected Output(s):</b>	Improved data management of greenhouse gas emissions and ozone depleting substances consumption (Output 3.4, CP 2008-2012)
<b>Executing Agency:</b>	Ministry of Natural Resources and Environment
<b>Implementing Partner:</b>	Department of Environment (DOE)
<b>Responsible Parties:</b>	DOE, UNDP
<b>Project Summary</b>	
<p>Malaysia's HCFC Phase-out Management Plan (HPMP Stage-I), for compliance with the 2013 and 2015 control targets for HCFC consumption according to the Montreal Protocol, comprises of a combination of interventions such as technology transfer investments, policies and regulations, technical assistance, training, awareness, communications and management, coordination and monitoring in various HCFC consuming sectors, to be implemented during 2012 to 2016, consistent with the provisions of the performance-based agreement between the Executive Committee of the Multilateral Fund and Malaysia.</p> <p>Upon successful completion, the plan will result in net sustainable reductions of 77.36 ODP tonnes in the national HCFC consumption by 2016, contributing to Malaysia's compliance with the control targets for consumption of HCFCs. In addition, the project will result in net CO<sub>2</sub>-equivalent direct emission reductions of about 1.35 million tonnes annually from 2016.</p>	
<b>Programme Period:</b>	2012 – 2016
<b>Key Result Area (Strategic Plan):</b>	<b>Total Resources Required:</b> US\$ 9,587,470
<b>Atlas Award ID:</b>	<b>Total Resources Allocated</b>
<b>Start Date:</b>	Regular: N/A
<b>End Date:</b>	Other: N/A
<b>PAC meeting date:</b>	MLF: US\$ 9,587,470
<b>Management Arrangements:</b>	In-kind contributions: N/A
	NIM

Agreed by Government

**DATUK DR RAHAMAT BIVI BT. YUSOFF**  
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30/4/2012  
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**Malaysia  
PROJECT DOCUMENT**

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## Abbreviations

APR	-	Annual Progress Report
AP System	-	Application Import Permit System
AWP	-	Annual Work Plan
CDR	-	Combined Delivery Report
CETEC	-	Center for Environmental Technologies
CFC	-	Chloroflourocarbon
CO <sub>2</sub>	-	Carbon Dioxide
DOE	-	Department of Environment
GMS	-	General Management Support
HACT	-	Harmonized Approach to Cash Transfer
HCFC	-	Hydrochloroflourocarbon
HPMP	-	HCFC Phase-out Management Plan
ISS	-	Implementation Support Services
MASHRAE	-	Malaysian Society of Air-conditioning, Heating and Refrigeration Engineers
MITI	-	Ministry of International Trade and Industry
MNRE	-	Ministry of Natural Resource and Environment
MOP	-	Meeting of Parties
NSC	-	National Steering Committee
OAI	-	Office of Audit and Investigations
ODS	-	Ozone Depleting Substance
OPU	-	Ozone Protection Unit
PU	-	Polyurethane
TWG	-	Technical Working Group
UNDP	-	United Nations Development Programme

## **I. INTRODUCTION**

### **1.1 OBJECTIVES**

The objectives of Malaysia's HCFC Phase-out Management Plan (HPMP Stage-I) are as below:

- To facilitate Malaysia's compliance with the control targets for HCFC consumption with minimal impacts on the national economy, on environment and on occupational health;
- To implement a combination of interventions such as technology transfer investments, policies and regulations, technical assistance, training and capacity-building, awareness and education and monitoring and management in the HCFC consuming sectors, contributing to achieve sustainable reductions and phase-out of HCFC consumption..

### **1.2 BACKGROUND**

#### **1.2.1 HPMP Preparation in Malaysia**

##### *Preparation funding*

In order to assist Malaysia for the preparation of its HPMP (Stage-I) for compliance with the 2013/2015 targets, UNDP, which was designated as the implementing agency for Malaysia's HCFC Phase-out Management Plan, submitted on behalf of Malaysia a request for preparation funding to the 55<sup>th</sup> meeting of the Executive Committee in July 2008 for the overarching HPMP strategy, which was approved at a level of US\$ 173,750. Further, in accordance with ExCom Decision 56/16, Malaysia was eligible for an additional funding of US\$ 250,000 for preparation of investment and associated activities in various sectors. This funding was approved in the 57<sup>th</sup> meeting of the ExCom in April 2009.

##### *Preparation Process*

The HPMP preparation process consisted of the following steps:

- Formation of the national team (assignment of stakeholder entities for carrying out the sector-level and national-level data collection and analysis work).
- Stakeholder consultations (regular periodic meetings of TWGs and interactions with government and industry stakeholders)
- Information dissemination and industry interaction (sector-level workshops and events)
- Data collection at the sector-level (and reconciliation with the national-level)
- Data analysis at the sector-level (and reconciliation at the national-level)
- Preparation of draft sectoral strategies and national strategy
- Stakeholder interactions/consultations (national stakeholders workshop)
- Finalization of the HPMP (Stage-I) proposal and Government endorsement

For the work of data collection, analysis and sector and national-level strategy preparation DOE and UNDP commissioned CETEC (Center for Environmental Technologies), a Malaysian think-tank and consulting organization. CETEC in turn, engaged experts from the chemical industry as well as Malaysian Society of Air-conditioning, Heating and Refrigeration Engineers (MASHRAE), to provide assistance for sector-level work.

The draft national HCFC phase-out management plan was prepared focusing on compliance with the 2013 and 2015 targets, incorporating the draft sector and national strategies, with review and technical advice provided by UNDP and in close coordination with DOE.

### ***Government-Industry Cooperation for HPMP Preparation***

Throughout the HPMP preparation process, a core group of key industry representatives were in continuous consultation with CETEC, DOE and UNDP, ensuring proactive representation and participation of the industry in the HPMP preparation process.

### ***HPMP Submission and Approval***

The Malaysia HPMP Stage-I was submitted for consideration at the 65<sup>th</sup> ExCom Meeting in November 2011, wherein it was approved.

## **II. SITUATION ANALYSIS**

### **2.1 HCFC SUPPLY SCENARIO**

#### **2.1.1 Production**

There is no production of HCFCs in Malaysia.

#### **2.1.2 Exports**

There is no export or feedstock use of HCFCs recorded in Malaysia in 2009.

#### **2.1.3 Imports**

The entire domestic demand is met through imports mainly from China, India, Republic of Korea, Singapore and USA. Import of HCFCs is to be regulated in Malaysia (see Section 3.4.2). HCFC-141b, HCFC-22 and HCFC-123 are the main HCFCs imported.

#### **2.1.4 Distribution**

HCFCs are sold by the importers to manufacturers or users directly or indirectly through secondary distributors or retailers. HCFCs are also supplied through service establishments and contractors. Larger manufacturers also import HCFCs directly.

## 2.2 HCFC CONSUMPTION

The HCFC consumption in Malaysia increased from 841 metric tonnes in 1996 to 7,700 metric tonnes in 2009, indicating an average annual growth rate of over 18%. This steady increase in HCFC consumption was ascribed to sustained economic development during that decade, resulting in increased demand for consumer, commercial and industrial products operating on HCFCs, particularly in the refrigeration and air conditioning sectors.

### 2.2.1 Recent HCFC Consumption

Based on data collected from the survey and compiled, collated and reconciled between data from Department of Customs, Department of Statistics, Ministry of Trade and Industry and data reporting from Ministry of Environment, the consumption of HCFCs in Malaysia during 2005 to 2009 was as below:

**Table-1: Malaysia HCFC Consumption (2005 to 2009)**

Year/ Substance	HCFC-141b		HCFC-22		HCFC-123		Other		Total	
	Metric	ODP	Metric	ODP	Metric	ODP	Metric	ODP	Metric	ODP
2005	899	98.9	4,553	250.4	60	1.2	155	8.7	<b>5,667</b>	<b>359.2</b>
2006	1,153	126.8	4,562	250.9	25	0.5	86	4.9	<b>5,826</b>	<b>383.1</b>
2007	1,280	140.8	4,911	270.1	54	1.1	40	1.5	<b>6,285</b>	<b>413.5</b>
2008	1,206	132.7	4,471	245.9	106	2.1	45	2.5	<b>5,829</b>	<b>383.2</b>
2009	1,335	146.9	6,255	344.1	68	1.4	42	1.8	<b>7,700</b>	<b>494.2</b>

*Note: Metric tonnes rounded off to the nearest 1. ODP tonnes rounded off to the nearest decimal.*

HCFC-141b and HCFC-22 are the main HCFCs used, respectively in the Polyurethane Foams Sector and Refrigeration and Air Conditioning Sectors. Other HCFCs include HCFC-225 and HCFC-142b used in solvent, refrigerant, propellant and blowing agent applications.

### 2.2.2 HCFC Consumption by Sector and Substance

The 2009 HCFC consumption in Malaysia by substance and sector is tabulated below:

**Table-2: Malaysia HCFC Consumption by Sector and Substance (2009)**

Sector/Substance	HCFC-22	HCFC-141b	Other	Total
<b>Manufacturing</b>				
Air Conditioning	1,915	-	21	1,936
Refrigeration	330	-	20	350
Firefighting	-	-	13	13
PU Foams	-	1,335	-	1,335
XPS Foams	6	-	4	10
Solvents	-	-	1	1
<b>Servicing</b>	4,004	-	41	4,055
<b>Total</b>	<b>6,255</b>	<b>1,335</b>	<b>110</b>	<b>7,700</b>

*Note: All figures in metric tonnes, rounded off to the nearest 1.00.*

In terms of substances in metric tonnes, HCFC-22 accounts for about 81.2% of the consumption and HCFC-141b accounts for about 17.3% of the total consumption. HCFC-123, HCFC-225 and other HCFCs account for the remaining consumption.

Within manufacturing, the sectoral contributions to HCFC consumption are Air Conditioning (53.1%), Refrigeration (9.6%) and PU Foams (36.6%). In metric tonnes, about 47.3% of the total HCFC consumption is in manufacturing and remaining in servicing.

About 60-70% of the consumption in manufacturing originates from organized enterprises with good technical and managerial capability. The remaining consumption in manufacturing originates in small and medium-sized enterprises.

The main challenges for HCFC reductions identified were the current non-availability of cost-effective, environment-friendly, efficient and mature alternatives and also the implementability of conversions within the short time span available for meeting the 2013 and 2015 control targets for HCFC consumption.

## **2.3 TECHNOLOGY**

The selection of alternative technologies to HCFCs is governed by the following:

### **Requirements for the alternative substance**

The alternative substance whether used as a refrigerant, blowing agent or fire suppressant, should:

- Have favorable physical and chemical properties for the concerned application
- Be inert and stable
- Be compatible with existing materials
- Preferably not be flammable
- Not be toxic
- Have zero ODP and low GWP
- Be easily available

### **Requirements for the technology**

In addition to the substance, the phase-out of HCFCs requires plant and process conversions. Additional requirements that the overall conversion technology needs to fulfill are as below:

- Proven and reasonably mature technology
- End-product properties and performance should be maintained
- Cost-effective conversion with minimal disruption of current manufacturing operations

- Compliance with established local and international standards for health safety and environment
- Low overall direct and indirect CO<sub>2</sub>-equivalent emissions
- Implementable in a relatively short time frame

Currently, alternative substances and technologies that fully meet the above requirements are not available, except for one or two applications.

Due to the environmental and occupational impact of technologies in the Ozone Depleting Substance (ODS) consuming sectors, the past two decades have been marked by constant uncertainties and changes as well as several technological innovations and investments to overcome them.

As more scientific and technical information on alternative technologies and their environmental impacts, as well as information on research on new alternatives becomes available, it is clear that the eventual choice of alternative technology will need to carefully take into account environmental impacts and focus more on long-term environmental and occupational sustainability. This will need resources to be directed towards innovative products and processes that minimize ozone and climate impacts, while remaining efficient and affordable.

## **2.4 INSTITUTIONAL FRAMEWORK**

### **2.4.1 Institutional Arrangements**

Malaysia established the Ozone Protection Unit (OPU) within the Department of Environment (DOE) to respond to mandates of the Montreal Protocol. The OPU within the Air Division of the Department of Environment, plays a lead role in the Government's sustained efforts to phase-out ODS in the country.

The OPU is assisting the Ministry of Natural Resources and Environment as the Secretariat to the National Steering Committee (NSC) for the Protection of Ozone Layer that serves as an advisory body to the Government to provide strategic and policy guidance for implementation of the Montreal Protocol. The Chair of the NSC is the Secretary General of the Ministry of Natural Resources and Environment. There are various working groups for the implementation of Montreal Protocol in Malaysia and the OPU acts as their coordinating body. The OPU is supported through the Institutional Strengthening Project with financial assistance from the Multilateral Fund and implemented by UNDP.

### **2.4.2 Existing Policies and Regulations**

Malaysia has taken a proactive approach in phasing out controlled substances under the Montreal Protocol. It has formulated policies and legislations to restrict and limit the use of these controlled substances. These policies and strategies have provisions for the monitoring of the importation and consumption of controlled substances as well as for



promoting the use of non-ODS substitutes and alternatives in existing industries and new investments.

Malaysia's environmental policy regime can be traced to as early as 1974 with introduction of the Environmental Quality Act, 1974. Amendments to the Act had been made to include provisions on the prohibition of the use of CFCs in the refrigeration, foam and fire-fighting sectors. The guidelines for the control measures for the protection of the ozone layer to facilitate the implementation of the phase-out programme were issued by the Department of Environment in 1994. To provide regulatory and policy support for enabling the industry to eliminate ODS in line with the country's obligations under the Montreal Protocol, the Government of Malaysia has taken and continues to take the following key initiatives and actions:

- Environmental Quality (Prohibition on the Use of CFCs and Other Gases As Propellants and Blowing Agents) Order, 1993;
- Environmental Quality (Refrigerant Management) Regulations, 1999;
- Environmental quality (Halon Management ) Regulations,1999;
- Environmental Quality (Delegation of Powers) (Halon Management) Order, 2000;
- Hydrogen Cyanide (Fumigation) Act (1953), (revised 1981);
- Occupational Safety and Health Act (1974);
- Factories and Machinery Act (1967)
- Customs Act (1967); and
- Plant Quarantine Act (1976).

The above regulations provide the authority to control the import, installation, use and/or disposal of CFCs and other ODS substances controlled under the Montreal Protocol.

One of the primary systems of controls on ODS is the Application Import Permit System (AP System), which was administered by the Ministry of International Trade and Industry (MITI). Since its introduction in 1994 under the Prohibition of Import (Amendment No. 4) Order, 1994 of the Customs Act, 1967, all importers of the listed ODS, namely CFC-11, CFC-12, CFC-13, CFC-113, CFC-114, CFC-115, carbon tetrachloride (CTC) and 1,1,1-trichloroethane (TCA) must obtain an import permit issued by MITI. The total quantity of any of these substances that can be imported in any year is set by MITI in consultation with DOE. The amount is reduced each year in line with the Montreal Protocol obligations. From 2012, the issuance of the AP system will be handled by DOE in consultation with MITI.

### **III. STRATEGY**

#### **3.1 PRINCIPLES**

The overarching strategy underlying the HCFC Phase-out Management Plan (HPMP) for Malaysia is based on the following guiding principles:

- Reflect national context and priorities, national policies and country-drivenness;
- Develop and demonstrate a strengthened and proactive partnership between government and industry;
- Draw upon the lessons learnt from functioning of institutional arrangements and operational mechanisms, integrate and build upon existing infrastructures and introduce new mechanisms as needed;
- Be dynamic and evolving, and to be open for revisions and adaptation as necessary in response to evolving situations

## **3.2 APPROACH FOR COMPLIANCE**

Malaysia will develop and implement a staged approach for complying with the adjusted control schedule for Annex-C, Group-I substances (HCFCs) under the Montreal Protocol.

### **3.2.1 Stage-I (2012 to 2016)**

Considering the profiles of the various HCFC consuming sectors and sub-sectors, their current and forecasted consumption, their future prospects considering the country's need for sustained and sustainable economic development, the burgeoning population of HCFC-containing products, equipment and resulting ozone and climate impacts, requirements for effective and efficient management and coordination and to ensure a systematic transition with minimal disruption, the Stage-I period from 2012 to 2016 will focus on converting manufacturing facilities in select HCFC consuming sectors where non-HCFC, zero-ODP and low-GWP technologies can be applied.

To ensure that these conversions and the associated reductions in HCFC consumption remain sustainable and targeted, specific regulations will be promulgated. To control the growth of HCFC consumption, recovery and reclaim programmes and capacity-building programmes (for technicians and enforcement officials) will be carried out in the Servicing Sector. To further support the sustainability of these reductions, appropriate technical assistance, training and awareness programmes will be implemented.

### **3.2.2 Stage-II (2016 to 2020)**

In the Stage-II period from 2016 to 2020, three focal areas for action are identified as below:

- Phase-out of the HCFC consumption in the remaining manufacturing sectors, which could not be addressed in Stage-I, through investments, regulations and technical assistance.
- Reduction of HCFC consumption in the Servicing Sector, for which necessary supporting actions in terms of investments, policy, regulations, technical assistance, training, capacity-building and awareness will be implemented,

- Sustained monitoring and enforcement of regulations issued during Stage-I and additional regulations as may be needed

### **3.2.3 Subsequent Stages (beyond 2020)**

The focus of actions for subsequent stages will be on further reductions in HCFC demand for servicing in line with the subsequent control targets for HCFC consumption. This will involve sustaining and strengthening infrastructures for effective and efficient management of HCFCs, introducing and strengthening decentralized enforcement mechanisms and further mainstreaming the implementation of the Montreal Protocol in national and local institutions.

### **3.2.4 Strategic Issues**

Malaysia expects to encounter tremendous challenges for meeting the control targets for HCFC consumption in accordance with the adjusted phase-out schedule. Two key strategic issues are identified as below:

- The time available to implement actions for achieving the objectives of Stage-I (2012 to 2016), Stage-II (2016 to 2020) and subsequent stages, is extremely limited and will introduce extraordinary management and coordination challenges for government and industry. While in the midst of implementing Stage-I, preparation for Stage-II will need to be initiated, well in advance of 2016, so that implementation of Stage-II can commence smoothly, using the momentum gained in the implementation of Stage-I. To address this constraint, the management and coordination of actions will need to be forward-looking, systematic, effective and efficient and both government and industry will need to dedicate strong focus and adequate resources to ensure that implementation is approached consistently and in a result-oriented and unified manner.
- Malaysia will give serious and special attention to maximizing the environmental benefits of HCFC phase-out by prioritizing safe and sustainable low-GWP alternative technologies in accordance with the guidance provided by Meeting of Parties (MOP) Decision XIX/6. Malaysia has also set voluntary national targets for CO<sub>2</sub>-equivalent emission reductions. In view of this, Malaysia considers it of utmost importance that adequate resources need to be targeted towards introducing benign alternative technologies and curtailing the population of products and equipment containing HCFCs or other high-GWP substances.

## **3.3 PRIORITIZATION FOR STAGE-I**

As described in Section 3.2.1, Malaysia will focus on manufacturing sectors for converting to alternative technologies for compliance with the 2013 and 2015 targets. The prioritizing of enterprises, applications, sub-sectors and sectors will be based on the following criteria:

- Applications and sub-sectors where mature and benign alternatives are available

- Enterprises with sound financial standing and market reputation, with larger HCFC consumption and with good technical and managerial capacity, to ensure cost-effective conversions with maximum impact and implementability within the short timeframe
- Endeavoring to achieve phase-out on application-level or sub-sector level to facilitate easier regulation and enforcement and to maintain a level playing field for all stakeholders without market distortion

### 3.4 ANALYSIS OF REDUCTIONS REQUIRED FOR STAGE-I (2012 TO 2016)

#### 3.4.1 Baseline and Targets

As described in Sections 2.2.1, the HCFC consumption in Malaysia has been experiencing steady growth. In order to ensure that compliance with the 2013 and 2015 targets is achieved, while ensuring that legitimate needs of consumers and industry are met, the government and stakeholders carried out detailed analyses for projecting scenarios in order to establish the level of reductions needed to be achieved and available in various sub-sectors and applications for complying with the 2013 and 2015 targets, taking into account the prioritization principles described in Section 3.3. The following methodology was used:

- Establish the national HCFC consumption Baseline (average of 2009 and 2010 levels in ODP tonnes) based on the projected HCFC consumption for 2010.
- Establish the allowable growth until 2013 for national-level HCFC consumption, to ensure adequate availability of HCFCs for legitimate needs of various sectors
- Apply the prioritization principles described in Section 3.3 and establish and segregate the level of HCFC consumption available in each sub-sector or application that could accomplish phase-out no later than 2015.

The HCFC Consumption Baseline for Malaysia (average of 2009 and 2010 consumption levels) is shown below:

Table-3: Malaysia HCFC Consumption Baseline

Substance	Consumption (ODP tonnes)		
	2009*	2010*	Baseline
Annex-C Group-I substances (HCFCs)	494.2	537.5	515.8

\* A7 data reporting

Based on the above, the targets for compliance with the 2013 and 2015 controls are as below:

Table-4: Stage-I Targets

Target	Maximum Consumption Level (ODP tonnes)
From 01 January 2013	515.8

From 01 January 2015	464.2
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### 3.4.2 Reductions for Stage-I Compliance

As enumerated earlier, the average compounded growth in consumption in Malaysia over a five-year period during 2005-2009, was 8.28% annually on ODP-tonne basis. During the same period, the average compounded growth in GDP was about 4.67% annually.

Malaysia will limit the growth of HCFC consumption during 2011 and 2012 at about 2.75% annually, through the introduction of a quota system for HCFC imports. Under a projected business as usual scenario, the HCFC consumption by 2013, will reach 567.38 ODP tonnes. The Stage-I activities must reduce the HCFC consumption by 51.6 ODT tones to meet the 2013 compliance target. An additional 51.5 ODP tonnes would be needed to be reduced between 2013 and 2015, to achieve the 2015 compliance target. Thus, the total reductions needed for achieving both the 2013 and 2015 through the HPMP Stage-I work out to about 103.16 ODP tonnes.

Based on the prioritization criteria described in Section 3.3, Malaysia has decided to achieve reductions in HCFC consumption in various sectors as below:

Table-5: Reductions for Stage-I Compliance

Sector	Reductions for 2013 and 2015 targets (ODP tonnes)		
	Manufacturing	Servicing	Total
Air Conditioning	0	6.20	6.20
Refrigeration	0	2.36	2.36
Firefighting	0	0	0
Foams	94.60	0	94.60
Solvents	0	0	0
<b>Total</b>	<b>94.60</b>	<b>8.56</b>	<b>103.16</b>

### 3.5 RATIONALE AND PHASE-OUT STRATEGY

The following rationale and strategic considerations are involved in designing this phase-out strategy for compliance with the 2013 and 2015 compliance targets:

- Manufacturing, high ODP HCFCs (HCFC-141b) and the polyurethane (PU) Foams Sector have been prioritized
- Applications and sub-sectors where mature and relatively benign technologies are available are prioritized
- Financially sound and viable enterprises with good technical and managerial capacity and large consumption have been prioritized, to ensure implementability and maximum impact

- Modest interventions in the Servicing Sector are proposed, to adapt and build on the servicing sector infrastructure, to contribute to the 2013 and 2015 targets, as well as to effectively control the growth in the servicing sector consumption.

Based on the above, the PU Foams Sector, which has predominantly HCFC-141b consumption and where low-GWP technologies can be applied to a relatively small number of well-organized enterprises, will be prioritized. The PU Foams Sector will achieve reductions of 94.6 ODP tonnes.

In order to control growth of HCFC consumption in servicing through containment, recovery and reclamations, as well as to ensure capacity-building of technicians and enforcement officials, modest interventions in the Servicing Sector are proposed.

A key strategic consideration is the approach to deal with the HCFC consumption in manufacturing that would be unaddressed, either due to non-availability of mature and viable alternatives, or due to unimplementability in small and medium-sized enterprises within the available timeframe. The major unaddressed consumption would be in the Air Conditioning, Refrigeration and Servicing Sectors. Through carefully designed policies and targeted regulations, Malaysia will control the growth in HCFC consumption in sectors unaddressed for phase-out in Stage-I. For effective implementation, adequate resources will need to be accordingly allocated.

### 3.6 STRATEGY COMPONENTS AND COSTS

The strategy for compliance with the Stage-I targets for compliance with the 2013 and 2015 milestones is comprised of the following components:

#### 3.6.1 Policies, Regulations, Project Management and Coordination

##### *Policies and Regulations*

Policies and targeted regulations that are enforceable without distorting the markets will be instrumental in controlling the consumption of HCFCs, for meeting the 2013 and 2015 targets. Some of the key planned regulations planned for Stage-I are described below:

Table-6: Key Planned Regulatory Actions

Year	Planned Regulatory Actions
2012	Establishment of import restrictions from AP system based on HCFC Baseline (average national consumption for 2009/2010)
	Amend existing regulations for controlling use, imports, manufacturing, assembly and installation of products containing HCFCs
2013	Licensing re-export of HCFCs
	Enforcement of AP system
	Prohibition of establishment and expansion of new HCFC-based manufacturing capacities
	Establish incentive system for promoting use of alternatives to HCFCs
2015	Certification of technicians for handling HCFCs
	Prohibition of manufacturing, assembly and import of HCFC-based air conditioners (2.5 HP and

	lower) for use in Malaysia
	Prohibit imports of polyols pre-blended with HCFCs
	Include HCFCs in the list of restricted gases

### ***Management, Coordination and Monitoring***

The earliest date by which actual field activities can commence, is estimated to be early-2012. This is to allow time for putting in place the necessary project initiation procedures, agreements, etc. This means that stringent timelines will be encountered for implementing actions for Stage-I compliance. This will make the task of management and coordination of activities very challenging. Adequate resources would need to be allocated, to support the additional costs of management, coordination and monitoring.

### ***Awareness and Communications***

It is considered extremely important to engage and enlist the support of all stakeholders in the implementation of the HPMP (Stage-I). To accomplish this, targeted awareness and communication actions will need to be carried out, and aligned with the implementation of the HPMP Stage-I. Accordingly resources would need to be allocated to cover the costs of awareness and communications actions.

The total costs/funding for this component for the duration of the HPMP Stage-I (2012 to 2016) are tabulated below:

<b>Cost Component</b>	<b>Funding (US\$)</b>
<b>Project Management</b>	
Project staff	210,000
Overheads and operational costs	90,000
Plant visits for monitoring	60,000
<b>Coordination</b>	
Stakeholder meetings/workshops	90,000
Documentation and materials	15,000
<b>Verification</b>	
Performance verification	60,000
<b>Awareness and Communication</b>	
Publicity materials	15,000
Advertisements	60,000
<b>Total</b>	<b>600,000</b>

### **3.6.2 Polyurethane Foam Sector Plan**

The Polyurethane Foams Sector Plan will aim to phase out HCFC consumption in selected foam manufacturing enterprises by 2015. The successful implementation of this plan will contribute 91.7% to the phase-out target, leading to a phase-out of 860 metric tonnes of HCFC-141b.

In addition, the Polyurethane Foams Sector Plan will also provide technical assistance to four Malaysian-owned systems houses, so as to make available at least one low-GWP, safe, non-HCFC formulation per systems house, prior to 2015, which will enable downstream enterprises, mainly SMEs, to phase-out HCFCs cost-effectively.

Technical assistance to the Polyurethane Foams Sector will be provided through workshops, international and national experts and technical information dissemination.

The breakdown of the costs and funding for the Polyurethanes Foam Sector Plan is as below:

<b>Cost Component</b>	<b>Funding (US\$)</b>
<b>Technology Conversions at thirteen enterprises</b>	
Incremental capital and operating costs of conversion at thirteen enterprises (Berjaya Steel, Cycleworld, Insafoam, Kwangtai, Linear Panel, Ocean Rotomoulding, Pangkat Industrial, Ricwil Malaysia, Rigidfoam Industries, Saicond Engineering, Supiera Enterprises, United Panel, Zun Utara Industries)	7,000,000
Contingencies	147,470
Technical assistance from external experts	90,000
<b>Sub-total</b>	<b>7,327,470</b>
<b>Technical Assistance to Systems Houses</b>	
Incremental capital and operating costs for four enterprises (Colorex, Maskimi, Oriken, PPT))	750,000
Contingencies	70,000
Technical assistance from external experts	60,000
<b>Sub-total</b>	<b>880,000</b>
<b>Sector Technical Support</b>	
Five annual technical workshops	60,000
External experts	15,000
Documentation and materials	15,000
<b>Sub-total</b>	<b>90,000</b>
<b>Total</b>	<b>8,297,470</b>

### 3.6.3 Technical Assistance for the Servicing Sector

Since a large proportion of the unaddressed consumption in 2015 would be in the Servicing Sector, actions would need to be initiated at the outset, to curb the growth of HCFC-based equipment population during the first 3-4 critical years during which phase-out actions are being implemented. Specific policy and technical assistance interventions will be needed to control the growth in HCFC consumption in servicing until 2015 to acceptable levels.

The key interventions will comprise of the following:

- Sustainable refrigerant management to promote reclamation and re-use of refrigerants and consequently reduce the demand for virgin refrigerants



- Training and capacity-building of trainers, technicians and enforcement officials, to ensure that adequate capacity exists to carry out reclamation, retrofitting programmes as well enforcement of current and future regulations related to ODS
- Pilot retrofitting/replacement demonstration programmes to initiate actions at the end-users of ODS-based equipment, to gradually and eventually reduce demand for ODS as refrigerant in current and future population of refrigeration and air conditioning equipment
- Technical assistance workshops and information dissemination for the Air Conditioning and Refrigeration Sectors, both manufacturing and servicing, to provide updated alternative technology information.

The breakdown of the costs for this component is as below:

<b>Cost Component</b>	<b>Funding (US\$)</b>
<b>Refrigerant Management</b>	
Mini-reclaim units and accessories (US\$ 20,000/set, 9 sets)	180,000
Recovery units and tools (US\$ 2,500/set, 30 sets)	75,000
Stakeholder workshops for reclamation training (5)	45,000
Documentation and materials	5,000
Technical experts	10,000
<b>Sub-total</b>	<b>315,000</b>
<b>Technician Training</b>	
Training workshops for Master Trainers	15,000
Training workshops for Technicians	30,000
Technical experts	10,000
Documentation and training materials	5,000
<b>Sub-total</b>	<b>60,000</b>
<b>Enforcement Officials Training</b>	
Training workshops for enforcement officials	30,000
Technical experts	10,000
Documentation and materials	5,000
Refrigerant Identifiers (15)	45,000
<b>Sub-total</b>	<b>90,000</b>
<b>Pilot Retrofitting/Replacement Demonstration</b>	
Pilot retrofitting/replacement (air conditioning/refrigeration)	100,000
Workshops	20,000
Technical experts	10,000
Documentation and materials	5,000
<b>Sub-total</b>	<b>135,000</b>
<b>Technical Assistance Workshops for R&amp;AC Sector</b>	
Workshops	60,000
Technical experts	20,000
Documentation and materials	10,000
<b>Sub-total</b>	<b>90,000</b>
<b>Total</b>	<b>690,000</b>

### 3.7 SUMMARY OF COSTS AND FUNDING

The total funding for each of the components is summarized below:

<b>Strategy Component</b>	<b>Phase-out (ODP tonnes)</b>	<b>Funding (US\$)</b>
Management, Coordination and Monitoring	0	600,000
Polyurethane Foams Sector Plan	94.60	8,297,470
Technical assistance for Servicing Sector	8.42	690,000
<b>Total</b>	<b>103.02</b>	<b>9,587,470</b>

*Note: All amounts rounded off to the nearest US\$ 1.00 and do not include agency support costs*

#### IV. TIME-FRAME AND MONITORING MILESTONES

The overall timeframe and monitoring milestones are as below:

MILESTONE/TIME FRAME	2012				2013				2014				2015				2016			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
<b>HCFC Consumption Limit (ODP tonnes)</b>	N/A				515.76				515.76				464.18				438.40			
<b>Technology Conversions</b>																				
Finalization of implementation plan	■																			
Enterprise-level agreements	■	■	■																	
Enterprise-level conversions		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
Commissioning					■	■	■	■	■	■	■	■	■	■	■					
<b>Project Management</b>																				
Finalization of implementation plan	■	■																		
Regulations development	■	■	■	■	■	■	■	■												
Enforcement			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Monitoring and Coordination	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Awareness and capacity-building			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Stakeholder consultations	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Performance verification									■	■		■	■		■	■		■	■	

## V. ANNUAL WORK PLAN

<b>Award ID</b>							
<b>Project ID</b>							
<b>Project Title</b>	HCFC Phase-out Management Plan (HPMP) Stage-I for Malaysia						
<b>Executing Agency</b>	Department of Environment (DOE)						
Expected Outputs	Responsible Party	Source of Funds	ATLAS Code	ATLAS Budget Description	Annual Budget (US\$)		
					2012	2013	2014-2016
<b>Output 1:</b> Project Management and Coordination	UNDP	63030	71200	International experts	5,000	5,000	Note 4
	DOE	63030	72600	Grants	140,000	155,000	
	DOE	63030	74500	Miscellaneous	5,000	2,908	
<b>Sub-total</b>					<b>150,000</b>	<b>162,908</b>	
<b>Output 2:</b> Phase-out of HCFC consumption in the Polyurethane Foams Sector	DOE/UNDP	63030	72100	Contractual Services <sup>Note 1</sup>	2,210,000	1,877,247	
	DOE/UNDP	63030	72100	Contractual Services <sup>Note 2</sup>	39,000	42,000	
	DOE/UNDP	63030	72100	Contractual Services <sup>Note 3</sup>	0	15,000	
	DOE/UNDP	63030	75700	Workshops/Meetings	15,000	15,000	
	DOE	63030	74500	Miscellaneous	54,000	60,000	
<b>Sub-total</b>					<b>2,318,000</b>	<b>2,009,247</b>	
<b>Output 3:</b> Technical assistance to the Servicing Sector	DOE/UNDP	63030	72100	Contractual Services <sup>Note 1</sup>	70,000	93,000	
	DOE/UNDP	63030	72100	Contractual Services <sup>Note 2</sup>	70,000	82,000	
	DOE/UNDP	63030	75700	Workshops/Meetings	15,000	15,000	
	DOE	63030	74500	Miscellaneous	4,845	10,000	
<b>Sub-total</b>					<b>159,845</b>	<b>200,000</b>	
<b>GRAND TOTAL</b>					<b>2,627,845</b>	<b>2,372,155</b>	

- Notes:**
1. Recipient enterprises, for phase-out or demonstration projects
  2. Appropriate entities for technical assistance, training, industry interaction and awareness
  3. Performance verification
  4. The budgets are currently shown for the first tranche of US\$ 5,000,000. The balance funding of US\$ 4,587,470, will be released by MLF in future tranches in 2013, 2015 and 2016 and will be phased-in to the budgets through appropriate budget revisions as detailed in the agreement between the Government of Malaysia and the Executive Committee of the Multilateral Fund in Appendix IV.

### Source of Funds (first tranche):

Source	Project ID	Amount (US\$)
MLF	MAL/PHA/65/TAS/168	359,845
MLF	MAL/PHA/65/INV/169	4,327,247
MLF	MAL/PHA/65/TAS/170	312,908
<b>Total</b>		<b>5,000,000</b>

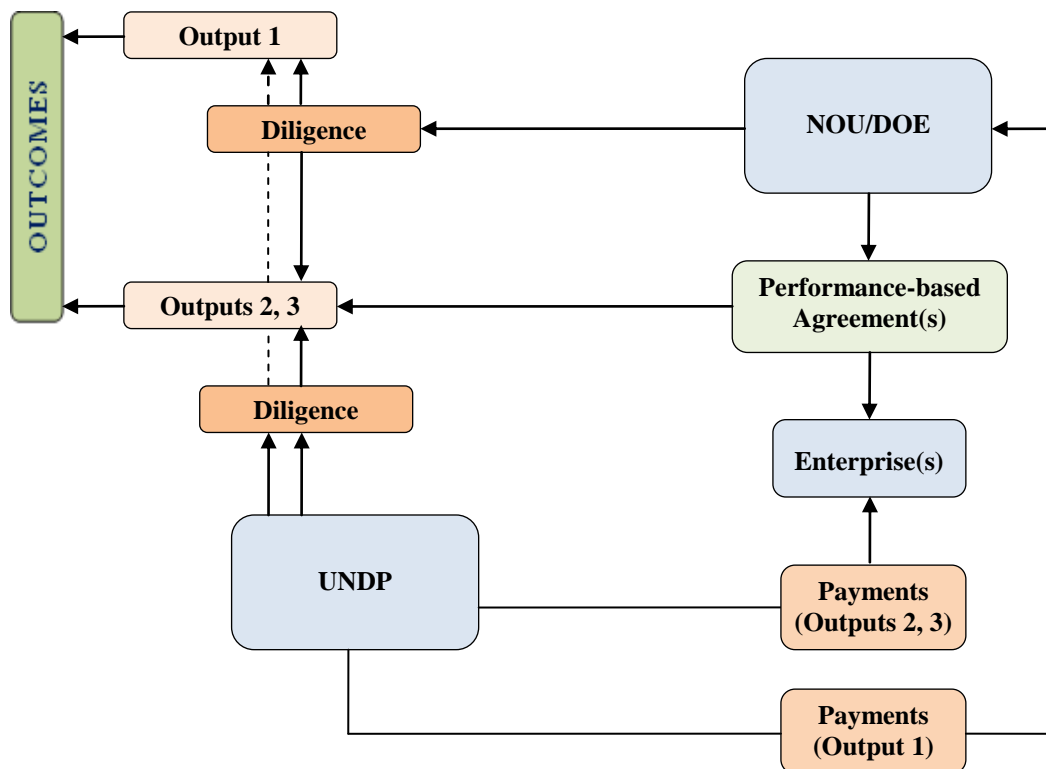
**Note:** Excluding agency fees

## VI. MANAGEMENT ARRANGEMENTS

### 6.1 IMPLEMENTATION MODALITY

The funding for the project is approved in-principle by the Executive Committee of the Multilateral Fund, to assist Malaysia in complying with the 2013 and 2015 control measures for HCFCs under the Montreal Protocol and is subject to the provisions of the performance-based agreement between the Executive Committee and Government of Malaysia (attached as Annex-IV), comprising of annual/biennial HCFC consumption and phase-out targets. Approval of future funding tranches is contingent upon achievement of these targets, failing which Malaysia could be liable for penalties for non-compliance. The project implementation would need to be within the framework of this agreement and the components to be implemented through performance-based agreements involving the beneficiary enterprises and/or the Government.

The project will be managed through National Implementation Modality. The Government of Malaysia through its National Ozone Unit, Ministry of Environment (DOE) will implement the project with support from UNDP as may be requested and agreed. The execution arrangements for the project outputs will follow the structure and process depicted below:



For Output 1 (Project management and coordination), performance-based payments will be made by UNDP to NOU/DOE, based on agreed milestones and deliverables (Annex-III).

For Outputs 2 and 3 (Polyurethane Foams Sector Plan and Technical Assistance for Servicing Sectors), NOU/DOE will enter into performance-based phase-out agreements with enterprises in these two sectors. Upon achievement of the agreed milestones and deliverables in these

agreements, UNDP will make payments to the enterprises upon NOU/DOE endorsement and upon carrying out the required diligence through verification.

## **6.2 ROLES AND RESPONSIBILITIES**

### **6.2.1 National Steering Committee (NSC)**

A National Steering Committee provides guidance and direction to the project implementation process according to the established detailed work plan monitoring tool. The Committee chaired by the Secretary General of Ministry of Natural Resources and Environment, composed of representatives from Ministry of Finance, Ministry of Foreign Affairs, Ministry of Internal Trade and Consumers Affairs, Ministry of Energy, Green Technology and Water, Ministry of Agriculture, Economic Planning Unit, Ministry of International Trade and Industry, Malaysian Investment Development Authority, Customs Department, Statistic Department, Fire and Rescue Department, DOE, NGO and other relevant stakeholders.

### **6.2.2 Ozone Protection Unit, Air Division, DOE**

The Ozone Protection Unit (NOU) within the Air Division of the Department of Environment (DOE) acts as a national focal point for the implementation of the Montreal Protocol and is responsible for the overall coordination of ODS Phase-out programme in Malaysia. DOE will have the following roles and responsibilities:

- Overall responsibility for supervision and monitoring of implementation;
- Coordination of activities among various stakeholders and partners;
- Developing appropriate policy and regulatory actions, including review and coordination amongst different government departments and ensuring their enactment and enforcement;
- Executing performance-based agreements with enterprises participating in the HPMP for technology conversions and HCFC phase-out, and endorsing disbursements to the enterprises based on agreed performance targets;
- Establishing completion of enterprise level technology conversions and phase-out of HCFCs;
- Coordinating between various HCFC-consuming sectors at national level in such a way as to ensure that the agreed national-level phase-out targets and consumption targets are met;
- Facilitating stakeholder consultations;
- Conducting awareness and outreach activities to ensure communication and dissemination of information to stakeholders and public;
- Facilitating performance verification and financial audit as required;
- Preparing annual implementation plans and progress reports in accordance with the provisions of the HPMP agreement between the Executive Committee of the Multilateral Fund and Government and reports as may be required by UNDP.

### **6.2.3 MITI**

MITI will assist DOE with the review of the reports to be submitted to the Executive Committee of the Multilateral Fund and assist DOE with the implementation and execution of the Application Import Permit System.

### **6.2.4 CUSTOMS DEPARTMENT**

The customs department will assist DOE with the review of the reports to be submitted to the Executive Committee of the Multilateral Fund and assist DOE with the implementation and execution of the Application Import Permit System.

### **6.2.5 UNDP**

UNDP has been designated as the implementing agency for the overall HPMP including all HCFC consuming sectors. UNDP will have the following responsibilities:

- Supporting DOE in ensuring an effective and smooth implementation process;
- Providing assistance for policy/regulatory actions, management and technical support to DOE as and when required;
- Assisting DOE in the process of consultations with stakeholders on the technical and logistical aspects of HPMP implementation;
- Supporting DOE in the review and endorsement process for enterprise-level technology conversions and phase-out agreements;
- Assisting DOE and stakeholders on alternative technologies and technology transfer;
- Assisting DOE in identification and recruitment of expert(s) and project staff as required;
- Ensuring performance verification and disbursements in accordance with the HPMP agreement between the Executive Committee of the Multilateral Fund and Government of Malaysia;
- Assisting DOE in the preparation and submission of annual implementation plans, progress reports and requests for future funding tranches, as stipulated in the HPMP agreement between the Executive Committee of the Multilateral Fund and Government of Malaysia;
- Undertaking consultations and clarifications with MLF Secretariat as may be required in context of submission and approval of annual implementation plans and progress reports;
- Carrying out the required monitoring and supervision missions.
- Carrying out procurement of equipment

Other roles and responsibilities and terms of references not mentioned in this document shall be agreed with the implementing partner when necessary.

### **6.3 FINANCIAL MANAGEMENT**

Based on the approved AWP, UNDP will provide required financial resources to the Implementing Partner to carry out project activities during the annual cycle. Under the Harmonized Approach to Cash Transfer ([HACT](#)), the following modalities may be used:

- Direct cash transfers to the Implementing Partner, for obligations and expenditures to be made by them in support of activities;
- Direct payments to vendors and other third parties, for obligations incurred by the Implementing Partner;
- Reimbursement to the Implementing Partner for obligations made and expenditure incurred by them in support of activities

The FACE form as per Annex VII should be used for all of the above cash disbursements as well as for expenditure reporting.

The Implementing partner and Project assistant will work closely with UNDP to monitor the use of the financial resources and are accountable for

- Managing UNDP's resources to achieve the expected results

- Maintaining an up to date accounting system that contains records and controls to ensure the accuracy and reliability of financial information and reporting. Expenditures made should be in accordance with the, Annual Work Plans and budgets.

At the end of a quarter/year UNDP prepares a Combined Delivery Report (CDR) which records all disbursements made under the project for verification. The Implementing Partner and UNDP should sign this CDR.

A project revision shall be made when appropriate; to respond to changes in the development context or to adjust the design and resources allocation to ensure the effectiveness of the project provided that the project remains relevant to the Country Programme. A project revision shall be supported by the record of an approval decision made by the project NSC, and an updated and signed AWP.

#### **6.4 UNDP SUPPORT SERVICES**

In addition, UNDP may provide the following services:

- a) identification and recruitment of project personnel;
- b) procurement of goods and services
- c) Identification of training activities and assistance in carrying them out

The above will be carried out based on UNDP policies and procedures following the principles of best value for money, fairness, integrity, transparency, and effective competition.

UNDP will charge for the provision of support services in accordance with the prevailing Universal Price List issued by UNDP in New York annually.

#### **IN KIND CONTRIBUTION**

In addition to the financial resources through UNDP, the implementing partner will provide the following in-kind contribution:

- Assist in gaining access to all relevant data and information required to for the project that is accessible for public viewing;
- Office space (i.e. room/workspace) for the Project assistant, consultants and experts at DOE
- Use of office support facilities by the Project assistant, consultants and experts (e.g. fax machine, stationary, Xerox machine, telephone), and secretarial support where applicable;
- Facilities for convening meetings, workshops and seminars.

Any reimbursable expenses can be borne by the project fund as agreed Annual Work Plan (AWP).

## **VII. MONITORING FRAMEWORK AND EVALUATION**

The project activities will be closely monitored by UNDP. In compliance with UNDP regulations, the following will be conducted:

### **7.1 MONITORING AND REPORTING**



Monitoring will include a continuous and systematic review of the various activities and will be intended to (i) measure input, output, and performance indicators; (ii) provide regular and up-to-date information on the progress towards meeting the overall project objectives; and (iii) alert implementing partners to potential problems in implementation, and propose corrective measures. Milestone review will be undertaken jointly with national counterparts and all concerned stakeholders and beneficiaries.

The National Steering Committee (NSC) will meet after the receipt of each project report or at least twice a year, whichever is greater and address project issues raised, review project progress reports and provide direction and recommendations to ensure that the agreed deliverables are produced satisfactorily according to the project document. A final NSC meeting should also be held at the end of project completion to agree to and endorse the final findings and outcomes of the project and to make recommendations towards project closure.

The reporting with respect to this project will comprise of annual/biennial implementation plans, reporting on implementation of previous tranches and performance verification, consistent with the reporting requirements stipulated in the HPMP agreement between the Executive Committee of the Multilateral Fund.

UNDP will be responsible for financial monitoring and reporting on all disbursements of the programme and will ensure continued reporting to the Government of Malaysia and Montreal Protocol MLF.

The following are the reports which are to be carried out:

- **Mid Year Progress Report**  
A Mid Year Progress Report shall be shared with the NSC by 30 June of each project year. As a minimum requirement, the Mid Year Progress Report shall utilize the standard template for the Annual Project Report covering a six month period.
- **Annual Progress Report (APR)**  
An Annual Progress Report shall be shared with the NSC by the end of the last quarter of each year. The Annual Progress Report shall be a narrative report, with data provided by calendar year, regarding the progress since the year prior to the previous report, reflecting the situation of the Country in regard to phase out of the Substances, how the different activities contribute to it, and how they relate to each other. The report should include ODS phase-out as a direct result from the implementation of activities, by substance, and the alternative technology used and the related phase-in of alternatives, to allow the Secretariat to provide to the Executive Committee information about the resulting change in climate relevant emissions. The report should further highlight successes, experiences, and challenges related to the different activities included in the Plan, reflecting any changes in the circumstances in the Country, and providing other relevant information. The report should also include information on and justification for any changes vis-à-vis the previously submitted APR(s), such as delays, uses of the flexibility for reallocation of funds during implementation of a tranche, or other changes. A set of quantitative information for all APR(s), must also be submitted through an online database.
- **Final Project Review Report**

This document which is prepared by the implementing partner is a structured assessment of progress based on the chain of results initially defined in the Project Document and Annual Work Plan (AWP) and will include information on financial allocations of expenditure. It may be supplemented by additional narrative to meet specific reporting needs of stakeholders, especially the donor(s). The following should be submitted together with the report:

- Lessons learnt log - summarizing the information captured throughout the implementation of the project
- Minutes of NSC meetings
- Annual signed Combined Delivery Reports (CDRs)
- Statements of cash position (if applicable)
- Statements of assets and equipment

This report will be discussed at the Final Project Review meeting mentioned above.

- **Final Project Evaluation**

Project evaluation assesses the performance of a project in achieving its intended results. It yields useful information on project implementation arrangements and the achievement of outputs. It is at this level that direct cause and attribution can be addressed given the close causal linkage between the intervention and its effect or output. Project evaluation provides valuable information to support informed decision-making and serves to reinforce the accountability of the implementing agency. Depending on the purpose, project evaluations can be commissioned by the management at any time during the project cycle: at mid point, just before or after completion. They should ideally take place around the time of completing a project to determine the future of the project (e.g. continuation or termination of the project), to decide whether the concept should be scaled up or replicated elsewhere, and/or to generate lessons that are of strategic significance for the organization. The evaluation should be conducted by an independent consultant.

## **7.2 PERFORMANCE VERIFICATION**

In accordance with the HPMP agreement between the Executive Committee of the Multilateral Fund and Government of Malaysia, performance verification will need to be carried out for each year for which national level consumption targets are stipulated. This would apply to each year beginning 2013.

Performance verification will be carried out by an independent external entity. The terms of reference for the verification shall be jointly developed by and agreed between UNDP and DOE. The verification will establish the following key parameters:

- Whether or not the targets for national HCFC consumption and/or phase-out for a given year as defined in the HPMP agreement between the Executive Committee and Government of Malaysia were achieved;
- Whether or not the HCFC consumption at enterprise level was reduced or phased-out as planned, employing the alternative technologies as agreed;
- Whether or not the technical assistance activities were appropriately conducted as planned in accordance with the annual implementation plan for that year.

The performance verification for a given year shall be completed no later than 75 days prior to the date of the meeting of the Executive Committee, to which the submission is due.

### **7.3 FINANCIAL MONITORING AND QUALITY ASSURANCE**

A Combined Delivery Report (CDR) is a report that reflects the total expenditures and actual obligations (recorded in Atlas) of a Project during a period. This report is prepared by UNDP using Atlas and shared with the implementing partner on a quarterly basis and at the end of each year. The Implementing Partner is required to verify each transaction made and sign the quarterly issued CDR report. Statements of cash position as well as assets and equipments should also be submitted together with the CDR on a yearly basis.

Audit is an integral part of sound financial and administrative management, and of the UNDP accountability framework. The project will be audited at least once in its lifetime and in accordance with the threshold established for the annual expenditures by the Office of Audit and Investigations (OAI). The audit provides UNDP with assurance that resources are used to achieve the results described and that UNDP resources are adequately safeguarded

The selection of an Audit Firm shall be through a competitive Request for Proposals, in consultation with the Implementing Partner and EPU or if possible shall be performed by the National Audit Authority. UNDP procedures must be followed as per the specific Terms of Reference for Audits of NEX/NIM Projects.

The audit is expected to provide assurance related to the following broad areas where applicable:

- Project progress and rate of delivery (PP)
- Financial management (FM)
- Procurement of goods and /or services (PR)
- Human resource selection and administration (HR)
- Management and use of equipment and inventory (EQ)
- Record-keeping systems and controls (R)
- Management structure (MS)
- Auditors' comments on the implementation status of prior year audit

### **7.4 REVIEW**

One review meetings will be held annually between UNDP, DOE, and other stakeholders and partners. In addition, an Annual Project Review Meeting will be chaired by EPU during the fourth quarter of the year to assess the performance of the project based on the Annual Work Plan (AWP) submitted at the beginning of the calendar year as well as the Annual Progress Report submitted during the fourth quarter of each calendar year. The annual project review meeting will be arranged prior to the submission date for implementation plans and reports to the Executive Committee. The review will involve all key project stakeholders and the Implementing Partner, and will focus on the extent to which progress have been made towards achievement of the outputs and that they remain aligned to appropriate outcomes as outlined in the project document. This review should update output targets and results achieved. In the last year of the project, the review will be a final assessment.

A Final Project Review meeting will be conducted towards the end of the project completion. Its purpose is to assess the performance and success of the project. It should look at sustainability of the results, including the contribution to related outcomes (and the status of these outcomes) and capacity development. It will also review lessons learned and recommendations that might improve design and implementation of other UNDP-funded projects. The meeting will discuss the Final Project Review Report that should be submitted two weeks prior to the Final Project Review Meeting.

Additional review meetings as necessary will be arranged to monitor progress of implementation, to identify potential risks and to devise consensual remedial actions.

## 7.5 QUALITY MANAGEMENT FOR RESULTS

<b>Outcome:</b> Malaysia's compliance with the national HCFC consumption targets as per the Montreal Protocol and in accordance with the agreement between the Executive Committee of the Multilateral Fund and Government of Malaysia. The following outputs are required from the project, to achieve this outcome:		
Output 1: Project Management and Coordination		
Output 2: Phase-out of HCFCs in selected enterprises in the Polyurethane Foams Sector		
<b>Output 1</b>	Project Management and Coordination	<b>Start Date:</b> March 2012 <b>End Date:</b> Dec 2016
<b>Purpose</b>	Ensure smooth technical and operational management of the project, including the required regulatory and awareness interventions.	
<b>Description</b>	<ul style="list-style-type: none"> <li>• Enact regulations for control of HCFC consumption</li> <li>• Technical, financial and operational management</li> <li>• Coordination with stakeholders and partners</li> <li>• Promote awareness and communications for stakeholders and public to ensure sustainability</li> <li>• Monitoring, reporting and verification</li> </ul>	
<b>Quality Criteria</b>		<b>Quality Method</b>
Controls on HCFC consumption		Enactment of regulations for control of HCFC consumption
Project implementation progress as planned		Timely submission of implementation plans, reports and verification to the Executive Committee
Date(s) of Assessment		1Q 2014 and 1Q 2015
Date(s) of Assessment		1Q 2013, 2014, 2016 and 2018
<b>Output 2</b>	HCFC phase-out in selected enterprises in the Polyurethane Foams Sector	<b>Start Date:</b> March 2012 <b>End Date:</b> Dec 2016
<b>Purpose</b>	Phase-out of HCFCs at selected enterprises in the Polyurethane Foams Sector by converting to agreed ozone-friendly alternative technologies which minimize impacts on health, safety and environment.	
<b>Description</b>	<ul style="list-style-type: none"> <li>• Enterprise-level technology conversions to non-HCFC technologies</li> <li>• Technical assistance at enterprise and sector levels</li> </ul>	
<b>Quality Criteria</b>		<b>Quality Method</b>
Enterprise-level technology conversions		Signed agreements with enterprises
Phase-out of HCFCs at enterprise level		No HCFC consumption at enterprise-level confirmed through verification
Technical assistance		Smooth conversion to agreed safe and environment-friendly technologies
Date(s) of Assessment		2Q2012, 4Q2012
Date(s) of Assessment		1Q2014, 1Q2016
Date(s) of Assessment		1Q2013, 1Q2014, 1Q2015, 1Q2016
<b>Output 3</b>	Technical Assistance for Servicing	<b>Start Date:</b> March 2012 <b>End Date:</b> Dec 2016
<b>Purpose</b>	Reduced demand for HCFCs in the Refrigeration and Air Conditioning (Servicing) Sector	
<b>Description</b>	<ul style="list-style-type: none"> <li>• Sustainable refrigerant management</li> <li>• Demonstration of retrofitting/replacement of equipment with non-HCFC refrigerants</li> </ul>	
<b>Quality Criteria</b>		<b>Quality Method</b>
Sustainable refrigerant management		Recovery/reclamation equipment operational
Technical assistance		Smooth conversion to agreed safe and environment-friendly technologies
Date(s) of Assessment		4Q2013
Date(s) of Assessment		4Q2013, 4Q2014

## VIII. LEGAL CONTEXT

This document together with the Country Programme document signed by the Government and UNDP which is incorporated by reference, constitute together the instrument envisaged and defined in the Supplemental Provisions to the Project attached hereto in Annex-II and forming an integral part hereof, as “the Project Document”.

Consistent with the above Supplemental Provisions, the responsibility for the safety and security of the Implementing Partner and its personnel and property, and of UNDP’s property in the Implementing Partner’s custody, rests with the Implementing Partner. To this end, the Implementing Partner shall:

- a) Put in place an appropriate security plan and maintain the security plan, taking into account the security situation in the country where the project is being carried;
- b) Assume all risks and liabilities related to the Implementing Partner’s security, and the full implementation of the security plan.

UNDP reserves the right to verify whether such a plan is in place, and to suggest modifications to the plan when necessary. Failure to maintain and implement an appropriate security plan as required hereunder shall be deemed a breach of the Implementing Partner’s obligations under this Project Document.

The Implementing Partner agrees to undertake all reasonable efforts to ensure that none of the UNDP funds received pursuant to the Project Document are used to provide support to individuals or entities associated with terrorism and that the recipients of any amounts provided by UNDP hereunder do not appear on the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). The list can be accessed via <http://www.un.org/Docs/sc/committees/1267/1267ListEng.htm>. This provision must be included in all sub-contracts or sub-agreements entered into under/further to this Project Document. (The term “Government Co-Operating Agency” mentioned in the Supplemental Provisions shall mean the executing agency/implementing partner to the project as stated in the cover page of this document).

## ANNEXES

<b>Annex-I</b>	<b>:</b>	<b>Risk Analysis</b>
<b>Annex-II</b>	<b>:</b>	<b>Supplemental Provisions</b>
<b>Annex-III</b>	<b>:</b>	<b>Milestones and Indicators for Output 1 (Project Management and Coordination)</b>
<b>Annex-IV</b>	<b>:</b>	<b>Agreement between the Executive Committee of the Multilateral Fund and Government of Malaysia for HPMP Stage-I</b>
<b>Annex-V</b>	<b>:</b>	<b>UNDP annual work plan and monitoring tool</b>
<b>Annex-VI</b>	<b>:</b>	<b>Project Annual Report Template</b>
<b>Annex-VII</b>	<b>:</b>	<b>Face form</b>
<b>Annex-VIII</b>	<b>:</b>	<b>Letter of Agreement for the Provision of Support Service</b>

<b>Annex-IX</b>	<b>:</b>	<b>Terms of reference: National Steering Committee</b>
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## ANNEX-I

### RISK ANALYSIS

No	Description	Date Identified	Type	Impact and Probability ( <i>I= low, 5=high</i> )	Countermeasures/ Management Response	Owner
1	Delay in enactment of regulations	Project initiation date	Operational	Effective controls on HCFCs will not be in place and may lead to non-compliance with provisions of ExCom agreement <i>P = 1, I = 5</i>	Close and regular coordination between DOE and other government departments and agencies	DOE
2	Delay in implementation of enterprise-level conversions	Project initiation date	Operational	HCFC phase-out at enterprise-level may not take place as planned <i>P = 1, I = 4</i>	Improved project management through regular monitoring of enterprise-level activities	DOE/UNDP
3	Delay in availability of alternative technologies	Project initiation date	Operational	HCFC phase-out at enterprise-level may not take place as planned <i>P = 1, I = 4</i>	Regular consultations with technical experts and closely monitoring technological developments	DOE/UNDP

## ANNEX-II

### SUPPLEMENTAL PROVISIONS

#### **General responsibilities of the Government, UNDP and the executing agency**

1. All phases and aspects of UNDP assistance to this project shall be governed by and carried out in accordance with the relevant and applicable resolutions and decisions of the competent United Nations organs and in accordance with UNDP's policies and procedures for such projects, and subject to the requirements of the UNDP Monitoring, Evaluation and Reporting System.
2. The Government shall remain responsible for this UNDP-assisted development project and the realization of its objectives as described in this Project Document.
3. Assistance under this Project Document being provided for the benefit of the Government and the people of (the particular country or territory), the Government shall bear all risks of operations in respect of this project.
4. The Government shall provide to the project the national counterpart personnel, training facilities, land, buildings, equipment and other required services and facilities. It shall designate the Government Co-operating Agency named in the cover page of this document (hereinafter referred to as the "Co-operating Agency"), which shall be directly responsible for the implementation of the Government contribution to the project.
5. The UNDP undertakes to complement and supplement the Government participation and will provide through the Executing Agency the required expert services, training, equipment and other services within the funds available to the project.
6. Upon commencement of the project the Executing Agency shall assume primary responsibility for project execution and shall have the status of an independent contractor for this purpose. However, that primary responsibility shall be exercised in consultation with UNDP and in agreement with the Co-operating Agency. Arrangements to this effect shall be stipulated in the Project Document as well as for the transfer of this responsibility to the Government or to an entity designated by the Government during the execution of the project.
7. Part of the Government's participation may take the form of a cash contribution to UNDP. In such cases, the Executing Agency will provide the related services and facilities and will account annually to the UNDP and to the Government for the expenditure incurred.

#### (a) Participation of the Government

1. The Government shall provide to the project the services, equipment and facilities in the quantities and at the time specified in the Project Document. Budgetary provision, either in kind or in cash, for the Government's participation so specified shall be set forth in the Project Budgets.



2. The Co-operating Agency shall, as appropriate and in consultation with the Executing Agency, assign a director for the project on a full-time basis. S/he shall carry out such responsibilities in the project as are assigned to him/her by the Co-operating Agency.
3. The estimated cost of items included in the Government contribution, as detailed in the Project Budget, shall be based on the best information available at the time of drafting the project proposal. It is understood that price fluctuations during the period of execution of the project may necessitate an adjustment of said contribution in monetary terms; the latter shall at all times be determined by the value of the services, equipment and facilities required for the proper execution of the project.
4. Within the given number of man-months of personnel services described in the Project Document, minor adjustments of individual assignments of project personnel provided by the Government may be made by the Government in consultation with the Executing Agency, if this is found to be in the best interest of the project. UNDP shall be so informed in all instances where such minor adjustments involve financial implications.
5. The Government shall continue to pay the local salaries and appropriate allowances of national counterpart personnel during the period of their absence from the project while on UNDP fellowships.
6. The Government shall defray any customs duties and other charges related to the clearance of project equipment, its transportation, handling, storage and related expenses within the country. It shall be responsible for its installation and maintenance, insurance, and replacement, if necessary, after delivery to the project site.
7. The Government shall make available to the project - subject to existing security provisions – any published and unpublished reports, maps, records and other data which are considered necessary to the implementation of the project.
8. Patent rights, copyright rights and other similar rights to any discoveries or work resulting from UNDP assistance in respect of this project shall belong to the UNDP. Unless otherwise agreed by the Parties in each case, however, the Government shall have the right to use any such discoveries or work within the country free of royalty and any charge of similar nature.
9. The Government shall assist all project personnel in finding suitable housing accommodation at reasonable rents.
10. The services and facilities specified in the Project Document which are to be provided to the project by the Government by means of a contribution in cash shall be set forth in the Project Budget. Payment of this amount shall be made to the UNDP in accordance with the Schedule of Payments by the Government.
11. Payment of the above-mentioned contribution to the UNDP on or before the dates specified in the Schedule of Payments by the Government is a prerequisite to commencement or continuation of project operations.

(b) Participation of UNDP and the executing agency

1. UNDP shall provide to the project through the Executing Agency the services, equipment and facilities described in the Project Document. Budgetary provision for the UNDP contribution as specified shall be set forth in the Project Budget.
2. The Executing Agency shall consult with the Government and UNDP on the candidature of the Project Manager who, under the direction of the Executing Agency, will be responsible in the country for the Executing Agency's participation in the project. The Project Manager shall supervise the experts and other agency personnel assigned to the project, and the on-the-job training of national counterpart personnel. He shall be responsible for the management and efficient utilization of all UNDP-financed inputs, including equipment provided to the project.
3. The Executing Agency, in consultation with the Government and UNDP, shall assign international staff and other personnel to the project as specified in the Project Document, select candidates for fellowships and determine standards for the training of national counterpart personnel.
4. Fellowships shall be administered in accordance with the fellowships regulations of the Executing Agency.
5. The Executing Agency may, in agreement with the Government and UNDP, execute part or the entire project by subcontract. The selection of subcontractors shall be made, after consultation with the Government and UNDP, in accordance with the Executing Agency's procedures.
6. All material, equipment and supplies which are purchased from UNDP resources will be used exclusively for the execution of the project, and will remain the property of UNDP in whose name it will be held by the Executing Agency. Equipment supplied by UNDP shall be marked with the insignia of the UNDP and of the Executing Agency.
7. Arrangements may be made, if necessary, for a temporary transfer of custody of equipment to local authorities during the life of the project, without prejudice to the final transfer.
8. Prior to completion of UNDP assistance to the project, the Government, UNDP and the Executing Agency shall consult as to the disposition of all project equipment provided by the UNDP. Title to such equipment shall normally be transferred to the Government, or to an entity nominated by the Government, when it is required for continued operation of the project or for activities following directly therefrom. UNDP may, however, at its discretion, retain title to part or all of such equipment.
9. At an agreed time after the completion of UNDP assistance to the project, the Government and UNDP, and if necessary the Executing Agency, shall review the activities continuing from or consequent upon the project with a view to evaluating its results.
10. UNDP may release information relating to any investment oriented project to potential investors, unless and until the Government has requested the UNDP in writing to restrict the release of information relating to such project.

## **Rights, Facilities, Privileges and Immunities**

1. In accordance with the Agreement concluded by the United Nations (UNDP) and the Government concerning the provision of assistance by UNDP, the personnel of UNDP and other United Nations organizations associated with the project shall be accorded rights, facilities, privileges and immunities specified in said Agreement.
2. The Government shall grant UN volunteers, if such services are requested by the Government, the same rights, facilities, privileges and immunities as are granted to the personnel of UNDP.
3. The Executing Agency's contractors and their personnel (except nationals of the host country employed locally) shall:
  - (a) Be immune from legal process in respect of all acts performed by them in their official capacity in the execution of the project;
  - (b) Be immune from national service obligations;
  - (c) Be immune together with their spouses and relatives dependent on them from immigration restrictions;
  - (d) Be accorded the privileges of bringing into the country reasonable amounts of foreign currency for the purposes of the project or for personal use of such personnel, and of withdrawing any such amounts brought into the country, or in accordance with the relevant foreign exchange regulations, such amounts as may be earned therein by such personnel in the execution of the project;
  - (e) Be accorded together with their spouses and relatives dependent on them the same repatriation facilities in the event of international crisis as diplomatic envoys.
4. All personnel of the Executing Agency's contractors shall enjoy inviolability for all papers and documents relating to the project.
5. The Government shall either exempt from or bear the cost of any taxes, duties, fees or levies which it may impose on any firm or organization which may be retained by the Executing Agency and on the personnel of any such firm or organization, except for nationals of the host country employed locally, in respect of:
  - (a) The salaries or wages earned by such personnel in the execution of the project;
  - (b) Any equipment, materials and supplies brought into the country for the purposes of the project or which, after having been brought into the country, may be subsequently withdrawn therefrom;
  - (c) Any substantial quantities of equipment, materials and supplies obtained locally for the execution of the project, such as, for example, petrol and spare parts for the operation and maintenance of equipment mentioned under (b), above, with the provision that the types and approximate quantities to be exempted and relevant procedures to be followed shall be agreed upon with the Government and, as appropriate, recorded in the Project Document; and

(d) As in the case of concessions currently granted to UNDP and Executing Agency's personnel, any property brought, including one privately owned automobile per employee, by the firm or organization or its personnel for their personal use or consumption or which after having been brought into the country, may subsequently be withdrawn therefrom upon departure of such personnel.

6. The Government shall ensure:

(a) Prompt clearance of experts and other persons performing services in respect of this project; and the prompt release from customs of:

- (i) Equipment, materials and supplies required in connection with this project; and
- (ii) Property belonging to and intended for the personal use or consumption of the personnel of UNDP, its Executing Agencies, or other persons performing services on their behalf in respect of this project, except for locally recruited personnel.

7. The privileges and immunities referred to in the paragraphs above, to which such firm or organization and its personnel may be entitled, may be waived by the Executing Agency where, in its opinion or in the opinion of UNDP, the immunity would impede the course of justice and can be waived without prejudice to the successful completion of the project or to the interest of UNDP or the Executing Agency.

8. The Executing Agency shall provide the Government through the resident representative of UNDP, with the list of personnel to whom the privileges and immunities enumerated above shall apply.

9. Nothing in this Project Document or Annex shall be construed to limit the rights, facilities, privileges or immunities conferred in any other instrument upon any person, natural or juridical, referred to hereunder.

### **Suspension or termination of assistance**

1. UNDP may by written notice to the Government and to the Executing Agency concerned suspend its assistance to any project if in the judgement of the UNDP any circumstance arises which interferes with or threatens to interfere with the successful completion of the project or the accomplishment of its purposes. UNDP may, in the same or a subsequent written notice, indicate the conditions under which it is prepared to resume its assistance to the project. Any such suspension shall continue until such time as such conditions are accepted by the Government and as UNDP shall give written notice to the Government and the Executing Agency that it is prepared to resume its assistance.

2. If any situation referred to in paragraph 1, above, shall continue for a period of fourteen days after notice thereof and of suspension shall have been given by UNDP to the Government and the Executing Agency, then at any time thereafter during the continuance thereof, UNDP may by written notice to the Government and the Executing Agency terminate the project.

3. The provisions of this paragraph shall be without prejudice to any other rights or remedies UNDP may have in the circumstances, whether under general principles of law or otherwise.

### ANNEX-III

#### **MILESTONES AND INDICATORS FOR OUTPUT 1 (PROJECT MANAGEMENT AND COORDINATION)**

For Output 1 (Project management and coordination), performance-based payments will be made by UNDP to NOU/DOE, based on achievement of agreed milestones and deliverables as per the timelines and indicators tabulated below:

<b>No</b>	<b>Milestone</b>	<b>Indicator(s)</b>	<b>Timeline</b>	<b>Amount (US\$)</b>
1	Finalization of project document and management arrangements	<ul style="list-style-type: none"><li>▪ Project document signature</li><li>▪ HPMP launch workshop conducted</li></ul>	30 April 2012	60,000
2	Establishment on controls on imports of HCFCs	<ul style="list-style-type: none"><li>▪ Quota system for HCFC imports established</li></ul>	30 August 2012	80,000
3	HCFC consumption for 2011 established	<ul style="list-style-type: none"><li>▪ Reporting of 2011 A7 data to Ozone Secretariat</li><li>▪ Reporting of 2011 CP progress report data to MLF</li></ul>	30 September 2012	60,000
4	Progress report for 2012 and planning for 2013	<ul style="list-style-type: none"><li>▪ Preparation of 2012 implementation report</li><li>▪ Preparation of 2013 implementation plan</li></ul>	30 April 2013	95,000
<b>Total</b>				<b>295,000</b>

**MALAYSIA**

**HCFC PHASE-OUT MANAGEMENT PLAN (HPMP STAGE-1) FOR  
COMPLIANCE WITH THE 2013 AND 2015 CONTROL TARGETS FOR  
ANNEX-C, GROUP-I SUBSTANCES**

*Prepared jointly by:*

**Malaysia Department of Environment (DOE)  
United Nations Development Programme (UNDP)**

**AUGUST 2011**

**MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE  
MONTREAL PROTOCOL ON SUBSTANCES THAT DEplete THE OZONE LAYER**

**PROJECT COVER SHEET**

**COUNTRY:** MALAYSIA

**PROJECT TITLE:**

HCFC Phase-out Management Plan (HPMP) Stage-I for compliance with the 2013 and 2015 control targets for Annex-C, Group-I substances

**IMPLEMENTING/BILATERAL AGENCIES:**

UNDP

**NATIONAL COORDINATING AGENCY:**

Department of Environment (DOE)

**LATEST REPORTED CONSUMPTION DATA FOR ODS ADDRESSED IN THE PROJECT:**

**A. Article-7 Data (metric tonnes for 2009):**

Annex-C, Group-I substances (HCFCs)	7,700.08
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**B. Country Programme Sectoral Data (metric tonnes for 2009):**

Substance	Total
HCFC-123	68.14
HCFC-124	0.07
HCFC-141b	1,335.01
HCFC-142b	4.20
HCFC-21	37.20
HCFC-22	6,254.79
HCFC-225	0.67

**ODS CONSUMPTION REMAINING ELIGIBLE FOR FUNDING (ODP Tonnes) :** N/A

**CURRENT YEAR BUSINESS PLAN:** Included

PROJECT DATA		2011	2012	2013 <sup>1</sup>	2014	2015 <sup>1</sup>	Total
Annex-C Group-I (HCFCs)	Montreal Protocol Limits (ODP tonnes) <sup>2</sup>	N/A	N/A	515.8	515.8	464.2	N/A
	Annual Consumption Limit (ODP tonnes)	N/A	N/A	515.8	515.8	464.2	N/A
	Annual Phase-out (ODP tonnes)	N/A	N/A	51.6	N/A	51.6	103.2
	Annual Unfunded Phase-out (ODP tonnes)	N/A	N/A	N/A	N/A	N/A	N/A
	<b>Total Phase-out (ODP tonnes)</b>	<b>N/A</b>	<b>N/A</b>	<b>51.6</b>	<b>N/A</b>	<b>51.6</b>	<b>103.2</b>

FUNDING (US\$) <sup>2</sup>							
Funding for Lead Agency (UNDP)	5,500,000	0	4,000,000	0	1,052,240	10,552,240	
<b>Total Funding (US\$)</b>	<b>5,500,000</b>	<b>0</b>	<b>4,000,000</b>	<b>0</b>	<b>1,052,240</b>	<b>10,552,240</b>	

AGENCY FEES (US\$)							
Agency fees for Lead Agency (UNDP)	412,500	0	300,000	0	78,918	791,418	
<b>Total Agency Fees (US\$)</b>	<b>412,500</b>	<b>0</b>	<b>300,000</b>	<b>0</b>	<b>78,918</b>	<b>791,418</b>	
<b>TOTAL COST TO MLF (US\$)</b>	<b>5,912,500</b>	<b>0</b>	<b>4,300,000</b>	<b>0</b>	<b>1,131,158</b>	<b>11,343,658</b>	

Notes: 1. Baseline for HCFC consumption (average of 2009 and 2010 levels)  
2. Funding for the year presumes approval no later than the last ExCom meeting of the year.

**STATUS OF COUNTERPART FUNDING:**

Included

**PROJECT MONITORING MILESTONES:**

Included

**PROJECT SUMMARY**

Malaysia's HCFC Phase-out Management Plan (HPMP Stage-I) comprises of a combination of interventions such as technology transfer investments, policies and regulations, technical assistance, training, awareness and communications and management, coordination and monitoring in various HCFC consuming sectors, to be implemented during 2011 to 2015.

**Impact:** Upon successful completion, the plan will result in net sustainable reductions of minimum 51.56 ODP tonnes in the national HCFC consumption by 2015, contributing to Malaysia's compliance with the 2013 and 2015 control targets for HCFCs. In addition, the project will result in net CO<sub>2</sub>-equivalent emission reductions of about 0.9 million tonnes annually from 2015.

**Prepared by:** UNDP and DOE in consultation with all stakeholders

**Version:** Final

**Date:** 14 August 2011

## EXECUTIVE SUMMARY

Malaysia acceded to the Vienna Convention and ratified the Montreal Protocol on Substances that deplete the Ozone Layer in August 1989. As of October 2001, Malaysia has ratified all the amendments to the Montreal Protocol. Malaysia was classified as a party operating under Paragraph-1, Article-5 of the Montreal Protocol and thus qualified for technical and financial assistance, including transfer of technology, through the financial mechanism of the Montreal Protocol.

Malaysia's Country Programme incorporating the National Strategy and Action Plan for controlling the use of Ozone Depleting substances was approved 1992. Since then Malaysia has taken proactive measures such as phase-out project activities including technology transfer investments, technical assistance, training and capacity-building, information dissemination and awareness-raising and regulations. Malaysia has established a comprehensive regulatory framework for controlling ODS. As a result, Malaysia has consistently been in compliance with the provisions of the Montreal Protocol.

Hydrochlorofluorocarbons (HCFCs) are classified as controlled substances under Annex-C Group-I of the Montreal Protocol and are subject to the adjusted control schedule for Article-5 countries; to freeze the consumption at baseline levels from 2013 and reduction of 10% from baseline levels from 2015.

HCFCs are used in Malaysia in various industry sectors, such as Air Conditioning, Refrigeration, Foams, Firefighting and Solvents. The predominant HCFC used is HCFC-22 mainly in the Refrigeration and Air Conditioning Sectors. HCFC consumption in Malaysia increased from 841 metric tonnes in 1996 to 7,700 metric tonnes in 2009, indicating an average annual growth rate of over 18%. In the past five years, HCFC consumption in Malaysia has grown at a relatively steadier rate of 8% annually. The main reasons for this growth are sustained economic development and resulting increase in demand for consumer, commercial and industrial products that use HCFCs.

In order to meet the 2013 freeze and 2015 reduction targets, the industry, consumers and government will need to make tremendous efforts. This will involve phasing out HCFC use in major manufacturing sectors and reducing dependence on HCFCs and controlling and reducing HCFC use wherever possible in the servicing sector. The main constraints for transitioning from HCFCs to alternative environment-friendly substitutes is the dependable and economic availability of benign and sustainable substitutes and the limited time available for implementing phase-out actions for compliance. Extraordinary efforts will be needed to curb the momentum of inevitable growth in HCFC consumption in sectors that are not addressed through this proposal.

To overcome these constraints, adequate technical and financial assistance would be one of the inputs needed to minimize the burden of transition on consumers and industry. Also, adequate institutional support will be needed to ensure that awareness of the impending consumption limits is duly disseminated and capacity-building and training programmes for stakeholders are carried out.



## Phase-out Targets

The successful implementation of the HCFC Phase-out Management Plan (Stage-I) for Malaysia will result in limiting HCFC consumption levels to the baseline level (average of 2009 and 2010) by 2013 and reducing a further 10% to meet the 2015 target. In order to meet this objective, actions to ensure a minimum phase-out of 103.16 ODP tonnes of HCFC consumption will need to be accomplished in a relatively short time span of about three years. This phase-out will be addressed in this HPMP (Stage-I), through technology conversions in about 13 enterprises in the Polyurethane Foams Sector, which will be carefully selected based on their financial soundness and sustainability, technical and managerial capacity, reputation and criticality for sustainable reductions. In addition, actions to limit the growth of HCFC consumption in sectors not addressed through this proposal will need to be implemented; therefore modest interventions in the Servicing Sector are also proposed. Technical assistance to the Air Conditioning and Refrigeration (Manufacturing) Sectors is also proposed, ensure smooth transition to environment-friendly alternatives in future. In order to ensure that the phase-out actions are carried out on time and remain sustainable, targeted policy and regulatory actions, management and coordination and awareness programmes will also need to be implemented.

## Prioritization and Technology

Consistent with the ExCom guidelines, the polyurethane foam sector has been prioritized for phase-out actions to meet the 2013 and 2015 targets. Hydrocarbon alternatives have been selected for all conversions

## Costs

The overall costs of achieving reductions as articulated in this proposal for meeting the Stage-I targets for 2013 and 2015 are estimated at over US\$ 19.9 million. The funding request for the HPMP (Stage-I) is for US\$ 10.55 million. The balance of the costs will be borne by the industry and country. The summary of the costs is tabulated below:

Component	Funding Request (US\$)
Management and Coordination	990,000
Polyurethane Foams Sector Plan	8,757,240
Technical Assistance for the Servicing Sector	715,000
Technical Assistance for Air Conditioning and Refrigeration (Manufacturing) Sectors	90,000
<b>Net funding request (Stage-I)</b>	<b>10,552,240</b>

## Impact

Upon successful completion, the Malaysia HPMP (Stage-I) will result in a sustainable phase-out of 51.6 ODP tonnes of HCFC consumption from the baseline by 2015, contributing to Malaysia's compliance with the 2013 and 2015 control targets for Annex-C, Group-I substances (HCFCs) under the Montreal Protocol. In addition, the project will result in net direct CO<sub>2</sub>-equivalent emission reductions of about 0.9 million tonnes annually from 2015.

## MALAYSIA - HCFC PHASE-OUT MANAGEMENT PLAN (STAGE-I)

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## LIST OF ABBREVIATIONS

<b>CETEC</b>	Centre for Environment Technology
<b>CFC</b>	Chloro Fluoro Carbons
<b>CP</b>	Country Programme
<b>CTC</b>	Carbon Tetra Chloride
<b>ExCom</b>	Executive Committee of the Multilateral Fund
<b>GWP</b>	Global Warming Potential
<b>HCFCs</b>	Hydrochlorofluorocarbons
<b>HFCs</b>	Hydrofluorocarbons
<b>IA</b>	Implementing Agency
<b>DOE</b>	Department of Environment, Ministry of Natural Resources and Environment
<b>MAC</b>	Mobile Air Conditioning
<b>MASHRAE</b>	Malaysian Society of Heating, Refrigerating and Air Conditioning Engineers
<b>MITI</b>	Ministry of International Trade and Industry
<b>MLF</b>	Multilateral Fund for the Implementation of the Montreal Protocol
<b>MOP</b>	Meeting of Parties to the Montreal Protocol
<b>MP</b>	Montreal Protocol
<b>MT</b>	Metric Tonnes
<b>ODP</b>	Ozone Depleting Potential
<b>ODS</b>	Ozone Depleting Substances
<b>R&amp;R</b>	Recovery and Recycling
<b>SMEs</b>	Small and Medium-sized Enterprises
<b>TEAP</b>	Technology and Economic Assessment Panel of the Montreal Protocol
<b>TR</b>	Tons of Refrigeration
<b>UNDP</b>	United Nations Development Programme

## 1. INTRODUCTION

### 1.1 OBJECTIVES

The objectives of the overarching strategy of Malaysia's HCFC Phase-out Management Plan are as below:

- To facilitate Malaysia's compliance with the control targets for HCFC consumption with minimal impacts on the national economy, on environment and on occupational health
- To implement a combination of interventions such as technology transfer investments, policies and regulations, technical assistance, training and capacity-building, awareness and education and monitoring and management in the selected HCFC consuming sectors, contributing to achieve sustainable reductions and phase-out of HCFC consumption.

### 1.2 BACKGROUND

#### 1.2.1 Country profile

Malaysia is a tropical peninsular country in Southeast Asia, bordering Brunei, Malaysia, Thailand and Singapore, with a coastline of about 4,700 km. The total land area is about 329,000 sq. km and with a population of about 25.5 million (2009). The average population density is about 78 persons per sq km and urban population is about 70% of the total population. The per capita GDP was about US\$ 7,440 (2009), with agriculture accounting for 9.4%, industry about 40.9% and services about 49.7% of the GDP.

#### 1.2.2 ODS phase-out activities in Malaysia

##### Ratification of Montreal Protocol and its amendments

Malaysia was one of the earliest among developing countries, to become a party to the Vienna Convention and the Montreal Protocol. Over the years, Malaysia has been playing a proactive role in the deliberations of the various Montreal Protocol bodies. The dates of ratification by Malaysia of the Montreal Protocol and its amendments were:

Table-1: Dates of Ratification of Montreal Protocol and Amendments

<b>Agreement</b>	<b>Ratification</b>
Vienna Convention	29 August 1989
Montreal Protocol	29 August 1989
London Amendment	16 June 1993
Copenhagen Amendment	05 August 1993
Montreal Amendment	26 October 2001
Beijing Amendment	26 October 2001

## ODS Phase-out Activities

Malaysia took early actions towards controlling consumption of CFCs, Halons, CTC/TCA and Methyl Bromide.

Malaysia's Country Programme reflecting the national strategy and action plan for controlling the use of ozone depleting substances was approved at the 6<sup>th</sup> ExCom meeting in 1992. The Country Programme prioritized ODS phase-out activities in the main ODS consuming sectors, through technology transfer investments, technical assistance, capacity building, training and monitoring.

Malaysia's Country Programme Update was prepared in 1995. The Country Programme Update reassessed the ODS consuming sectors in Malaysia, reviewed the progress made in ODS phase-out and identified further activities needed for the future, thus renewing Malaysia's commitment for complying with the Montreal Protocol control targets and obligations.

A number of investment and non-investment activities were implemented by Malaysia, for complying with the Montreal Protocol targets during 1993 to 2001. These are depicted in Figure-1 below:

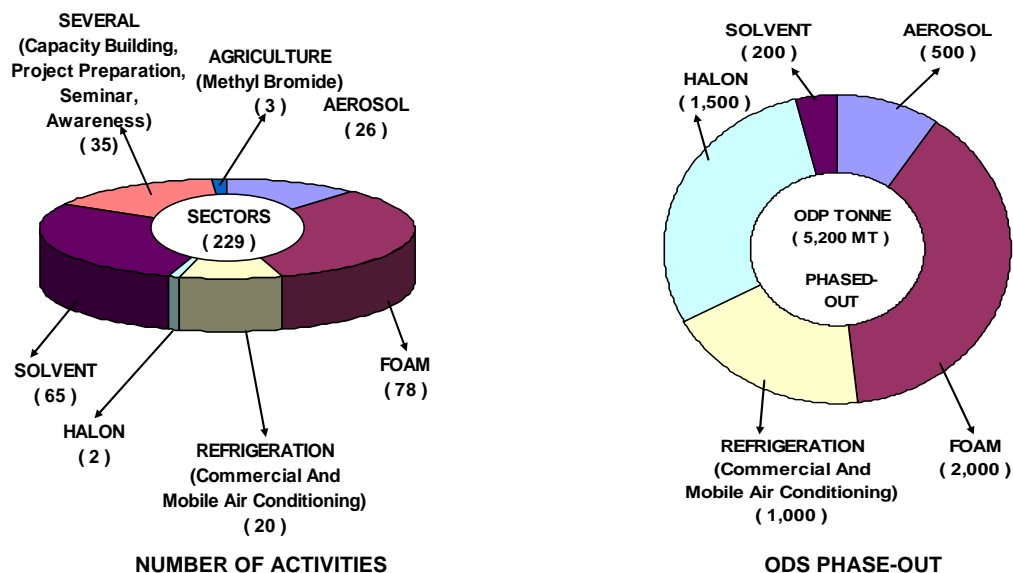


Figure-1: ODS Phase-out Activities in Malaysia (1993-2003)

Malaysia's National CFC Phase-out Plan for addressing the phase-out of all remaining consumption of Annex-A Group-I substances (CFCs) and also CTC/TCA by 2010, was approved at the 35<sup>th</sup> ExCom meeting December 2001. The National CFC Phase-out Plan was a performance-based multi-year agreement between Malaysia and the Executive Committee, which enabled Malaysia to comply with the 2005, 2007 and 2010 control milestones of the Montreal Protocol.

## MLF assistance for investment projects for CFC phase-out

Malaysia's baseline for Annex-A Group-I substances (CFCs) for the purposes of Montreal Protocol was 3,271 ODP tonnes (average of calculated consumption from 1995 to 1997).

During 1992-2010, a total of 88 individual and group investment projects and one national phase-out plan were approved by MLF, to phase out CFCs in the Aerosols, Foams and Refrigeration sectors in Malaysia, with a total funding of US\$ 39.28 million at a cost-effectiveness of US\$ 7.65/kg, targeting to phase out a total of 5,133 ODP tonnes of CFCs. Table-2 below summarizes the approvals by sector.

Table-2: MLF assistance for CFC phase-out investment projects (1992 to 2010)

<b>Approval Period</b>	<b>Aerosols</b>	<b>Foams</b>	<b>Refrigeration</b>	<b>National Plan</b>	<b>Total</b>
Until Dec 1997 (US\$)	2,658,832	11,023,386	8,215,370	0	21,897,588
Impact (ODP tonnes)	548	1,495	552	0	2,595
Cost-effectiveness (US\$/kg-y)	4.85	7.37	14.88	N/A	8.43
Jan 1998 to Dec 2009 (US\$)	0	2,766,773	3,098,884	11,517,005	17,382,662
Impact (ODP tonnes)	0	305	286	1,947	2,538
Cost-effectiveness (US\$/kg-y)	N/A	9.07	10.83	5.92	6.85
Cumulative funding until Dec 2009 (US\$)	2,658,832	13,760,159	11,314,254	11,517,005	<b>39,280,250</b>
Cumulative Impact (ODP tonnes)	548	1,800	838	1,947	<b>5,133</b>
Cumulative cost-effectiveness (US\$/kg-y)	4.85	7.64	13.50	5.92	<b>7.65</b>

*Source: MLF project inventory*

Until December 1997, the total approvals for CFC phase-out investment projects amounted to about US\$ 21.9 million, to phase out 2,595 ODP tonnes at a cost-effectiveness of US\$ 8.43/kg, representing about 56% of the total funding and 51% of the total phase-out, noting that these approvals were primarily targeted to assist Malaysia to meet the 1999 freeze in CFC consumption at the baseline level.

### **1.2.3 Accelerated HCFC Phase-out**

HCFCs, which have Ozone Depleting Potential (ODP) up to 15% of that of CFCs, are classified as controlled substances under Annex-C, Group-I of the Montreal Protocol. HCFCs therefore need to have use restrictions and would eventually have to be phased-out. Initially for developing countries, the scheduled phase-out date for HCFCs was 01 January 2040 with an interim control measure of freezing HCFC production and consumption at 2015 levels, from 01 January 2016.

HCFCs were also used historically as refrigerants in the refrigeration and air conditioning industry. Due to sustained economic growth experienced by developing countries during the 1980s and thereafter, the demand for consumer and industrial products using HCFCs increased rapidly. Further, due to the high global warming potential (GWP) of HCFCs, their increased use was also a threat to the global climate system.

During the implementation of the CFC phase-out under the Montreal Protocol, HCFCs were approved as interim substitutes for CFCs in many of the projects and activities supported by the Multilateral Fund.

Recognizing the environmental benefits of reducing HCFC production and consumption earlier than the previous control schedule, the XIXth Meeting of the Parties to the Montreal Protocol in September 2007, through its Decision XIX/6, accelerated the phase-out schedule for HCFCs by 10 years. The first control is the freeze on production and consumption of HCFCs from 01 January 2013, at the Baseline Level (average of 2009 and 2010 consumption levels). The second control step is the reduction of 10% from the Baseline Levels on January 1, 2015. Subsequent control steps are 35% reduction by 2020, 67.5% by 2025, 97.5% by 2030 and complete phase out from 01 January 2040. The decision confirmed stable and sufficient funding for Article-5 countries to meet these new obligations.

#### **1.2.4 HCFC Survey in Malaysia (2005-2007)**

The ExCom approved at its 45<sup>th</sup> Meeting in 2005, funding for UNDP to carry out HCFC surveys in 12 countries, to assess the HCFC consumption and growth trends in these countries. Malaysia was one of the countries which requested to be a part of this activity. The key expected result of this survey was establishing the HCFC consumption profiles and projected growth rates in HCFC consumption in various sectors in Malaysia until 2015. The survey was carried out during 2005 to 2007. The survey focused on data collection and analysis mainly from upstream suppliers of chemicals and equipment, as well as sampling of enterprise-level HCFC use patterns.

In this survey, it was noted that Malaysia's HCFC consumption increased from 1,456 metric tonnes in 1997 to 5,635 metric tonnes in 2005, signifying a compounded annual growth rate of about 18.43%. HCFC-22 and HCFC-141b were the two main HCFCs consumed. HCFC-141b is used as a blowing agent in foam production as a replacement for CFC-11. HCFC-22 is used as a refrigerant in air conditioning and refrigeration systems, especially in comfort air conditioning units, central air conditioning chillers and industrial refrigeration.

Based on projected annual growth rates in demand forecasted for HCFCs until 2015 in various sectors in this survey, it was estimated that unconstrained consumption of HCFCs in Malaysia would reach about 8,261 metric tonnes in 2015. This was expected to lead to additional environmental impacts on ozone depletion as well as on global warming due to the ozone depleting potential and high global warming potential of HCFCs.

The survey identified constraints and opportunities for long term management of HCFCs such as availability and costs of mature and environmentally friendly alternatives to HCFCs in various sectors, needs for training and capacity-building, technology transfer and adequate financial assistance for HCFC phase-out.

#### **1.2.5 HCFC Phase-out Management Plans (HPMPs)**

Decision XXI/6 of the Meeting of the Parties to the Montreal Protocol, referred above, also requested the Executive Committee of the Multilateral Fund to assist Article-5 Parties for preparing and implementing HCFC Phase-out Management Plans (HPMP), to facilitate their compliance with the accelerated control targets.

The 54th Meeting of the Executive Committee in April 2008, through Decision 54/39, adopted guidelines for HPMPs, which provide an indicative outline and content of the HPMPs, with the following key elements:

- a) Adoption of a staged approach for HPMPs within the context of an overarching strategy for HCFC reductions and phase-out as per the adjusted schedule. The HPMP (Stage-1) would focus on compliance with the 2013 freeze and 2015 reduction targets. The subsequent stages would focus on HCFC phase-out in compliance with the future reduction control targets.
- b) Commitments to achieving the 2013 and 2015 control milestones through performance-based agreements

Further, through Decision 60/44, ExCom adopted funding guidelines for various components and types of HPMPs.

Malaysia's HPMP (Stage-I) complies with the provisions of all ExCom decisions relevant to HPMPs.



## **2. HPMP PREPARATION IN MALAYSIA**

### **2.1 HPMP PREPARATION FUNDING**

In order to assist Malaysia for the preparation of its HPMP (Stage-I) for compliance with the 2013/2015 targets, UNDP, on behalf of Malaysia, submitted a request for preparation funding to the 55<sup>th</sup> meeting of the Executive Committee which was held in July 2008 for the overarching HPMP strategy, which was approved at a level of US\$ 173,750. Further, in accordance with ExCom Decision 56/16, Malaysia was eligible for an additional funding of US\$ 250,000 for preparation of investment and associated activities in various sectors. This funding was approved in the 57<sup>th</sup> meeting of the ExCom in April 2009.

### **2.2 HPMP NATIONAL INCEPTION WORKSHOP**

In December 2008, a HPMP national inception workshop for a wide spectrum of industry and government stakeholders was held in Subang Jaya, Malaysia. The workshop was jointly organized by DOE and UNDP. The objectives of the workshop were to raise awareness of Malaysia's new obligations under the Montreal Protocol arising from the accelerated phase-out schedule for HCFCs, to disseminate and exchange information on alternative technologies and to develop a consensual and stakeholder-driven plan of action for preparation of Malaysia's HPMP (Stage-1) for compliance with the 2013/2015 targets. The workshop was attended by about 400 participants including high-level decision-makers from industry, government and many international participants, making it one of the first and largest of its kind in the region. The stakeholders acknowledged key compliance challenges and opportunities in various sectors and agreed on broad plan, mechanism, milestones and timelines for actions for HPMP preparation. The key recommendations of this workshop were to affirm a proactive partnership between government and industry for HPMP preparation and implementation and to take swift and forward-looking actions to meet the 2013 and 2015 control targets for reductions in HCFC consumption.

### **2.3 GOVERNMENT-INDUSTRY PARTNERSHIP FOR HPMP PREPARATION**

Throughout the HPMP preparation process, a core group of key industry representatives were in continuous consultation with CETEC, DOE and UNDP, ensuring proactive representation and participation of the industry in the HPMP preparation process.

### **2.4 HPMP PREPARATION PROCESS**

The HPMP preparation process consisted of the following steps:

- Formation of the national team (assignment of stakeholder entities for carrying out the sector-level and national-level data collection and analysis work).
- Stakeholder consultations (regular periodic meetings for interactions with government and industry stakeholders)
- Information dissemination and industry interaction (sector-level workshops and events)
- Data collection at the sector-level (and reconciliation with the national-level)
- Data analysis at the sector-level (and reconciliation at the national-level)

- Preparation of draft sectoral strategies and national strategy
- Stakeholder interactions/consultations (national stakeholders workshop)
- Finalization of the HPMP (Stage-I) proposal

#### **2.4.1 Formation of the national team**

For the work of data collection, analysis and sector and national-level strategy preparation DOE and UNDP commissioned CETEC (Center for Environmental Technologies), a Malaysian think-tank and consulting organization. CETEC in turn, engaged experts from the chemical industry as well as Malaysian Society of Air-conditioning, Heating and Refrigeration Engineers (MASHRAE), to provide assistance for sector-level work.

#### **2.4.2 Information dissemination and stakeholder interaction**

In order to adequately inform the stakeholders, the challenges and opportunities in complying with the adjusted phase-out schedule for HCFCs, DOE, UNEP and CETEC conducted several stakeholder interaction meetings for each sector.

Technical experts from the industry, both from Malaysia and abroad, shared knowledge and experiences on alternative technologies. DOE representatives and environment departments of local administrations also participated and provided guidance on the international regulatory scenario. Information brochures on HCFC phase-out and HPMP preparation were prepared and distributed.

#### **2.4.3 Data Collection**

Appropriate questionnaires and formats for reporting information and data were developed with the assistance of UNDP. These questionnaires were sent to enterprises or distributed during sector-level interaction workshops.

Sector-level data was collected from upstream suppliers of chemicals and downstream enterprises through telephone, meetings and on-site visits. For manufacturing sectors, the coverage of enterprises was over 80% based on HCFC consumption.

At the national level, data reconciliation was carried out through interactions with Customs Department, Department of Statistics and Ministry of Trade and Industry.

Comparative analysis of different sets of data originating from downstream users, upstream suppliers and government departments such as customs and statistics, indicated that the variance between the overall data between survey figures and official statistics was less than 5% and thus, the final data and analysis is indicative of the real situation prevailing in Malaysia.

#### **2.4.4 Data Analysis**

The data analysis at the sector level included classification based on historical and present HCFC consumption by sub-sector and application, establishing patterns of unconstrained growth in each sub-sector, analysis of the status of alternative technologies for each sub-sector and application and the prospects of phase-out of the use of HCFCs in each sub-sector based on the same. The required national-level phase-out for meeting the 2013 and 2015 control targets was then broadly established.

#### **2.4.5 Draft sectoral strategies**

Based on the data analysis as described above, the following approach for prioritizing sub-sectors/applications for HCFC phase-out was adopted:

- Segregation of eligible and ineligible enterprises (and consumption)
- Segregation of first and second conversions as applicable (and related consumption)
- Availability of zero-ODP and low-GWP mature alternative technology options for each sub-sector/application
- Implementability of the conversions within the available timeframe of about 3 years

Consistent with the guidance from ExCom, manufacturing was prioritized and high-ODP substances (HCFC-141b) were prioritized, within the context of the above.

The phase-out in the selected/prioritized sub-sectors/applications would be carried out in conjunction with targeted, effective and enforceable regulations, which would be supported by the industry. The sector-level strategies proposed a timeline for required regulations based on the above and also incorporated estimates of resources needed for carrying out conversions, technical assistance, awareness and other activities to support the changeover.

#### **2.4.6 Stakeholder Consultations and draft national strategy**

Several consultation meetings for data reconciliation and strategy preparation were organized, ensuring a transparent and participatory approach for developing the sector strategies. The basic national strategy was developed based on the outputs of this bottom-up approach with the involvement of all stakeholder representatives.

A national stakeholder consultation seminar was arranged in November 2010 with participation from key government stakeholders, national and international experts, and key representatives of the national scientific and technical institutions and over 250 industry representatives. The comments and recommendations of the stakeholders were collected, collated and incorporated in the national strategy.

Further sector-level consultations were held to refine the sectoral and national approaches and phase-out quantities, particularly in context of policies and regulations as well as implementability of conversions for achieving the phase-out targets.

#### **2.4.7 Finalization of the HPMP (Stage-I) proposal**

The draft national HCFC phase-out management plan was prepared focusing on compliance with the 2013 and 2015 targets, incorporating the draft sector and national strategies, with review and technical advice provided by UNDP and in close coordination with DOE.

The time available for Article-5 parties including Malaysia, for meeting the 2013/2015 control targets was considered to be quite limited. It was estimated that there would be maximum of about 3 years from 2011, to implement key activities leading to compliance with the 2013 and 2015 targets. It was therefore considered imperative that the preparation of Malaysia's HPMP and its submission to and approval by the Executive Committee was accomplished no later than 2011, so that adequate time as well as technical and financial assistance was available to implement actions for compliance.

Accordingly, upon government endorsement, the final HPMP (Stage-I) proposal for Malaysia was targeted for submission no later than the 65th ExCom meeting in November 2011.

### 3. SITUATION ANALYSIS

#### 3.1 HCFC SUPPLY SCENARIO

##### 3.1.1 Production

There is no production of HCFCs in Malaysia.

##### 3.1.2 Exports and feedstock uses

No exports or feedstock uses of HCFCs have been recorded in 2009.

##### 3.1.3 Imports

The entire domestic demand is met through imports mainly from China, India, Republic of Korea, Singapore and USA. Import of HCFCs is regulated in Malaysia (see Section 3.4.2). HCFC-141b, HCFC-22 and HCFC-123 are the main HCFCs imported.

##### 3.1.4 Distribution

HCFCs are sold by the importers to manufacturers or users directly or indirectly through secondary distributors or retailers. HCFCs are also supplied through service establishments and contractors. Larger manufacturers also import HCFCs directly.

#### 3.2 HCFC CONSUMPTION

##### 3.2.1 Historical HCFC consumption

The HCFC consumption in Malaysia increased from 841 metric tonnes in 1996 to 7,700 metric tonnes in 2009, indicating an average annual growth rate of over 18%.

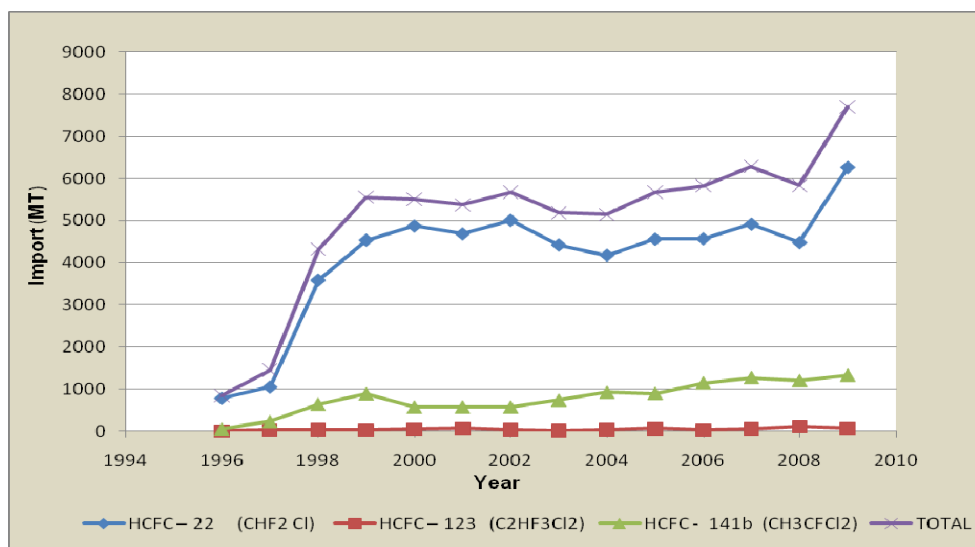


Figure-2: Malaysia HCFC consumption in metric tonnes (1996-2009)

This steady increase in HCFC consumption was ascribed to sustained economic development resulting in increased demand for consumer, commercial and industrial products requiring HCFC use or operating on HCFCs, particularly in the foams, refrigeration and air conditioning sectors.

### 3.2.2 Recent HCFC Consumption

Based on data collected from the survey and compiled, collated and reconciled between data from Department of Customs, Department of Statistics, Ministry of Trade and Industry and data reporting from Ministry of Environment, the consumption of HCFCs in Malaysia during 2005 to 2009 was as below. The past five years data has considered for further analysis to account for potentially unrepresentative increases and decreases occurring over shorter periods:

Table-3: Malaysia HCFC Consumption (2005 to 2009)

Year/ Substance	HCFC-141b		HCFC-22		HCFC-123		Other		Total	
	Metric	ODP	Metric	ODP	Metric	ODP	Metric	ODP	Metric	ODP
2005	899	98.9	4,553	250.4	60	1.2	155	8.7	5,667	359.2
2006	1,153	126.8	4,562	250.9	25	0.5	86	4.9	5,826	383.1
2007	1,280	140.8	4,911	270.1	54	1.1	40	1.5	6,285	413.5
2008	1,206	132.7	4,471	245.9	106	2.1	45	2.5	5,829	383.2
2009	1,335	146.9	6,255	344.1	68	1.4	42	1.8	7,700	494.2

Note: Metric tonnes rounded off to the nearest 1. ODP tonnes rounded off to the nearest decimal.

Other HCFCs include HCFC-225 and HCFC-142b used in solvent, refrigerant, propellant and blowing agent applications.

There was a dip in overall HCFC consumption between 2007 and 2008, as Malaysia was one of the first countries to experience the impact of the global economic downturn. However, as an average over a five-year period during 2005-2009, the HCFC consumption has grown at more realistic level at a compounded annual rate of 7.97% on a metric-tonne basis and 8.28% on ODP-tonne basis. These trends are considered realistic, based on the average growth rate in the overall GDP in Malaysia, which was 4.67% during 2005-2009.

Figure-3 below shows the 2009 HCFC consumption by substance (in metric tonnes).

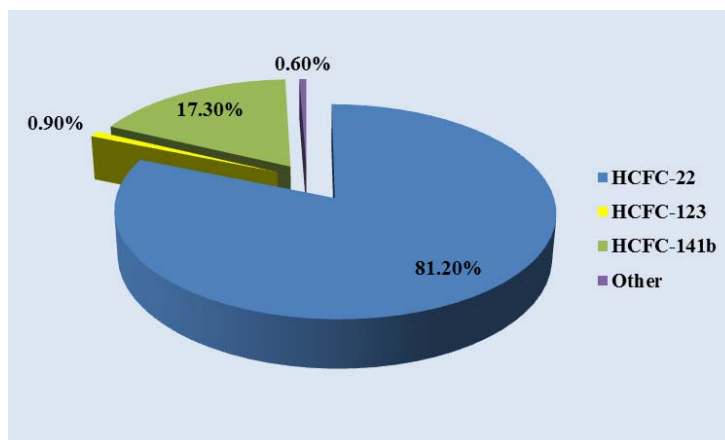


Figure-3: Malaysia HCFC consumption by substance in metric tonnes (2009)

The breakdown of the HCFC consumption between manufacturing and servicing is shown below:

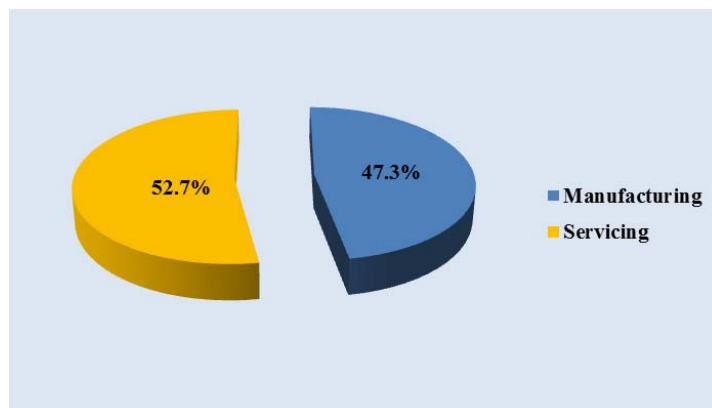


Figure-4: Malaysia HCFC consumption by Manufacturing and Servicing (2009)

The consumption in Servicing is mainly of HCFC-22 and HCFC-123 with trace quantities of HCFC-124.

### 3.3 INDUSTRY STRUCTURE

As mentioned in Section 1.2.1, the industry in Malaysia contributed about 41% to the GDP (2009) and is thus a critical element in the economy. Historically, Malaysia has had a robust industrial and manufacturing base in various sectors from petrochemicals to consumer goods. The main HCFC consuming sectors also are largely consistent with this trend and have a diverse manufacturing base in Malaysia.

#### 3.3.1 Air Conditioning Sector

##### *Manufacturing*

This sector is classified into five sub-sectors tabulated below: air-cooled split and packaged units, water-cooled packaged units, heat pumps, direct-expansion chillers and flooded chillers (centrifugal chillers). The data on HCFC consumption in manufacturing this sector for 2009 is shown below:

Table-4: HCFC consumption in manufacturing in the Air Conditioning Sector (2009)

Sub-sector	HCFC Consumption (metric tonnes)
Air-cooled split and packaged units	1,750
Water-cooled packaged units	21
Heat pumps	4
Direct expansion chillers	92
Flooded chillers	48
<b>Total</b>	<b>1,915</b>

As seen above, the bulk of the HCFC consumption (~91%) in manufacturing in the Air Conditioning Sector originates from air-cooled split and packaged units. In 2009, 2,778,999 units were manufactured in Malaysia.

There are 8 major manufacturers and about 23 small and medium-sized manufacturers in this sector. The major manufacturers in the sector are well-organized and have a good technical and managerial capacity for engineering, manufacturing as well as environmental issues. Only three of these eight manufacturers have A5 ownership (ranging from 02% to 65%). The rest are multinationals with 100% non-A5 ownership. The small and medium-sized enterprises are locally owned. All of the current manufacturing capacity in this sector was established before September 2007.

### ***Imports***

The imports of air conditioning equipment in Malaysia is mainly of air-cooled split and packaged units, of which split room air-conditioners up to 2.5 HP rating constitute the bulk of the imports. There are about twenty importers, of which about ten are large-sized. In 2009, about 200,000 units were imported to Indonesia, mainly from China, Japan and US, predominantly HCFC-22 based. The imported air-conditioners are fully or partially charged with refrigerants. During installation of these split air-conditioners, additional top-up charge is needed and this was estimated to be 128 metric tonnes in 2009.

### ***Exports***

Malaysia is a significant export hub for air conditioning equipment in the region, particularly for air-cooled split and packaged air-conditioners. All major manufacturers recorded exports in 2009, amounting to a total of 1,857,697 air-cooled split and packaged units.

### ***Servicing***

The estimated population of HCFC-based equipment in the air conditioning sector in 2009 was ~7 million (air-cooled split and packaged units) and about 2,200 (direct-expansion and flooded chillers). HCFC-22 and HCFC-123 were the main substances used for servicing in this sector. The estimated HCFC consumption in servicing in this sector in 2009 was 4,004 metric tonnes.

The Sector has experienced a healthy growth in the past decade with progressive and substantial investments in manufacturing technology, capacity and capability. Due to the steady economic development, market penetration of air conditioning equipment has grown significantly in the past few years and is expected to continue to do for the next several years.

It was estimated that unconstrained consumption in the Sector is likely to reach about 5,000 metric tonnes by 2015. The main challenges for HCFC phase-out in the Sector were identified to be the absence of a mature and efficient alternative technology and the rapidly growing population of HCFC-based air conditioning equipment, enhancing the HCFC demand in manufacturing and servicing.



### 3.3.2 Refrigeration Sector

The Refrigeration Sector performs a critical function of serving the cold chain in Malaysia, where the service sector contributes 40% to the national economy. Due the expanding market for food service equipment, the quality and sophistication of the manufacturing technology has gradually improved over the years, resulting from investments made for catering to the long-term potential. The Sector also experiences competition from imported products and equipment, testifying to the significant market potential.

#### *Manufacturing*

Three sub-sectors and applications have been defined in the Refrigeration Sector, and their 2009 consumption is shown below:

Table-5: HCFC Consumption and Sub-sectors in the Refrigeration Sector (2009)

<b>Sub-sector</b>	<b>HCFC Consumption (metric tonnes)</b>
Domestic refrigeration	0
Commercial refrigeration	80
Cold chain refrigeration	250
<b>Total</b>	<b>330</b>

The Domestic Refrigeration sub-sector did not report any HCFC consumption in Malaysia in 2009. The polyurethane foam part converted to cyclopentane during CFC phase-out and the refrigerant technology was HFC-134a.

The Commercial Refrigeration sub-sector comprises of vending machines, visi-coolers, bottle coolers, water-coolers, chest freezers, etc. used in restaurants and other food service establishments. There are about twenty manufacturers of commercial refrigeration equipment in Malaysia, but they predominantly use HFC-134a, R-404a, etc as refrigerants. Only a few use HCFC-22 as a refrigerant. In 2009, about 80 metric tonnes was consumed in manufacturing by this sub-sector.

The Cold Chain Refrigeration sub-sector comprises of supermarket refrigeration equipment (such as display cabinets, island freezers, walk-in coolers and freezers), cold storages and warehouses. R-404a and R-507 are mainly used in low-temperature applications. Ammonia is used in some applications and HCFC-22 is used in medium temperature applications. In 2009, about 250 metric tonnes of HCFC-22 was used in manufacturing in this sub-sector.

#### *Servicing*

The servicing demand for HCFC-22 is growing due the rapidly increasing population of commercial refrigeration equipment, due to retrofits carried out for R-502 based equipment to HCFC-22 during CFC phase-out and due to new demand for servicing of HCFC-22 based equipment. In 2009, the estimated HCFC-22 demand for servicing in this sector was estimated to be about 250 metric tonnes.

The Refrigeration Sector has been experiencing a steady growth in the past few years. The main challenges seen are for limiting the growth in population of HCFC-based equipment both domestically manufactured and imported, in absence of cost-effective and efficient retrofit alternatives as well as mature and cost-effective candidates for converting the manufacturing capacity, which are also environmentally acceptable.

### **3.3.3 Polyurethane Foams Sector**

Polyurethane foams for various applications are manufactured in Malaysia. The sector has experienced steady growth in recent years, due to the economic development and increase in purchasing power of the population and resulting growth in demand mainly in the construction appliance and cold chain industry segments.

Based on the information from the survey and stakeholder consultations, HCFC-141b is the predominant blowing agent used in the sector. It is used either as pure HCFC-141b or pre-blended in polyols supplied by the polyurethane chemical suppliers. There is no local production of HCFC-141b and therefore the entire requirement is met through imports by chemical suppliers, systems houses or sometimes directly by the foam manufacturers. The sector is organized into four categories of stakeholder enterprises as below:

- HCFC importers
- Systems houses
- Processing equipment suppliers
- Foam manufacturers

There are about 15-20 chemical suppliers that import HCFCs, including a few which import polyols suited for HCFC-141b. There is a small quantity of imported HCFC-141b pre-blended polyols.

There are seven systems houses, namely, BASF, Colorex, Cosmo, Dow, Maskimi, PPT and Oriken, which have facilities for blending and customization of HCFC-141b polyols in Malaysia.

Polyurethane foam processing equipment is not manufactured locally. There are four main polyurethane foam processing equipment suppliers with a presence in Malaysia, namely, Cannon, OMS, RIM Polymers and SAIP. Other global suppliers are represented through their respective corporate representations.

There are an estimated 100 manufacturers of polyurethane foam in Malaysia. This comprises of about 13 large-sized and organized manufacturers, about 20 medium-sized manufacturers and the rest being small and tiny manufacturers. Rigid polyurethane foam is the predominant product, which uses HCFC-141b as a blowing agent.

The two main sub-sectors consuming HCFC-141b in this sector are the rigid foam sub-sector and integral skin foam sub-sector.

The 2009 estimated HCFC consumption by sub-sector is tabulated below:

Table-6: HCFC Consumption and Sub-sectors in the Foams Sector (2009)

Sub-sector	Application (No. of enterprises)	2009 HCFC Consumption (metric tonnes)
Rigid Foam	Discontinuous sandwich panels (30)	1,045
	Refrigeration equipment (10)	90
	Insulated boxes (1)	40
	Pipe insulation (10)	40
	Spray insulation (10)	50
	Other (40)	60
	<b>Total (Rigid Foam)</b>	<b>1,325</b>
Integral Skin	Furniture and automotive (3)	10
Foam	<b>Total (Integral Skin Foam)</b>	<b>10</b>
<b>Total</b>		<b>1,335</b>

Almost 60-70% foam manufacturers are small and medium-sized, however, due to their small size and capacity, their contribution to the overall sector consumption is only about 20-30%. The larger and more organized enterprises are mainly engaged in manufacturing of sandwich panels, insulated boxes and refrigeration equipment. A significant number of enterprises (over 90%) have converted previously from CFCs to HCFCs through assistance from MLF.

Due to the consistent growth in demand for consumer and commercial goods and with the expansion in the construction industry, the Polyurethane Foams sector expects to experience an average annual growth of about 10-12% annually.

The key challenge identified for reducing demand for HCFCs, was the implementability of zero-ODP and low-GWP alternative blowing agents in small and medium-sized enterprises.

### 3.3.4 XPS Foams Sector

Based on the survey, there is currently only one enterprise manufacturing extruded polystyrene foam boards in Malaysia. While the HCFC consumption in this enterprise could not be confirmed, it is estimated based on import profile of substances in 2009, that less than 15 metric tonnes of HCFC-22 and HCFC-142b combined were consumed.

### 3.3.5 Firefighting Sector

HCFC-123 has been a preferred blend component in fire extinguishing systems because of its ability to counter combustion chemically, without use of water, foam or powder. Since HCFC-123 is inert and stable, it offers the possibility to have a long or unlimited shelf life. HCFC-123 also has perhaps the lowest ODP among HCFCs typically encountered.

There are two types of fire extinguishing systems manufactured in Malaysia with HCFC-123 as the key blend component: Portable Fire Extinguishers and Total Flooding Systems. There is only one manufacturer of HCFC-123 based fire extinguishing systems, which consumed 13 metric tonnes of HCFC-123 in 2009. The main challenges foreseen for introducing non-HCFC alternatives are obtaining certifications for performance, toxicity and other environmental impacts and resource constraints.

### 3.3.6 Solvents Sector

HCFC-based solvents are used in general and precision cleaning, drying and defluxing applications and in electronics cleaning such as audio and video-heads, reflector glasses for laser printers and lenses, which require optimal surface cleanliness. HCFC-225 has been used as a solvent for such applications, due to its similar physical properties and cleaning performance as CFC-113, its compatibility with most plastics, elastomers and metals, excellent permeability due to low surface tension, non-flammability and short drying time. HCFC-225 can also be used as a carrier for silicone and other lubricants and also as a coolant. In 2009, only about 0.67 metric tonnes of HCFC-225 has been reported in the Solvents Sector. Due to the small quantities of HCFC-225 used and its low ODP and GWP, it is not considered a priority for the compliance targets until 2015.

### 3.3.7 Summary

The 2009 HCFC consumption in Malaysia by substance and sector is tabulated below:

Table-7: Malaysia HCFC Consumption by Sector and Substance (2009)

Sector/Substance	HCFC-22	HCFC-141b	Other	Total
<b>Manufacturing</b>				
Air Conditioning	1,915	-	21	1,936
Refrigeration	330	-	20	350
Firefighting	-	-	13	13
PU Foams	-	1,335	-	1,335
XPS Foams	6	-	4	10
Solvents	-	-	1	1
<b>Servicing</b>	4,004	-	41	4,055
<b>Total</b>	<b>6,255</b>	<b>1,335</b>	<b>110</b>	<b>7,700</b>

*Note: All figures in metric tonnes, rounded off to the nearest 1.00.*

In terms of substances in metric tonnes, HCFC-22 accounts for about 81.2% of the consumption and HCFC-141b accounts for about 17.3% of the total consumption. HCFC-123, HCFC-225 and other HCFCs account for the remaining consumption.

Within manufacturing, the sectoral contributions to HCFC consumption are Air Conditioning (53.1%), Refrigeration (9.6%) and PU Foams (36.6%). In metric tonnes, about 47.3% of the total HCFC consumption is in manufacturing and remaining in servicing.

About 60-70% of the consumption in manufacturing originates from organized enterprises with good technical and managerial capability. The remaining consumption in manufacturing originates in small and medium-sized enterprises.

The main challenges for HCFC reductions identified were the current non-availability of cost-effective, environment-friendly, efficient and mature alternatives and also the implementability of conversions within the short time span available for meeting the 2013 and 2015 control targets for HCFC consumption.

## **3.4 INSTITUTIONAL FRAMEWORK**

### **3.4.1 Institutional Arrangements**

Malaysia established the Ozone Protection Unit within the Department of Environment (DOE) to respond to mandates of the Montreal Protocol. The Ozone Protection Unit (OPU) within the Air Division of the Department of Environment, plays a lead role in the Government's sustained efforts to phase-out ODS in the country.

The OPU is also the Secretariat to the National Steering Committee (NSC) for the Protection of Ozone Layer that serves as an advisory body to the Government to provide strategic and policy guidance for implementation of the Montreal Protocol. The Chair of the NSC is the Secretary General of the Ministry of Natural Resources and Environment. There are various working groups for the implementation of Montreal Protocol in Malaysia and the OPU acts as their coordinating body.

The OPU is partially supported through the Institutional Strengthening Project with financial assistance from the Multilateral Fund and implemented by UNDP.

Malaysia has taken a proactive approach in phasing out controlled substances under the Montreal Protocol. It has formulated policies and legislations to restrict and limit the use of these controlled substances. These policies and strategies have provisions for the monitoring of the importation and consumption of controlled substances as well as for promoting the use of non-ODS substitutes and alternatives in existing industries and new investments.

### **3.4.2 Existing Policies and Regulations**

Malaysia's environmental policy regime can be traced to as early as 1974 with introduction of the Environmental Quality Act, 1974. Amendments to the Act had been made to include provisions on the prohibition of the use of CFCs in the refrigeration, foam and fire-fighting sectors. The guidelines for the control measures for the protection of the ozone layer to facilitate the implementation of the phase-out programme were issued by the Department of Environment in 1994.

To provide regulatory and policy support for enabling the industry to eliminate ODS in line with the country's obligations under the Montreal Protocol, the Government of Malaysia has taken and continues to take the following key initiatives and actions:

- Environmental Quality (Prohibition on the Use of CFCs and Other Gases As Propellants and Blowing Agents) Order, 1993;
- Environmental Quality (Refrigerant Management) Regulations, 1999;
- Environmental quality (Halon Management ) Regulations,1999;
- Environmental Quality (Delegation of Powers) (Halon Management) Order, 2000;
- Hydrogen Cyanide (Fumigation) Act (1953), (revised 1981);
- Occupational Safety and Health Act (1974); and
- Plant Quarantine Act (1976).

The above regulations provide for powers to control the import, installation, use and/or disposal of CFCs and other ODS substances which are prohibited under the Montreal Protocol.

One of the primary systems of controls on ODS is the Application Import Permit System (AP System), which is administered by the Ministry of International Trade and Industry (MITI).

Since its introduction in 1994 under the Prohibition of Import (Amendment No. 4) Order, 1994 of the Customs Act, 1967, all importers of the listed ODS, namely CFC-11, CFC-12, CFC-13, CFC-113, CFC-114, CFC-115, carbon tetrachloride (CTC) and 1,1,1-trichloroethane (TCA) must obtain an import permit issued by MITI. The total quantity of any of these substances that can be imported in any year is set by MITI in consultation with DOE. The amount is reduced each year in line with the Montreal Protocol obligations.

Besides the above, the Government has also undertaken various educational and public awareness programmes on the need to protect the ozone layer. Various guidelines and documents have also been produced for industry and public information and include:

- Guidelines for prequalifying and selection criteria for acceptable alternatives of ODS (1995);
- Training Manual for mobile air conditioning and recycling/service workshop operators (1995); and
- Guidebook on on-ODS technology (1997).

Other initiatives implemented by the Government included the provision of incentives to investment in ozone friendly technologies by approving several fiscal measures such as duty exemptions on imports on non-ODS technology, duty exemption on imports of HFC-134a and also include:

- Promoting the decentralization of implementation and enforcement of policies and regulations by interacting with and strengthening local environment focal points
- Supporting public awareness initiatives and campaigns for promoting ozone layer protection at the consumer level.
- Regular interaction with other ministries and departments, industry representatives and implementing agencies for information dissemination related to impact of policy measures
- Actively participating in international meetings to represent Malaysia's interests
- Promoting research and use of ozone-friendly technologies
- Providing incentives and rewards for development and use of ozone-friendly technologies

### 3.5 TECHNOLOGY

The selection of alternative technologies to HCFCs is governed by the following:

#### **Requirements for the alternative substance**

The alternative substance whether used as a refrigerant, blowing agent or fire suppressant, should:

- Have favorable physical and chemical properties for the concerned application
- Be inert and stable
- Be compatible with existing materials
- Preferably not be flammable
- Not be toxic
- Have zero ODP and low GWP
- Be easily available

#### **Requirements for the technology**

In addition to the substance, the phase-out of HCFCs requires plant and process conversions. Additional requirements that the overall conversion technology needs to fulfill are as below:

- Proven and reasonably mature technology
- End-product properties and performance should be maintained
- Cost-effective conversion with minimal disruption of current manufacturing operations
- Compliance with established local and international standards for health safety and environment
- Low overall direct and indirect CO<sub>2</sub>-equivalent emissions
- Implementable in a relatively short time frame

Currently, alternative substances and technologies that fully meet the above requirements are not available, except for one or two applications. Due to the environmental and occupational impact of technologies in the ODS consuming sectors, the past two decades have been marked by constant uncertainties and changes as well as several technological innovations and investments to overcome them.

As more scientific and technical information on alternative technologies and their environmental impacts, as well as information on research on new alternatives becomes available, it is clear that the eventual choice of alternative technology will need to carefully take into account environmental impacts and focus more on long-term environmental and occupational sustainability. This will need resources to be directed towards innovative products and processes that minimize ozone and climate impacts, while remaining efficient and affordable.

More detailed technical analysis is presented as part of the projects and sector plans submitted in conjunction with this document.

## 4. STRATEGY

### 4.1 PRINCIPLES

The overarching strategy underlying the HCFC Phase-out Management Plan (HPMP) for Malaysia is based on the following guiding principles:

- Reflect national context and priorities, national policies and country-drivenness;
- Develop and demonstrate a strengthened and proactive partnership between government and industry;
- Draw upon the lessons learnt from functioning of institutional arrangements and operational mechanisms, integrate and build upon existing infrastructures and introduce new mechanisms as needed;
- Be dynamic and evolving, and to be open for revisions and adaptation as necessary in response to evolving situations

### 4.2 APPROACH FOR COMPLIANCE

Malaysia will develop and implement a staged approach for complying with the adjusted control schedule for Annex-C Group-I substances (HCFCs) under the Montreal Protocol.

#### 4.2.1 Stage-I (2011 to 2015)

Considering the profiles of the various HCFC consuming sectors and sub-sectors, their current and forecasted consumption, their future prospects considering the country's need for sustained and sustainable economic development, the burgeoning population of HCFC-containing products and equipment and resulting ozone and climate impacts, requirements for effective and efficient management and coordination and to ensure a systematic transition with minimal disruption, the Stage-I period from 2011 to 2015 will focus on converting manufacturing facilities in HCFC consuming sectors where non-HCFC, zero-ODP and low-GWP technologies can be applied. To ensure that these conversions and the associated reductions in HCFC consumption remain sustainable, targeted and specific regulations will be promulgated. To control the growth of HCFC consumption, recovery and reclaim programmes and capacity-building programmes (for technicians and enforcement officials) will be carried out in the Servicing Sector. To further support the sustainability of these reductions, appropriate technical assistance, training and awareness actions will be implemented.

#### 4.2.2 Stage-II (2015 to 2020)

In the Stage-II period from 2015 to 2010, three focal areas for action are identified as below:

- Phase-out of the HCFC consumption in the remaining manufacturing sectors, which could not be addressed in Stage-I, through investments, regulations and technical assistance.



- Reduction of HCFC consumption in the Servicing Sector, for which necessary supporting actions in terms of investments, policy, regulations, technical assistance, training, capacity-building and awareness will be implemented
- Sustained monitoring and enforcement of regulations

#### **4.2.3 Subsequent Stages (beyond 2020)**

The focus of actions for subsequent stages will be on further reductions in HCFC demand for servicing in line with the subsequent control targets for HCFC consumption. This will involve sustaining and strengthening infrastructures for effective and efficient management of HCFCs, introducing and strengthening decentralized enforcement mechanisms and further mainstreaming the implementation of the Montreal Protocol in national and local institutions.

#### **4.2.4 Strategic Issues**

Malaysia expects to encounter tremendous challenges for meeting the control targets for HCFC consumption in accordance with the adjusted phase-out schedule. Two key strategic issues are identified as below:

- The time available to implement actions for achieving the objectives of Stage-I (2011 to 2015), Stage-II (2015 to 2020) and subsequent stages, is extremely limited and will introduce extraordinary management and coordination challenges for government and industry. While in the midst of implementing Stage-I, preparation for Stage-II will need to be initiated, well in advance of 2015, so that implementation of Stage-II can commence smoothly, using the momentum gained in the implementation of Stage-I. To address this constraint, the management and coordination of actions will need to be forward-looking, systematic, effective and efficient and both government and industry will need to dedicate strong focus and adequate resources to ensure that implementation is approached consistently and in a result-oriented and unified manner.
- Malaysia will give serious and special attention to maximizing the environmental benefits of HCFC phase-out by prioritizing safe and sustainable low-GWP alternative technologies in accordance with the guidance provided by MOP Decision XIX/6. Malaysia has also set voluntary national targets for CO<sub>2</sub>-equivalent emission reductions (please refer to Section 4.10 for more details). In view of this, Malaysia considers it of utmost importance that adequate resources need to be targeted towards introducing benign alternative technologies and curtailing the population of products and equipment containing HCFCs or other high-GWP substances.

### **4.3 PRIORITIZATION FOR STAGE-I**

As described in Section 4.2.1, Malaysia will focus on manufacturing sectors for converting to alternative technologies for compliance with the 2013 and 2015 targets. The prioritizing of enterprises, applications, sub-sectors and sectors will be based on the following criteria:

- Applications and sub-sectors where mature and benign alternatives are available

- Enterprises with sound financial standing and market reputation, with larger HCFC consumption and with good technical and managerial capacity, to ensure cost-effective conversions with maximum impact and implementability within the short timeframe
- Endeavoring to achieve phase-out on application-level or sub-sector level to facilitate easier regulation and enforcement and to maintain a level playing field for all stakeholders without market distortion

#### 4.4 ANALYSIS OF REDUCTIONS REQUIRED FOR STAGE-I (2011 TO 2015)

##### 4.4.1 Baseline and Targets

As described in Sections 3.2.1 and 3.2.2, the HCFC consumption in Malaysia has been experiencing steady growth. In order to ensure that compliance with the 2013 and 2015 targets is achieved, while ensuring also that legitimate needs of consumers and industry are met, the government and stakeholders carried out detailed analyses for projecting scenarios in order to establish the level of reductions needed to be achieved and available in various sub-sectors and applications for complying with the 2013 and 2015 targets, taking into account the prioritization principles described in Section 4.3. The following methodology was used:

- Establish the national HCFC consumption Baseline (average of 2009 and 2010 levels in ODP tonnes) based on the reported HCFC consumption for 2010.
- Establish the allowable growth until 2013 for national-level HCFC consumption, to ensure adequate availability of HCFCs for legitimate needs of various sectors
- Apply the prioritization principles described in Section 4.3 and establish and segregate the level of HCFC consumption available in each sub-sector or application that could accomplish phase-out no later than 2015.

The HCFC Consumption Baseline for Malaysia (average of 2009 and 2010 consumption levels) is shown below:

Table-8: Malaysia HCFC Consumption Baseline

Substance	Consumption (ODP tonnes)		
	2009*	2010*	Baseline
Annex-C Group-I substances (HCFCs)	494.2	537.5	515.8

\* A7 data reporting

Based on the above, the targets for compliance with the 2013 and 2015 controls are as below:

Table-9: Stage-I Targets

Target	Maximum Consumption Level (ODP tonnes)
From 01 January 2013	515.8
From 01 January 2015	464.2

#### 4.4.2 Reductions for Stage-I Compliance

As enumerated in Section 3.2.2, the average compounded growth in consumption in Malaysia over a five-year period during 2005-2009, was 8.28% annually on ODP-tonne basis. During the same period, the average compounded growth in GDP was about 4.67% annually.

Malaysia will limit the growth of HCFC consumption during 2011 and 2012 at about 2.75% annually, through introduction of a quota system for HCFC imports, thus controlling the HCFC consumption by 2013, to no more than 567.38 ODP tonnes. Thus the reductions required for achieving the 2013 compliance target would work out to about 51.6 ODP tonnes. An additional 51.5 ODP tonnes would be needed to be reduced between 2013 and 2015, to achieve the 2015 compliance target. Thus, the total reductions needed for achieving both the 2013 and 2015 through the HPMP Stage-I work out to about 103.16 ODP tonnes.

Based on the prioritization criteria described in Section 4.3, Malaysia has decided to achieve reductions in HCFC consumption in various sectors as below:

Table-10: Reductions for Stage-I Compliance

Sector	Reductions for 2013 and 2015 targets (ODP tonnes)		
	Manufacturing	Servicing	Total
Air Conditioning	0	6.50	6.50
Refrigeration	0	2.36	2.36
Firefighting	0	0	0
Foams	94.60	0	94.60
Solvents	0	0	0
<b>Total</b>	<b>94.60</b>	<b>8.56</b>	<b>103.16</b>

#### 4.5 RATIONALE AND PHASE-OUT STRATEGY

The following rationale and strategic considerations are involved in designing this phase-out strategy for compliance with the 2013 and 2015 compliance targets:

- Manufacturing, high ODP HCFCs (HCFC-141b) and the PU Foams Sector have been prioritized
- Applications and sub-sectors where mature and relatively benign technologies are available are prioritized
- Financially sound and viable enterprises with good technical and managerial capacity and large consumption have been prioritized, to ensure implementability and maximum impact
- Modest interventions in the Servicing Sector are proposed, to adapt and build on the servicing sector infrastructure, to contribute to the 2013 and 2015 targets, as well as to effectively control the growth in the servicing sector consumption.

Based on the above, the PU Foams Sector, which has predominantly HCFC-141b consumption and where low-GWP technologies can be applied to a relatively small number of well-organized enterprises, will be prioritized. The PU Foams Sector will achieve reductions of 94.6 ODP tonnes (Annex-II, PU Foams Sector Plan).

In order to control growth of HCFC consumption in servicing through containment, recovery and reclamations, as well as to ensure capacity-building of technicians and enforcement officials, modest interventions in the Servicing Sector are proposed (Annex-III, Servicing Sector Plan).

A key strategic consideration is the approach to deal with the HCFC consumption in manufacturing that would be unaddressed, either due to non-availability of mature and viable alternatives, or due to unimplementability in small and medium-sized enterprises within the available timeframe. The major unaddressed consumption would be in the Air Conditioning, Refrigeration and Servicing Sectors. Through carefully designed policies and targeted regulations, Malaysia will control the growth in HCFC consumption in sectors unaddressed for phase-out in Stage-I. For effective implementation, adequate resources will need to be accordingly allocated (Annex-I, Project Management, Policies and Regulations).

#### 4.6 STRATEGY COMPONENTS AND COSTS

The strategy for compliance with the Stage-I targets for compliance with the 2013 and 2015 milestones is comprised of the following components:

##### 4.6.1 Policies, Regulations, Project Management and Coordination

###### *Policies and Regulations*

Policies and targeted regulations that are enforceable without distorting the markets will be instrumental in controlling the consumption of HCFCs, for meeting the 2013 and 2015 targets. Some of the key planned regulations planned for Stage-I are described below:

Table-11: Key Planned Regulatory Actions

Year	Planned Regulatory Actions
2012	Establishment of Application Permit (AP) import quota system based on HCFC Baseline (average national consumption for 2009/2010)
	Amend existing regulations for controlling use, imports, manufacturing, assembly and installation of products containing HCFCs
2013	Licensing re-export of HCFCs
	Enforcement of Application Permit (AP) quota system
	Prohibition of establishment and expansion of new HCFC-based manufacturing capacities
	Establish incentive system for promoting use of alternatives to HCFCs
2015	Certification of technicians for handling HCFCs
	Prohibition of manufacturing, assembly and import of HCFC-based air conditioners (2.5 HP and lower) for use in Malaysia
	Prohibit imports of polyols pre-blended with HCFCs
	Include HCFCs in the list of restricted gases

### ***Management, Coordination and Monitoring***

The earliest date by which actual field activities can commence, is estimated to be early-2012. This is to allow time for putting in place the necessary project initiation procedures, agreements, etc. This means that stringent timelines will be encountered for implementing actions for Stage-I compliance. This will make the task of management and coordination of activities very challenging. Adequate resources would need to be allocated, to support the additional costs of management, coordination and monitoring.

### ***Awareness and Communications***

It is considered extremely important to engage and enlist the support of all stakeholders in the implementation of the HPMP (Stage-I). To accomplish this, targeted awareness and communication actions will need to be carried out, and aligned with the implementation of the HPMP Stage-I. Accordingly resources would need to be allocated to cover the costs of awareness and communications actions.

More details on this component are provided in Annex-I.

#### **4.6.2 Polyurethane Foam Sector Plan**

The Polyurethane Foams Sector Plan will aim to phase out HCFC consumption in selected foam manufacturing enterprises by 2015. The successful implementation of this plan will contribute 91.7% to the phase-out target. More details are provided in Annex-II.

#### **4.6.3 Technical Assistance for the Servicing Sector**

Since a large proportion of the unaddressed consumption in 2015 would be in the Servicing Sector, actions would need to be initiated at the outset, to curb the growth of HCFC-based equipment population during the first 3-4 critical years during which phase-out actions are being implemented. Specific policy and technical assistance interventions will be needed to control the growth in HCFC consumption in servicing until 2015 to acceptable levels.

#### **4.6.4 Technical Assistance for Air Conditioning and Refrigeration (Mfg) Sectors**

Malaysia is one of the manufacturing hubs in Southeast Asia, for air conditioning and refrigeration equipment. These two sectors are not prioritized for phase-out actions to meet the Stage-I compliance targets. Cost-effective low-GWP alternatives in these two sectors are still not mature. To adequately prepare the locally-owned enterprises in these two sectors for conversion in Stage-II, it is considered important to ensure the engagement of these enterprise in the phase-out efforts, for the industry to keep abreast of the latest technological developments and to ensure that best practice technical information on selection of emerging low-GWP technologies is disseminated. This is expected to enable the locally-owned manufacturers of air conditioning and refrigeration equipment, to be prepared for cost-effective conversion to such technologies in the HPMP Stage-II.

#### 4.7 SUMMARY OF COSTS AND FUNDING

The total costs, requested funding and counterpart funding are summarized below. The breakdown of details of costs and funding for sector level activities are provided in the relevant annexes.

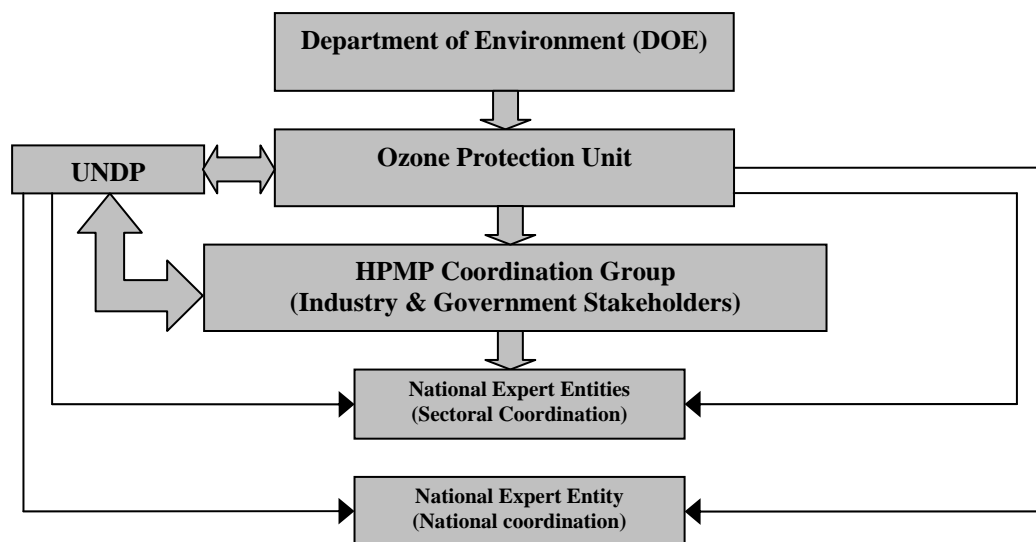
Strategy Component	Total Costs (US\$)	Counterpart Funding (US\$)	Net Funding Request (US\$)
Management, Coordination and Monitoring	990,000	0	990,000
Polyurethane Foams Sector Plan	18,231,000	9,473,760	8,757,240
Technical assistance for Servicing Sector	715,000	0	715,000
Technical assistance for the Air Conditioning and Refrigeration (Manufacturing) Sectors	90,000	0	90,000
<b>Total</b>	<b>20,026,000</b>	<b>9,473,760</b>	<b>10,552,240</b>

*Note: All amounts rounded off to the nearest US\$ 1.00 and do not include agency support costs*

#### 4.8 MANAGEMENT ARRANGEMENTS

The implementation of the HPMP (Stage-I) will need to be closely aligned and coordinated with the various policy, regulatory, fiscal, awareness and capacity-building actions the Government of Malaysia is taking and will need to take in future, ensuring consistency with national priorities.

The implementation of the HPMP (Stage-I) will be carried out using the national execution modality (except for individual projects). The following framework that was successfully used during the preparation stage will be primarily used for supervision and management of implementation, with changes as needed to respond to evolving needs.



The National Ozone Unit/DOE will have the overall coordination role. UNDP is the designated implementing agency for Malaysia's HPMP. Considering the challenges for implementing phase-out activities and related supporting activities in a short span of time to meet the 2013 and 2015 targets and considering that Malaysia will implement HPMP Stage-I through a performance-based agreement, the overall HPMP will be implemented through a performance-based mechanism between UNDP and DOE.

A project management unit with dedicated project staff will need to be formed, to undertake day-to-day implementation supervision and project management. The NOU/DOE will be supported by national and international technical experts as needed. The detailed roles and responsibilities of the stakeholders will be defined at the time of initiation of project implementation in more detail.

#### 4.9 MONITORING MILESTONES

Activity	2012				2013				2014				2015				2016	
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
<b>Investment Components</b>																		
Project initiation documentation																		
Establish project management unit																		
Stakeholder consultations																		
Enterprise-level agreements																		
Technology conversions																		
Commissioning and trials																		
<b>Non-investment Components</b>																		
Policy and Regulations																		
Technical Support																		
Technical Assistance for Servicing																		
Awareness and Capacity-building																		
<b>Verification</b>																		
Verification of phase-out																		

#### 4.10 ENVIRONMENTAL IMPACT

##### 4.10.1 Ozone Layer Protection

Successful implementation of the HPMP (Stage-I) in Malaysia will result in a phase-out of 103.16 ODP tonnes of HCFCs. After accounting for the controlled growth in consumption of HCFCs, the net impact would be minimum 51.6 ODP tonnes of sustained reductions in Malaysia's national HCFC consumption baseline from 2015.

##### 4.10.2 Global Warming

###### *Direct GHG emissions*

Due to the relatively high global warming potential of HCFCs, their phase-out will result in reduced direct GHG emissions. The net impact would be the difference in the direct emissions between HCFCs and the alternatives introduced to replace them as below:

###### *Before conversion*

Sector/Substance	HCFC-22	HCFC-141b
Foams (metric tonnes)	0	860
Servicing	155	0
<b>Total (metric tonnes)</b>	<b>155</b>	<b>860</b>
GWP <sup>1</sup>	1,810	725
Impact (CO <sub>2</sub> -eq tonnes)	280,550	623,500
<b>Total Impact (CO<sub>2</sub>-eq tonnes)/y</b>	<b>904,050</b>	

*After Conversion*

<b>Sector/Substance</b>	<b>R-410A</b>	<b>HC</b>
Foams (metric tonnes)	0	688
Servicing	0	0
<b>Total (metric tonnes)</b>	<b>0</b>	<b>688</b>
GWP <sup>1</sup>	2,088	11
Impact (CO <sub>2</sub> -eq tonnes)	0	7,568
<b>Total Impact (CO<sub>2</sub>-eq tonnes)/y</b>	<b>7,568</b>	

The net direct emission reductions are thus 896,482 CO<sub>2</sub>-eq tonnes annually.

*Indirect GHG emissions*

Energy efficiency improvements are not the primary objective of this plan therefore the impact of indirect GHG emissions cannot be accurately estimated at this time.

**4.10.3 Health and Safety**

The HPMP (Stage-I) will be implemented taking into account all considerations for safeguarding health and safety in line with local and international regulations and guidelines.



**MALAYSIA HPMP (STAGE-I) FOR 2013 AND 2015 COMPLIANCE**

**ANNEX-I**

**MANAGEMENT AND COORDINATION**

## **MALAYSIA HCFC PHASE-OUT MANAGEMENT PLAN STAGE-I MANAGEMENT AND COORDINATION**

### **INTRODUCTION**

This component of the Malaysia HPMP (Stage-I) for compliance with the 2013 and 2015 control targets, comprises of three parts:

- Support for Policies and Regulations
- Implementation Supervision, Management, Coordination and Monitoring
- Awareness and Communications

### **SUPPORT FOR POLICIES AND REGULATIONS**

A targeted, comprehensive and enforceable policy and regulatory framework is an essential component for supporting and sustaining the HCFC phase-out actions taken at the enterprise or sector level. Such a framework can effectively persuade HCFC manufacturers and users to participate proactively in and support the HPMP implementation. The key regulatory instrument for HCFC phase-out will focus on the supply side, by controlling and monitoring the import of HCFCs, supporting policies to discourage the demand of HCFCs are also considered to be necessary.

Malaysia has taken a proactive, forward-looking and targeted approach for regulating ODS, under the mandate provided by the overarching Environmental Quality Act, 1974. Amendments to the Act have been made to include provisions on the prohibition of the use of CFCs in the refrigeration, foam and fire-fighting sectors. The guidelines for the control measures for the protection of the ozone layer to facilitate the implementation of the phase-out programme were issued by the Department of Environment in 1994. To provide regulatory and policy support for enabling the industry to eliminate ODS in line with the country's obligations under the Montreal Protocol, the Government of Malaysia has taken and continues to take the following key initiatives and actions, which allow for control of import, installation, use and/or disposal of CFCs and other ODS substances which are prohibited under the Montreal Protocol.:

- Environmental Quality (Prohibition on the Use of CFCs and Other Gases As Propellants and Blowing Agents) Order, 1993;
- Environmental Quality (Refrigerant Management) Regulations, 1999;
- Environmental quality (Halon Management ) Regulations,1999;
- Environmental Quality (Delegation of Powers) (Halon Management) Order, 2000;
- Hydrogen Cyanide (Fumigation) Act (1953), (revised 1981);
- Occupational Safety and Health Act (1974); and
- Plant Quarantine Act (1976).

One of the primary systems of controls on ODS is the Application Import Permit System (AP System), which is administered by the Ministry of International Trade and Industry (MITI).

Since its introduction in 1994 under the Prohibition of Import (Amendment No. 4) Order, 1994 of the Customs Act, 1967, all importers of the listed ODS, namely CFC-11, CFC-12, CFC-13, CFC-113, CFC-114, CFC-115, carbon tetrachloride (CTC) and 1,1,1-trichloroethane (TCA) must obtain an import permit issued by MITI. The total quantity of any of these substances that can be imported in any year is set by MITI in consultation with DOE. The amount is reduced each year in line with the Montreal Protocol obligations.

For compliance with the control targets for HCFCs, policies and targeted regulations that are enforceable without distorting the markets will be instrumental in controlling the consumption of HCFCs, for meeting the 2013 and 2015 targets. Some of the key planned regulations planned for Stage-I are described below:

Year	Planned Regulatory Actions
2012	Establishment of Application Permit (AP) import quota system based on HCFC Baseline (average national consumption for 2009/2010)
	Amend existing regulations for controlling use, imports, manufacturing, assembly and installation of products containing HCFCs
2013	Licensing re-export of HCFCs
	Enforcement of Application Permit (AP) quota system
	Prohibition of establishment and expansion of new HCFC-based manufacturing capacities
	Establish incentive system for promoting use of alternatives to HCFCs
2015	Certification of technicians for handling HCFCs
	Prohibition of manufacturing, assembly and import of HCFC-based air conditioners (2.5 HP and lower) for use in Malaysia
	Prohibit imports of polyols pre-blended with HCFCs
	Include HCFCs in the list of restricted gases

Developing and implementing the proposed regulations will require close interaction with other departments and line ministries, agencies and stakeholders.

Following are the costs for supporting the development of an effective policy and regulatory framework, essential for meeting the HPMP (Stage-I) targets:

Cost Component	Funding Request (US\$)
<b>Quota Management</b>	
Desk review	5,000
Stakeholder meetings	30,000
Documentation and materials	5,000
<b>Regulations Development and Implementation</b>	
Desk review	5,000
Stakeholder meetings	30,000
Legal experts	10,000
Documentation and materials	5,000
<b>Total</b>	<b>90,000</b>

## IMPLEMENTATION SUPERVISION, MONITORING, COORDINATION AND MANAGEMENT

The earliest date by which actual field activities can commence, is estimated to be early-2012. This is to allow time for putting in place the necessary project initiation procedures, agreements, etc. This means that extraordinarily stringent timelines will be encountered for implementing actions for Stage-I compliance. This will make the task of management and coordination of activities very challenging. Adequate resources would need to be allocated, to support the additional costs of management, coordination and monitoring.

A Project Management and Coordination Unit with the responsibility to implement the HPMP (Stage-I) activities will be established. The unit will be responsible for carrying out following main tasks:

- Coordination with all HPMP Stage-I stakeholders
- Preparation or review of TORs for consultancy services to support implementation, and supervision of HCFC phase-out activities;
- Preparation, implementation and review of the annual implementation plan
- Preparation of relevant reports as ay be required
- Financial management to ensure effective use of resources
- Development and maintenance of project management information system
- Facilitating project supervision or evaluation as may be required
- Facilitating performance verification as required
- Organizing meetings and workshops to ensure full cooperation of all stakeholders
- Supervision and evaluation of conversion projects with assistance from technical experts

The costs for supporting the implementation supervision, management, coordination and monitoring the implementation of Malaysia's HPMP (Stage-I) are as below:

Cost Component	Funding Request (US\$)
<b>Project staff</b>	
Project manager (1) for four years	160,000
Project assistants (2) for four years	210,000
<b>Operational Costs</b>	
Overheads and operational costs	90,000
<b>Implementation Supervision and Monitoring</b>	
Stakeholder meetings	60,000
Plant visits for monitoring	60,000
<b>Coordination</b>	
Stakeholder meetings	60,000
Documentation and materials	10,000
<b>Verification</b>	
Performance verification	70,000
<b>Total</b>	<b>720,000</b>

## AWARENESS AND COMMUNICATIONS

It is critical to engage and enlist the support of all stakeholders in the implementation of the HPMP (Stage-I), considering the limited timeframe available for implementation and challenging phase-out targets. To accomplish this, targeted awareness and capacity-building activities will need to be carried out, and aligned with the implementation of the HPMP Stage-I.

Awareness of an issue leads to demand for more knowledge, experience and information. These inputs often need to be transmitted in a simplified message to stakeholders, who are not technically familiar with ozone and climate issues.

Awareness and capacity-building need to be targeted at three levels of stakeholders:

- **Government level:** Creating consciousness of ozone and climate-friendly products and equipment, leading to influencing government procurement decisions, support for regulations
- **Sector/enterprise level:** Communicating technology and environment related messages in an understandable and accessible way
- **Public level:** Further broadening and simplifying communications in order to influence public consciousness and decision-making about buying and associating with ozone and climate-friendly products

The public awareness messaging needs to utilize all communication channels; media (print, network, visual and internet), events (exhibitions, theme celebrations) and direct communications (meetings and workshops).

Cost Component	Funding Request (US\$)
<b>Government Stakeholders</b>	
Training meetings and workshops	30,000
Documentation and materials	5,000
<b>Industry stakeholders</b>	
Stakeholder meetings	30,000
Technical documentation and materials	5,000
<b>Public</b>	
Publicity materials (brochures, flyers)	5,000
Print media advertisements and PSAs	30,000
Network media advertisements and PSAs	45,000
Promotion in events	30,000
<b>Total</b>	<b>180,000</b>

## SUMMARY OF COSTS

The summary of costs and proposed funding for this component is as shown below:

<b>Cost Component</b>	<b>Funding Request (US\$)</b>
Support for policies and regulations	90,000
Implementation supervision and management	720,000
Awareness and capacity-building	180,000
<b>Total</b>	<b>990,000</b>

## IMPLEMENTATION

This component will be implemented as a part of the overall HPMP (Stage-I) for Malaysia. The Department of Environment (DOE) will coordinate the implementation. UNDP is the designated implementing agency for the HPMP and this component. More details on implementation and management arrangements are provided in the Overarching HPMP Stage-I document.

**MALAYSIA HPMP (STAGE-I) FOR 2013 AND 2015 COMPLIANCE**

**ANNEX-II**

**POLYURETHANE FOAM SECTOR PLAN FOR  
COMPLIANCE WITH THE STAGE-I PHASE-OUT TARGETS**

## MALAYSIA – POLYURETHANE FOAM SECTOR PLAN FOR COMPLIANCE WITH THE STAGE-I PHASE-OUT TARGETS

### INTRODUCTION

Polyurethane foams for various applications are manufactured in Malaysia. The sector has experienced steady growth in recent years, due to the economic development and increase in purchasing power of the population and resulting growth in demand mainly in the construction appliance and cold chain industry segments.

### STRATEGY PREPARATION

Questionnaires and information brochures were developed and disseminated to sensitize the industry for HCFC phase-out. Several stakeholder meetings were held.

Data on the sector was collected from the main manufacturers. The data was validated through on-site visits to main manufacturers. Based on the data collected, HCFC demand forecasts were prepared and analyzed, a review of alternative technologies was conducted, cost estimation for various options were made and a strategy and action plan was prepared.

### SECTOR BACKGROUND

#### Industry Structure

Based on the information from the survey and stakeholder consultations, HCFC-141b is the predominant blowing agent used in the sector. It is used either as pure HCFC-141b or pre-blended in polyols supplied by the polyurethane chemical suppliers. There is no local production of HCFC-141b and therefore the entire requirement is met through imports by chemical suppliers, systems houses or sometimes directly by the foam manufacturers. The sector is organized into four categories of stakeholder enterprises as below:

- HCFC importers
- Systems houses
- Processing equipment suppliers
- Foam manufacturers

There are about 15-20 chemical suppliers that import HCFCs, including a few which import polyols suited for HCFC-141b. There is a small quantity of imported HCFC-141b pre-blended polyols.

There are seven systems houses, namely, BASF, Colorex, Cosmo, Dow, Maskimi, PPT and Oriken, which have facilities for blending and customization of HCFC-141b polyols in Malaysia.

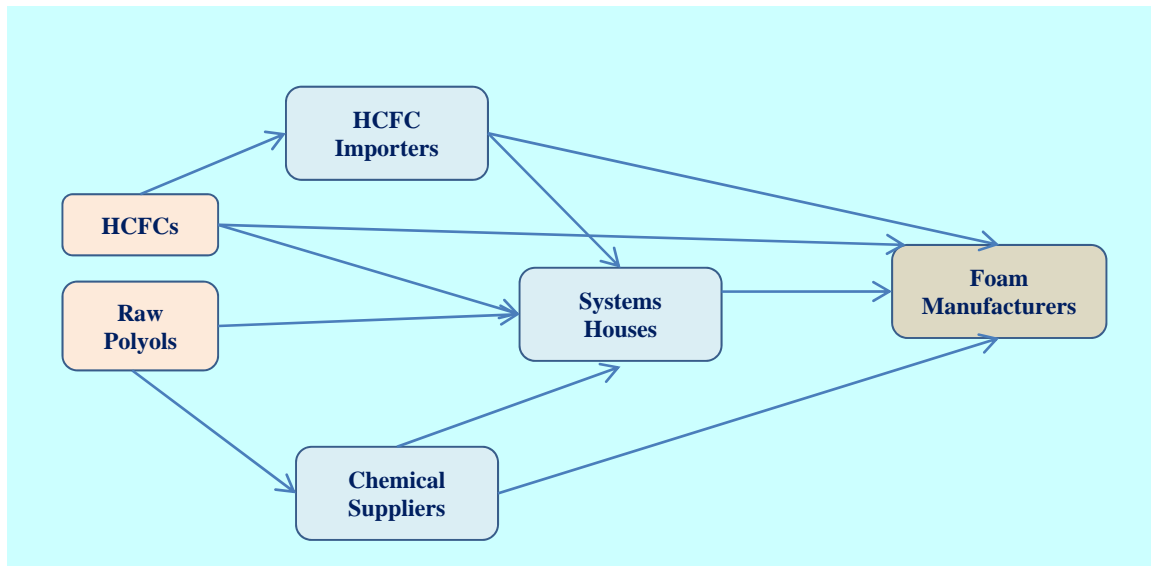
Polyurethane foam processing equipment is not manufactured locally. There are four main polyurethane foam processing equipment suppliers with a presence in Malaysia, namely, Cannon, OMS, RIM Polymers and SAIP. Other global suppliers are represented through their respective corporate representations.



There are an estimated 100 manufacturers of polyurethane foam in Malaysia. This comprises of about 13 large-sized and organized manufacturers, about 20 medium-sized manufacturers and the rest being small and tiny manufacturers. Rigid polyurethane foam is the predominant product, which uses HCFC-141b as a blowing agent.

### Supply Structure

The HCFC and chemical supply structure for the polyurethane foam industry is shown below:



### Classification of sub-sectors

The polyurethane foam sector in Malaysia is broadly classified into the following sub-sectors:

#### *Rigid polyurethane foam*

- Discontinuous sandwich panels for construction (roofing, walls and cold storages, trucks and trailer bodies)
- Refrigeration equipment (mainly commercial refrigeration)
- Insulated boxes
- Pipe insulation
- Spray insulation
- Other insulation (boardstock, etc)

#### *Integral skin polyurethane foam*

- Automotive and furniture parts

In terms of capacity and HCFC use, rigid polyurethane foam is the dominant sub-sector, within which discontinuous sandwich panels is the predominant application. There is very little capacity engaged in manufacturing of integral skin polyurethane foam based on HCFC technology.

## HCFC consumption

The 2009 estimated HCFC consumption by sub-sector is tabulated below:

Sub-sector	Application (No. of enterprises)	2009 HCFC Consumption (metric tonnes)
Rigid Foam	Discontinuous sandwich panels (30)	1,045
	Refrigeration equipment (10)	90
	Insulated boxes (1)	40
	Pipe insulation (10)	40
	Spray insulation (10)	50
	Other (40)	60
	<b>Total (Rigid Foam)</b>	<b>1,325</b>
Integral Skin Foam	Furniture and automotive (3)	10
	<b>Total (Integral Skin Foam)</b>	<b>10</b>
<b>Total</b>		<b>1,335</b>

Almost 60-70% foam manufacturers are small and medium-sized, however, due to their small size and capacity, their contribution to the overall sector consumption is only about 20-30%. The larger and more organized enterprises are mainly engaged in manufacturing of sandwich panels, insulated boxes and refrigeration equipment. A significant number of enterprises (over 90%) have converted previously from CFCs to HCFCs through assistance from MLF.

Due to the consistent growth in demand for consumer and commercial goods and with the expansion in the construction industry, the Polyurethane Foams sector expects to experience an average annual growth of about 10-12% annually.

The key challenge identified for reducing demand for HCFCs, was the implementability of zero-ODP and low-GWP alternative blowing agents in small and medium-sized enterprises.

### ALTERNATIVE TECHNOLOGIES

The selection of the alternative technology for rigid insulation foam is governed by the following considerations:

- Proven and reasonably mature technology.
- Cost effective conversion.
- Favorable processing characteristics
- Reliable and cost-effective availability of systems.
- Critical properties that have to obtained in the end product thermal conductivity, dimensional stability, closed cell content, adhesion strength, surface properties and strength)
- Compliance with established (local and international) standards on health, safety and environment, including zero ozone impact and low global warming impact.

The various available and emerging alternatives to replace HCFCs in rigid insulation foams are tabulated below. The molecular weight is mentioned as an indication of blowing efficiency and the GWP as an indication how the technology performs compared to HCFC-141b.

SUBSTANCE	GWP <sup>1</sup>	MOLECULAR WEIGHT	INCREMENTAL GWP <sup>2</sup>	COMMENTS
HCFC-141b	725	117	Baseline	
CO <sub>2</sub>	1	44	-725	Used direct/indirect (from water)
Pentanes	<15	72	-718	Explosive
HFC-245fa	1,030	134	443	
HFC-365mfc	794	148	279	
HFC-134a	1,430	102	522	
Methyl Formate	Negligible	60	-725	Flammable
Methylal	Negligible	76	-725	Reported for co-blowing only
Acetone	Negligible	58	-725	Used in flexible slabstock
FEA-1100	5	164 <sup>4</sup>	-718	Emerging
HFO-1234ze	6	114	-719	Recently introduced
HBA-2	<15	<134	>-708	Emerging
AFA-L1	<15	<134	>-708	Under development

<sup>1</sup> IPCC AR-4 (2007)

<sup>2</sup> GWPs compared to the baseline on an equimolar basis.

<sup>3</sup> UNEP Foams Technical Options Committee's 2006 report

<sup>4</sup> Calculated from published formulations

HFC-based systems (either liquid or gaseous), though promising, are not preferred due to their higher operating costs and high GWP. For water-based systems, the densities, insulation values and commercial availability are unsatisfactory at present. The penalty of performance and incremental costs for water-based systems for large-scale users offset the environmental advantages. Methyl Formate-based systems are also currently at initial stages of adoption in some markets.

Pentane based (n-, iso-, cyclo) systems require extensive safety related provisions/investments, that are justified in case of large scale users, due to the relatively favorable operating costs. Due to safety considerations, the use of pre-blended systems is not currently viable. Pentane-based systems are environmentally acceptable (zero ODP, no health hazards) and constitute a permanent technology. Pentane-based systems have been widely used as the technology of choice in organized and scale manufacturing of domestic refrigerators and sandwich panels.

For small-scale manufacturing, some of the newer technologies, such as aliphatic compounds (Methyl Formate, Methyl Al) and some emerging technologies (FEA-110, HBA-2, AFA-L1) show promise for cost-effective application within the next 3-4 years.

## PHASE-OUT STRATEGY

The HCFC phase-out strategy in the sector will comprise of the following components:

- Technology conversions at 13 select large and medium-sized enterprises, which can presently implement low-GWP alternatives within the time-frame available for compliance with the 2013 and 2015 targets
- Technical assistance to four systems houses to ensure availability of low-GWP and cost-effective alternatives, to the downstream enterprises that are unable to participate in Stage-I, so that they are adequately prepared for undertaking conversions during Stage-II.
- Technical support to the sector for information dissemination on emerging low-GWP alternatives.

## Technology Conversions

As seen in the distribution of HCFC consumption by sub-sector, a large proportion of the consumption is in the sandwich panel sub-sector, which is fast-growing. The technology conversions from HCFC-141b to hydrocarbons would be carried out at select large sandwich panel manufacturing enterprises. In addition, select large-sized enterprises in the insulated boxes and refrigeration applications would also carry out technology conversions to hydrocarbons. This is expected to result in a phase-out of 860 metric tonnes (94.6 ODP tonnes) of HCFC-141b (detailed baseline data and the technology conversion proposal is in Attachment-A).

## Technical Assistance to Systems Houses

The four Malaysian-owned systems houses, namely Colorex, Maskimi, Oriken and PPT, are proposed to be assisted, for customizing formulations using new and emerging low-GWP alternative technologies, focusing on aliphatic compounds (Methyl Formate, Methyl Al) and emerging technologies (FEA-1100, HBA-2 and AFA-L1), suited for pre-blending in polyols. This is expected to enable the four systems houses to be prepared to offer pre-blended polyols using such technologies within the next 3-4 years, so that the remaining mainly small and medium-sized enterprises in the sector can be cost-effectively converted as part of Stage-II of the HPMP. This component is considered critical because it takes 2-3 years to stabilize a technology for pre-blended polyols and ensure cost-effectiveness and market acceptance (see Attachment-B).

## Sector Technical Support

Alternative technologies for foam applications and particularly suited to SMEs, which meet all the ideal selection criteria, are not commercialized fully. It is therefore considered important for the industry to keep abreast of the latest technological developments, share information and exchange experiences with alternatives and document positive results for wider acceptance. This will be carried out through five technical assistance workshops (one annually) throughout the implementation period of the HPMP, mainly targeting SMEs. In addition, alternative technology and best practice technical information would be disseminated through technical fact sheets and other information materials (more details are provided in Attachment-C).

## PHASE-OUT COSTS

### Summary of Costs

Item	ICC	IOC	Total	Funding
<b>Investment</b>				
Technology conversions at enterprises	16,237,000	860,000	17,097,000	7,633,240
Technical assistance to systems houses	1,034,000	0	1,034,000	1,034,000
<b>Sub-total</b>	<b>17,271,000</b>	<b>860,000</b>	<b>18,131,000</b>	<b>8,667,240</b>
<b>Non-investment</b>				
Sector technical support	90,000	0	90,000	90,000
<b>Sub-total</b>	<b>90,000</b>	<b>0</b>	<b>90,000</b>	<b>90,000</b>
<b>Grand total</b>				<b>8,757,240</b>

*Note: All amounts in US dollars*

## **IMPLEMENTATION**

This sector plan will be implemented as a part of the overall HPMP (Stage-I) for Malaysia. The Department of Environment (DOE) will coordinate the implementation. UNDP is the designated implementing agency for this plan. More details on implementation and management arrangements are provided in the Overarching HPMP Stage-I document.

**TECHNOLOGY CONVERSIONS AT SELECT ENTERPRISES**

**Enterprise Baseline Data**

*Enterprises 1 to 3*

<b>Parameter</b>	<b>Enterprise-level data</b>		
Name	Berjaya Steel	Cycleworld	Insafoam
Location	Nilai	Klang	Puchong
Date of establishment	1980	1993	1992
Number of employees	120	100	70
A5 ownership	100%	100%	100%
Exports to non-A5 countries	0%	0%	0%
HCFC consumption (2009, metric tonnes)	43	160	41
Change in ODS-based capacity since 2007	None	None	None
Products	Commercial Refrigeration	Sandwich Panels	Sandwich Panels, Pipes
Main baseline equipment			
<i>Foam dispensers</i>	4 HP (2 Cannon, 2 OMS)	2 LP-OMS, 2 HP-Cannon	4 HP-Cannon, 1 LP-OMS
<i>Jigs/molds</i>	40	26	30
<i>Press/tools</i>	4 double daylight	4 double daylight	2 single, 3 double

*Enterprises 3 to 6*

<b>Parameter</b>	<b>Enterprise-level data</b>		
Name	Kwang Tai	Linear Panel	Ocean Rotomoulding
Location	Kuching	Ampang	Sekinchan
Date of establishment	1993	2000	2005
Number of employees	30	30	60
A5 ownership	100%	100%	100%
Exports to non-A5 countries	0%	0%	0%
HCFC consumption (2009, metric tonnes)	39	38	49
Change in ODS-based capacity since 2007	None	None	None
Products	Commercial Refrigeration	Sandwich Panels	Insulated boxes
Main baseline equipment			
<i>Foam dispensers</i>	2 HP (Cannon)	1 HP (OMS)	3 LP, 1 HP (RIM)
<i>Jigs/molds</i>	35	28	60
<i>Press/tools</i>	2 double daylight	1 double daylight	Rotomoulding tools

*Enterprises 6 to 9*

<b>Parameter</b>	<b>Enterprise-level data</b>		
Name	Pangkat Industrial	Rigidfoam Industries	Saicond Engineering
Location	Penang	Sungai Boloh	Johor
Date of establishment	1980	1979	1986
Number of employees	60	90	40
A5 ownership	100%	100%	100%
Exports to non-A5 countries	0%	0%	0%
HCFC consumption (2009, metric tonnes)	61	55	35
Change in ODS-based capacity since 2007	None	None	None
Products	Sandwich Panels	Sandwich Panels	Sandwich Panels
Main baseline equipment			
<i>Foam dispensers</i>	1 HP (KM), 2 LP (Cannon)	2 HP-KM, 3 LP-Hongwei	2 LP (Cannon)
<i>Jigs/molds</i>	30	50	20
<i>Press/tools</i>	2 double daylight	4 double daylight	2

### Enterprises 9 to 12

Parameter	Enterprise-level data		
Name	Supiera Enterprises	United Panel	Zun Utara Industries
Location	Johor	Puchong	Kedah
Date of establishment	1996	1978	1967
Number of employees	45	100	80
A5 ownership	100%	100%	100%
Exports to non-A5 countries	0%	0%	0%
HCFC consumption (2009, metric tonnes)	36	207	33
Change in ODS-based capacity since 2007	None	None	None
Products	Sandwich Panels	Sandwich Panels	Commercial Refrigeration
Main baseline equipment			
<i>Foam dispensers</i>	1 HP (Cannon)	2 HP (Elastogran)	3 HP (OMS)
<i>Jigs/molds</i>	20	50	22
<i>Press/tools</i>	1 double daylight	2 double daylight	Chest freezer fixtures

### Enterprise 13

Parameter	Enterprise-level data
Name	Ricwil Malaysia
Location	Shah Alam
Date of establishment	1984
Number of employees	110
A5 ownership	100%
Exports to non-A5 countries	0%
HCFC consumption (2009, metric tonnes)	63
Change in ODS-based capacity since 2007	None
Products	Pre-insulated pipes
Main baseline equipment	
<i>Foam dispensers</i>	2 HP (Cannon)
<i>Jigs/molds</i>	Pipe fixtures
<i>Press/tools</i>	NA

## Conversion

### *Technology selection*

The enterprises have selected cyclopentane technology for the conversion from HCFC-141b technology. The justification for selection of this technology is provided in the main document. Since the enterprises are relatively large-scale and well-organized and have qualified technical and managerial staff, they are in a position to manage the pentane-based conversion cost-effectively and safely.

The conversion to pentane-based systems will require safety precautions and provisions as per established norms and local regulations.

### Safety Implications

The use of flammable substances such as cyclopentane requires substantial changes in the manufacturing facilities and practices. Conformity to strict safety standards is a requirement of MLF funded projects. The following safety concept is proposed to be applied:

- Classify all identified hazard areas following IEC-79-10 (1986):

**Zone-0:** Where a constant amount of highly flammable/explosive substances is expected. Areas inside the cyclopentane piping and tanks are considered in this category. All materials and devices must be explosion-proof (EX) and properly grounded.

**Zone-1:** Where highly flammable/explosive substances are periodically expected. Areas around molds, fixtures and tooling are considered in this category. All materials and devices must be explosion-proof (EX-e, EX-d or EX-ia) and properly grounded. With adequate ventilation, Zone-1 can be reclassified to Zone-2.

**Zone-2:** Where highly flammable/explosive substances can be expected only during an accident or scheduled maintenance. Exterior of storage areas, premixing stations and foam dispensers are generally in this category. All materials and devices must be explosion-proof (EX-n or IP-54 sealing) and properly grounded.

- Apply engineered solutions, such as ventilation, ionized blowers, static eliminators, segregating walls, etc.
- Safeguard areas, which cannot be reclassified, by explosion-proofing.
- Provide additional safeguarding through a gas monitoring and detection system with sensors located at/near potential emission points and also portable gas detectors to be used as a part of a formal monitoring plan, for areas which do not have formal monitoring.
- Provide adequate emergency response gear, such as fire extinguishers.
- Provide adequate personnel training for safe operating procedures, preventive maintenance and emergency response, using formalized procedures, preparation of safety manuals and an emergency response plan.
- Use external safety and process experts for supervising designs, implementation and start-up

### ***Plant and process modifications***

1. The layout of the plants pertaining to handling polyurethane chemicals will need to be modified substantially.
2. Cyclopentane of the required purity/grade will need to be imported. A safe, reliable and convenient storage, delivery and handling system for cyclopentane will be required at each enterprise, comprising of the following:
  - *Storage:* This is proposed to be provided through the installation of an under/above ground carbon steel storage tank of 60 m<sup>3</sup> capacity. The capacity of the storage is determined based on procurement requirement of cyclopentane which needs to be imported, time relating to entire order to delivery cycle, procedural requirements for port inspection and clearance, return time for the cylinders and risks associated with timely availability of materials.
  - *Delivery:* Two delivery pumps for cyclopentane will have to be installed, one operating and one standby. The electric drive motors shall have explosion proof rating.
  - *Handling:* Piping and fittings for carrying the cyclopentane from the storage tank to the pre-mixing unit. Also, piping and fittings for receipt of supply of cyclopentane, including gas return and pressure relief lines will be required.
3. The existing pre-mixing arrangements where available, are not suitable for ensuring efficient and safe mixing of cyclopentane in the polyol. One new pre-mixing station per production line is proposed.



Each pre-mixing station will comprise of a closed-system static mixer, metering/recirculating pumps for components and chemical loading pumps, which incorporate the safety requirements for cyclo-pentane. A separate jacketed buffer tank will be needed for each line (total seven) to manage the demand for polyol blend in each line individually.

4. The foam dispensers will need to be replaced/retrofitted in order to be suited for use with pentane-based systems and to comply with the safety concept described earlier, as below:
  - Existing high-pressure foam dispensers will be retrofitted
  - Existing low-pressure dispensers will be replaced
5. The existing inter-connecting high pressure piping and fittings for transfer of the chemicals, between the batch pre-mixer, foam dispenser and the mixing heads, will need to be dismantled and replaced for handling cyclo-pentane formulations for safety reasons and due to the modified layout.
6. The existing foaming jigs/molds for the discontinuous lines will need to be retrofitted to be suitable for water heating instead of electric heating, for safety reasons.
7. There is no existing water conditioning systems, except the small dedicated chillers for the existing foam dispensers. It is proposed that new water conditioning systems, to provide both heating and cooling be installed at a convenient central location. This would be economic and convenient. This system would comprise of:
  - An electric water heater with necessary controls with capacity adequate to meet the heating requirements for the pre-mixing buffer tanks, component day tanks on the dispensers and jig/mold heating
  - Water circulation pumps.
  - A water chilling unit with necessary controls, with capacity adequate to cover the cooling requirements for the pre-mixing buffer tank and component day tanks on the dispenser, and circulation pump.
  - Interconnecting steel piping, valves, fittings and the necessary insulation for circulation of hot and cold water to the pre-mixing station, foam dispenser and jigs/molds.
  - Expansion cum storage tanks with insulation, for hot and cold water, controls and instruments.
8. A ventilation and exhaust system for maintaining safe concentrations of cyclopentane will be required. This will involve sheet metal ducting and blowers/fans for supply air as well as for exhaust of air extracted from the vulnerable locations
9. A safety system for detection and monitoring of hydrocarbon concentrations and for prevention of fire and explosion hazards will be required. This will comprise of the following:
  - Hydrocarbon sensors/detectors (about 30 units at assorted locations)
  - Alarm and control system

- Water sprinkler system for fire extinguishing, covering the vulnerable areas and about portable fire-extinguishers for areas unsegregated from the vulnerable areas
  - A nitrogen system for mold flushing to prevent static electricity generation
  - Anti-static floor treatment for the vulnerable areas amounting to about 1,000 sq. m.
10. Electrical works for the conversion complying with safety regulations pertaining to areas handling flammable/explosive substances, will be required, covering the following:
- A main control panel and local distribution panels for the new electrical equipment (cyclo-pentane pump motors, pre-mixing station pump motors, dispenser pump motors, water pumps motors, fan motors, compressor motor, etc)
  - Power cabling, earthing/grounding and terminations
  - Control and interlocking wiring for the safety systems
  - Back-up AC electric power generator covering the requirements of the ventilation, fire extinguishing, alarm system and nitrogen systems.
11. Civil and miscellaneous works will be required covering excavation and refilling for the underground cyclo-pentane storage, cyclopentane pumps foundations and housing, Miscellaneous civil works for pipe/duct/cable support installation, making and refinishing wall/floor openings, floor finishing, relocation of the dispensers, supports/foundations for installation of new equipment, etc.
12. Technical assistance from external process experts, to implement the new formulations and to ensure smooth transition to the new technology, will be needed.
13. Trials will be needed for validation of the new formulations and the new equipment. This will cover the cost of chemicals, raw materials/consumables and utilities required during the trials and commissioning.
14. On commissioning the plant, a safety audit will be required to be carried out and the plant safety established by a competent authority through inspection and certification.
15. The production personnel in the enterprises will be required to be reoriented to be able to work with the new formulations. Additionally, training for establishing safe practices in handling flammable/explosive substances will be required to be imparted. Such training will either be secured from specialized agencies or through pre-trained officials of the enterprise.

### ***Incremental Costs***

Investments will be needed to be made and provisions thereof included in the project budget, to cover the incremental costs of these changes. These changes will also result in incremental operating costs, for which provision has been made in the project budget.

Incremental capital and operating costs resulting from the changes described above are tabulated below:

### Incremental Cost Calculations (Enterprises 1 - 7)

No	Item	Unit	Unit Cost	Berjaya	Cycleworld	Insafoam	Kwangtai	Linear	Ocean	Pangkat
<b>Incremental Capital Costs</b>										
1	Pentane storage and handling system	Lot	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
2	Premixing stations	Sets	90,000	360,000	360,000	450,000	180,000	90,000	360,000	180,000
3	Additional polyol buffer tanks (300 lit) and accessories	Sets	15,000	60,000	60,000	75,000	30,000	15,000	60,000	30,000
4	New high-pressure foam dispensers suitable for pentane	Sets	120,000	0	240,000	120,000	0	0	120,000	240,000
5	Retrofitting of existing high-pressure foam dispensers	Sets	75,000	300,000	150,000	300,000	150,000	75,000	225,000	75,000
6	Jigs/molds and heating system modifications	Lot	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
7	Water conditioning system	Lot	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
8	Ventilation and exhaust system	Lot	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000
9	Fire safety system	Lot	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000
10	Civil and electrical works	Lot	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000
11	Product and process trials	Lot	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
12	Process and safety training	Lot	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
13	Safety audit/certification	Lot	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
14	Technical assistance from external experts	Lot	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
<b>Sub-total</b>				<b>1,300,000</b>	<b>1,390,000</b>	<b>1,525,000</b>	<b>940,000</b>	<b>760,000</b>	<b>1,345,000</b>	<b>1,105,000</b>
Contingencies (10%)				130,000	139,000	152,500	94,000	76,000	134,500	110,500
<b>Total (ICC)</b>				<b>1,430,000</b>	<b>1,529,000</b>	<b>1,677,500</b>	<b>1,034,000</b>	<b>836,000</b>	<b>1,479,500</b>	<b>1,215,500</b>
<b>Incremental Operating Costs</b>										
HCFC consumption		Kg	NA	43,000	160,000	41,000	39,000	38,000	49,000	61,000
System consumption		Kg	NA	344,000	1,280,000	328,000	312,000	304,000	392,000	488,000
Pentane-based chemical systems cost differential		Kg	0.125	43,000	160,000	41,000	39,000	38,000	49,000	61,000
<b>Total (IOC)</b>				<b>43,000</b>	<b>160,000</b>	<b>41,000</b>	<b>39,000</b>	<b>38,000</b>	<b>49,000</b>	<b>61,000</b>
<b>Total Costs (ICC+IOC)</b>				<b>1,473,000</b>	<b>1,689,000</b>	<b>1,718,500</b>	<b>1,073,000</b>	<b>874,000</b>	<b>1,518,500</b>	<b>1,276,500</b>
<b>Eligible Costs (max. US\$ 9.79/kg-ODS)</b>				<b>420,970</b>	<b>1,566,400</b>	<b>401,390</b>	<b>381,180</b>	<b>372,020</b>	<b>479,710</b>	<b>597,190</b>

### Incremental Cost Calculations (Enterprises 8 - 13)

No	Item	Unit	Unit Cost	Rigidfoam	Saicond	Supiera	United	Zun Utara	Ricwil
<b>Incremental Capital Costs</b>									
1	Pentane storage and handling system	Lot	75,000	75,000	75,000	75,000	75,000	75,000	75,000
2	Premixing stations	Sets	90,000	450,000	180,000	90,000	180,000	270,000	180,000
3	Additional polyol buffer tanks (300 lit) and accessories	Sets	15,000	75,000	30,000	75,000	30,000	45,000	30,000
4	New high-pressure foam dispensers suitable for pentane	Sets	120,000	360,000	240,000	120,000	0	0	0
5	Retrofitting of existing high-pressure foam dispensers	Sets	75,000	150,000	0	300,000	150,000	225,000	150,000
6	Jigs/molds and heating system modifications	Lot	45,000	45,000	45,000	45,000	45,000	45,000	45,000
7	Water conditioning system	Lot	20,000	20,000	20,000	20,000	20,000	20,000	20,000
8	Ventilation and exhaust system	Lot	120,000	120,000	120,000	120,000	120,000	120,000	120,000
9	Fire safety system	Lot	90,000	90,000	90,000	90,000	90,000	90,000	90,000
10	Civil and electrical works	Lot	80,000	80,000	80,000	80,000	80,000	80,000	80,000
11	Product and process trials	Lot	60,000	60,000	60,000	60,000	60,000	60,000	60,000
12	Process and safety training	Lot	30,000	30,000	30,000	30,000	30,000	30,000	30,000
13	Safety audit/certification	Lot	30,000	30,000	30,000	30,000	30,000	30,000	30,000
14	Technical assistance from external experts	Lot	30,000	30,000	30,000	30,000	30,000	30,000	30,000
<b>Sub-total</b>				<b>1,615,000</b>	<b>1,030,000</b>	<b>760,000</b>	<b>940,000</b>	<b>1,120,000</b>	<b>940,000</b>
Contingencies (10%)				161,500	103,000	76,000	94,000	112,000	94,000
<b>Total (ICC)</b>				<b>1,776,500</b>	<b>1,133,000</b>	<b>836,000</b>	<b>1,034,000</b>	<b>1,232,000</b>	<b>1,034,000</b>
<b>Incremental Operating Costs</b>									
HCFC consumption		Kg	NA	55,000	35,000	36,000	207,000	33,000	63,000
System consumption		Kg	NA	440,000	280,000	288,000	1,928,000	264,000	504,000
Pentane-based chemical systems cost differential		Kg	0.125	55,000	35,000	36,000	207,000	33,000	63,000
<b>Total (IOC)</b>				<b>55,000</b>	<b>35,000</b>	<b>36,000</b>	<b>207,000</b>	<b>33,000</b>	<b>63,000</b>
<b>Total Costs (ICC+IOC)</b>				<b>1,831,500</b>	<b>1,168,000</b>	<b>872,000</b>	<b>1,241,000</b>	<b>1,265,000</b>	<b>1,097,000</b>
<b>Eligible Costs (max. US\$ 9.79/kg-ODS)</b>				<b>538,450</b>	<b>342,650</b>	<b>352,440</b>	<b>1,241,000</b>	<b>323,070</b>	<b>616,770</b>

<b>Grand total eligible costs (13 enterprises)</b>	<b>7,633,240</b>
<b>Cost-effectiveness (based on total phase-out of 860 metric tonnes)</b>	<b>8.87</b>

**TECHNICAL ASSISTANCE TO SYSTEMS HOUSES****Introduction**

There are four Malaysian-owned systems houses in Malaysia. It is proposed that technical assistance be provided to these systems houses, for customizing formulations using new and emerging low-GWP alternative technologies, focusing on aliphatic compounds (Methyl Formate, Methyl Al) and emerging technologies (FEA-1100, HBA-2 and AFA-L1), suited for pre-blending in polyols. This is expected to enable the four systems houses to be prepared to offer pre-blended polyols using such technologies within the next three years, so that the remaining small and medium-sized enterprises in the sector can be cost-effectively converted as part of Stage-II of the HPMP. This component is considered critical because it takes 2-3 years to stabilize a technology for pre-blended polyols and ensure cost-effectiveness and market acceptance.

**Enterprise Baseline Data**

<b>Parameter</b>	<b>Enterprise-level data</b>			
Name	Colorex	Maskimi	Oriken	PPT
Location	Petaling Jaya	Kajang	Petaling Jaya	Puchong
Date of establishment	1996	1996	2003	1996
Number of employees	17	20	18	12
A5 ownership	100%	100%	100%	100%
Exports to non-A5 countries	0%	0%	0%	0%
HCFC use (2009, metric tonnes)	23	41	127	87
Change in ODS-based capacity since 2007	None	None	None	None
Sub-sectors served	Rigid PU foam	Rigid PU foam	Rigid PU foam	Rigid PU foam
Main baseline equipment	Raw polyol storage tanks, raw polyol transfer pumps, weigh tanks with agitators and load cells, jacketed reactor tanks with agitators, gas purge system and temperature control, plate heat exchangers, intermediate tanks, jacketed blend storage tank with temperature control and miscellaneous factory equipment such air compressors, hoists, etc.			
Foam equipment for validation	Low-pressure test foam dispenser, batch-type pre-mixer, assorted foaming molds and fixtures, miscellaneous testing equipment for foam properties			

**Project Description**

The key project inputs will cover the modification of existing facilities and introduction of new pilot-scale facilities for customizing, trials, evaluation and validation of non-HCFC formulations, mainly focusing on aliphatic compounds (Methyl Formate, Methyl Al, etc) and emerging alternatives (FEA-1100, HBA-2, AFA-L1, etc.)

The equipment required will include a laboratory-scale reactor, a pilot ethylene/propylene oxide blending and storage facility and retrofitting of the existing plant and machinery to handle non-HCFC chemicals. The existing low-pressure foam dispensers, which the enterprise currently use for their present trials, will be retrofitted to make them suitable for demonstrations/trials with the available substitute blowing agents.

A small range of molds and fixtures for trials of various foam types based on end-use and evaluation equipment for formulations and foam properties, are also envisaged. The technology for the new formulations will be acquired from chemical suppliers and external process experts. The production staff will need to be trained in the new process. Trials for establishing the process will be required. The project budget provides for the costs of these changes/investments.

The four systems houses will make the new formulations resulting from the implementation of this component, available to its downstream small and medium-sized end-users in the rigid polyurethane foam sub-sector. They will also provide technical support to these end-users through conduction of demonstrations and trials of the new formulations for these applications, to enable a smooth transition by these users to the new technologies. This component upon successful implementation will result in cost-effective indigenous availability of formulations suitable for no-HCFC low-GWP blowing agents for rigid foam applications. This will benefit the small and unorganized downstream foam producers, serviced by these systems houses, reduce the investment/operating costs for HCFC phase-out in the SMEs and will also contribute to the overall reduction in the use of HCFCs in the foam sector.

This project component will be implemented during the Stage-I period of Malaysia's HPMP, with the objective of making available low-GWP pre-blended polyols commercially available by the time the implementation of Stage-II of the HPMP begins.

### **Incremental Costs**

The incremental capital costs for each systems house are tabulated below:

<b>No</b>	<b>Item/Description</b>	<b>Unit</b>	<b>Qty</b>	<b>Cost (US\$)</b>
1	Retrofitting foam equipment for trials/demonstration of formulations	Nos	1	35,000
2	Closed-system premixing station	Nos	1	90,000
3	Laboratory scale autoclave reactor (250 lit)	Nos	1	20,000
4	Pilot EO/PO blending unit	Nos	1	25,000
5	Assorted jigs and molds for trials/demonstration	Lot	1	10,000
6	Evaluation and measuring equipment	Lot	1	15,000
7	Technical assistance for implementing the new technology and process	Lot	1	15,000
8	Trials for establishing the technology, equipment and process	Lot	1	15,000
9	Training and re-orientation of plant operators for the new technology	Lot	1	10,000
Sub-total				235,000
Contingencies (10%)				23,500
<b>Total</b>				<b>258,500</b>
<b>Grand total (for four systems houses)</b>				<b>1,034,000</b>

Since there is no direct consumption of HCFCs at the systems houses, no incremental operating costs are foreseen or sought.

**SECTOR TECHNICAL SUPPORT**

As mentioned earlier in this document, the polyurethane foam sector in Malaysia comprises of about 100 enterprises, of which about 60-70% are small and unorganized. Most of them are engaged in manufacturing a variety of rigid polyurethane foam products.

Although general awareness about quality assurance, training, environment and safety-related issues exists among these enterprises, it does not receive much emphasis due to low levels of operating capital, because of the small size of operation and the pressures on profitability exerted by the growing and very competitive domestic market. In general, the knowledge of polyurethane foam chemical systems and processing technologies is limited in these enterprises and therefore they would need external technical and financial support to enable them to effect the elimination of HCFCs in their foam manufacturing.

Furthermore, at the present time, cost-effective low-GWP alternatives are not fully commercialized, presenting a barrier for these SMEs to be ready for early conversions for phasing out HCFCs and contributing to Malaysia's Stage-I compliance.

It is therefore considered important for the industry to keep abreast of the latest technological developments, share information and exchange experiences with alternatives and document positive results for wider acceptance. This will be carried out through five technical assistance workshops (one annually) throughout the implementation period of the HPMP, mainly targeting SMEs. In addition, alternative technology and best practice technical information would be disseminated through technical fact sheets and other information materials.

The costs for the sector technical support are tabulated below:

<b>No</b>	<b>Item/Description</b>	<b>Cost (US\$)</b>
1	Technology workshops (one annually, total five)	50,000
2	National and international technical experts	35,000
3	Documentation and information materials	5,000
<b>Total</b>		<b>90,000</b>

**MALAYSIA HPMP (STAGE-I) FOR 2013 AND 2015 COMPLIANCE**

**ANNEX-III**

**TECHNICAL ASSISTANCE FOR THE SERVICING SECTOR**



## MALAYSIA HCFC PHASE-OUT MANAGEMENT PLAN STAGE-I TECHNICAL ASSISTANCE FOR THE SERVICING SECTOR

### INTRODUCTION

This component of the Malaysia HPMP (Stage-I) for compliance with the 2013 and 2015 control targets, comprises of three parts:

- Sustainable refrigerant management through recovery and reclamation
- Training and capacity-building of technicians and enforcement officials
- Pilot end-user retrofitting/replacement programme

### SECTOR BACKGROUND

The total HCFC consumption in the Servicing Sector in Malaysia was 4,055 metric tonnes in 2009. The predominant substance was HCFC-22 followed by smaller quantities of HCFC-123. The bulk of the HCFC consumption in the Servicing Sector was attributed to the servicing of HCFC-based equipment in the air conditioning sector (3,805 metric tonnes) and refrigeration sector (250 metric tonnes). Within the air conditioning sector, air-cooled split and packaged air conditioners, with an existing HCFC-based population of 6-7 million, dominate the HCFC consumption in servicing.

The typical service life of air conditioning and refrigeration equipment ranges from 10 to 25 years depending on the size and use profile. Larger-sized equipment tends to have longer service life. The HCFC consumption for servicing during the entire service life is estimated to be about 2-5 times the initial refrigerant charge, again, depending on the size and use profile of the equipment.

There are over 2,000 air conditioning and refrigeration servicing establishments in Malaysia. Some of them are affiliated to major manufacturers and many are small and unaffiliated. The baseline capacity and capability of the small establishments is limited.

There are an estimated 6,000 air conditioning and refrigeration technicians in Malaysia. Most technicians undergo some sort of training, but are predominantly field-trained. The manpower turnover is significant.

There are estimated 40-50 vocational training institutions imparting programs related to refrigeration and air conditioning equipment operation and maintenance for technicians.

Due to the prevailing economic and ready availability of HCFC-22 and high costs of alternatives, there is a lack of economic incentive to either re-use HCFCs or to deploy alternatives.

Given the rapidly increasing population of air conditioning and refrigeration equipment and considering the need to control HCFC consumption in order to meet the 2013 and 2015 compliance targets, it is considered necessary to intervene in the servicing sector, as part of the implementation of Malaysia's HPMP Stage-I.

## PROJECT DESCRIPTION

There are several main sources of HCFC consumption in the Servicing Sector, some of which are:

- Insufficient use and/or availability of reclaimed refrigerants meeting the relevant industry standards
- Leakage of refrigerant (due to inadequate leak-tightness and/or external factors such as mishaps, burnouts, failures, etc)
- Wastage of refrigerant (due to non-optimal practices in servicing)
- Challenges in enforcing regulations (due to lack of information and knowledge on regulations as well as on refrigerants)
- Extension of service life of HCFC-based equipment (due to high costs of replacement/retrofitting)

Malaysia will initiate addressing the above, to reduce HCFC consumption in the Servicing Sector, through the following:

- Sustainable refrigerant management through recovery and reclamation
- Training and capacity-building of technicians and enforcement officials
- Pilot end-user retrofitting/replacement programme

### **Sub-component 1: Sustainable Refrigeration Management**

Traditionally, in MLF-funded projects, programs for recovery/recycling and management of refrigerants (CFCs) were implemented in the following process:

- Identifying refrigeration servicing establishments
- Procuring and distributing refrigeration recovery/recycling equipment and accessories to these establishments
- Identifying candidates as Master Trainers and training them in good practices in refrigerant handling and refrigeration equipment servicing
- Identifying refrigeration service technicians and training them in good practices in refrigerant handling and refrigeration equipment servicing, through the Master Trainers
- Capacity-building of selected training establishments

The intended outcomes of such programs were:

- Reduction in CFC usage and emissions in servicing (through good practices training)
- Reduced dependence on virgin or new CFCs (through recovery and recycling)
- Capacity building of the workforce and facilities

However, it has been a common experience that refrigerant recovery/recycling and management programs implemented traditionally as described above, did not lead to achievement of all the intended outcomes to a satisfactory degree. In several developing countries where such programs were implemented it was found that the recovery/recycling equipment was under-utilized or not utilized.

Indeed, it was observed that most significant reductions in CFC usage in servicing occurred mainly due to retirement of CFC-based refrigeration equipment either through replacement or retrofitting. The following salient shortcomings in such programs are identified:

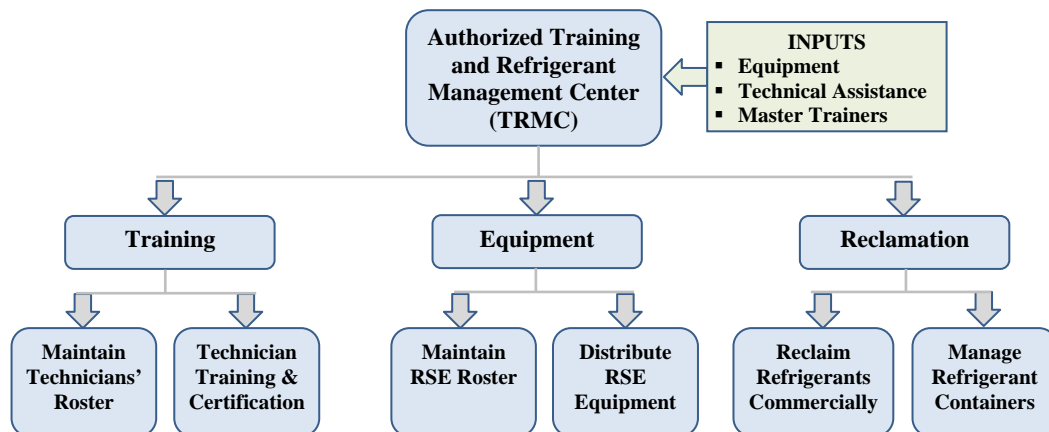
- Absence of a counterpart stake or ownership (e.g. participation in the recovery/recycling equipment costs) from the recipients, as the recovery/recycling equipment was provided entirely gratis
- Absence of a commercial incentive for recovery/recycling (or reclamation) of CFCs
- Inadequate definition of ownership of reclamation facilities (where such facilities were installed). Also the reclamation facilities were too large-scale and/or expensive enough to be economically unsustainable on their own in future
- Inadequate logistics for managing the flow of recovered CFCs from technicians or servicing establishments to the reclamation facility
- Absence of standards or certification of recycled and reclaimed CFCs (causing apprehension or suspicion in CFC buyers about the quality and performance of such CFCs)

These shortcomings were exacerbated by:

- Significant initial price differentials between CFCs and substitutes (CFCs were invariably cheaper)
- High investments needed for replacing or retrofitting CFC-based refrigeration equipment

A sustainable approach for refrigerant management in the Servicing Sector is proposed, drawing upon the lessons learnt in implementation of such programs in other countries and taking in to account recent technological developments, such as cost-effective availability of mini-reclaim units. The concepts underlying the proposed mechanism are:

- Acknowledging and harnessing market forces (to ensure commercial viability)
- Instituting Training and Refrigerant Management Centers (TRMCs) with a responsible role for program execution (see Figure-1 below)
- Careful selection of technology that best suits the program objectives



The figure above depicts the proposed program structure.

The Training and Refrigerant Management Centers would perform the following functions:

- Coordinate identification and training of Refrigeration Service Technicians (RSTs)
- Identify and maintain roster of Refrigeration Service Establishments (RSEs)
- Distribute servicing equipment (recovery units and tools) to RSEs
- Provide refrigerant reclamation services to RSEs on a commercial basis
- Manage refrigerant containers and record/track usage of reclaimed refrigerants
- Report as stipulated to DOE on recovery/reclamation activities

The existing training establishments could fulfill this role and could be designated as authorized TRMCs. Additionally, qualified large-sized service establishments could also be designated as authorized TRMCs. It is proposed that during HPMP Stage-I, a total of up to 10 TRMCs could be instituted considering the size of Malaysia, each with its own geographical jurisdiction.

The TRMCs would have substantive participation in the execution of the program. They would be provided with the following:

- One set of refrigerant mini-reclaim unit capable of purification to ARI-700 (2004) standards
- One set of accessories and tools
- Technical assistance as needed throughout the project duration

The TRMCs would serve as focal points for affiliation of Master Trainers, who after being initially trained and certified, would later participate as instructors for training RSTs. The TRMCs would be expected to identify Refrigeration Service Technicians (RSTs) and small-sized Refrigeration Service Establishments (RSEs) from their assigned geographical areas. The TRMCs would arrange the training of RSTs on a continuing basis in coordination with the Training Establishments. While the training of RSTs is intended to be mostly free of cost, it would be advisable that a small fee is charged by TRMCs to RSTs participating in the training, to ensure that the RSTs have ownership and seriousness in the training. The RSEs would be provided with refrigerant recovery equipment and accessories. It would be advisable to require the RSEs to make a small contribution towards the equipment costs to ensure that only serious RSEs willing to have a stake in using the equipment, participate in the program. The TRMCs could manage the distribution of equipment to the RSEs.

The RSEs from the geographical area affiliated to the local TRMC, would use this equipment to recover refrigerants and bring the recovered refrigerants to that TRMC for reclamation. The TRMC would charge a processing fee for this reclamation, to mitigate the costs and overheads associated with the reclamation operations. The refrigerant containers would be managed by the TRMCs on a rotational/exchange basis. The containers shall be appropriately labeled in accordance with prevailing regulations.

It is proposed that each TRMC, under a contractual agreement with the DOE, shall be contractually bound to carry out the following, within its geographical jurisdiction:

- Identify an agreed number of RSEs, for participating in the program
- Distribute refrigerant equipment to the RSEs and collect counterpart funding from them
- Identify, train and certify a certain number of RSTs annually through affiliated Master Trainers

- Provide reclamation services to RSEs on a commercial basis.
- Manage refrigerant containers and record/track usage of reclaimed refrigerants.

DOE will be responsible for ongoing monitoring of the program, with assistance from UNDP. UNDP will provide financial management and technical assistance and arrange payments to TRMCs upon endorsement by DOE. The costs for this sub-component are as below:

<b>Cost Component</b>	<b>Funding Request (US\$)</b>
<b>Training and Refrigerant Management Centers</b>	
Mini-reclaim units and accessories (US\$ 20,000/set, 10 sets)	200,000
Subsidy for three years for overheads	25,000
<b>RSEs/RSTs</b>	
Recovery units and tools (US\$ 2,500/set, 60 sets)	150,000
<b>Other</b>	
Stakeholder workshops for reclamation training (5)	50,000
Documentation and materials	5,000
Technical experts	20,000
<b>Total</b>	<b>450,000</b>

### **Sub-component 2: Training and Capacity-building**

This sub-component would comprise of two parts:

- Training of technicians
- Training of enforcement officials

#### ***Training of Technicians***

The sustainability of the outcomes of the servicing sector interventions would be significantly influenced by the capability and willingness of the large number of air conditioning and refrigeration technicians in this sector, to implement practices that would lead to optimal and economical use of HCFCs in servicing. To ensure that this important manpower base is positioned to contribute tangibly to HCFC reductions in the sector, it is essential to deliver to these technicians, the requisite level of classroom and hands-on training pertaining to operation and maintenance of equipment, process and applications involved in HCFC-based and substitute refrigerants, technologies and systems, with a specific emphasis on conservation, containment and recovery of refrigerants during servicing. This would comprise of the following:

- Create a pool of Master Trainers leading to a sustainable local capacity. The Master Trainers would be drawn from personnel available in the existing training establishments and from major service establishments, with the aim of preparing about 15 Master Trainers. The training of Master Trainer candidates would be delivered through training workshops to be conducted by experts designated by UNDP/DOE. It is proposed to organize five training workshops, each of two days duration. The curriculum would comprise of classroom presentations, practical demonstrations and field visits. The training courses would include training materials and development of the curriculum for subsequent technician training.

- Target the training of refrigeration technicians operating at the field level for their livelihoods, in good practices in refrigeration. Since these technicians are the first-level interface with the users of refrigeration equipment for servicing, it is considered crucial that key technicians are brought under the umbrella of training in Stage-I. Technician training for good practices in servicing would be carried out by Master Trainers (see above). The technicians would be provided with classroom and hands-on training, a guide in good practices, documentation and other technical reference materials. Upon completion of the prescribed course they would be provided with a certification. The technician training is envisaged to cover about 150 technicians during the HPMP Stage-I implementation, through five one-day sessions for each batch of ten technicians, spread over one year. The curriculum will comprise of but not be limited to the following:
  - Air conditioning and refrigeration system design, operation and maintenance, focusing on health, safety and environmental considerations
  - Introduction to codes and standards for manufacturing, operation, health and safety
  - Introduction to the latest service equipment and tools (leak detectors, vacuum pumps, recovery and reclaim equipment, refrigerant containers,
  - Workmanship training on leak control, testing and controls
  - Best practices in system monitoring, inventory control and record-keeping

### ***Training of Enforcement Officials***

The enforcement of existing and proposed regulations will require close cooperation between DOE and enforcement officials at entry points for controlled substances, both via imports as well as local distribution channels. Further, the technical capacity of enforcement officials will need to be enhanced for proper enforcement, through upgrading of their knowledge and skills with regard to refrigerants, refrigerant containers, refrigerant nomenclature, refrigerant blends, etc. it would be also essential to provide specific tools to enforcement officials, such as refrigerant identifiers particularly for refrigerant blends, to minimize barriers to enforcement.

It is proposed that about 90 key enforcement officials be trained, in a curriculum that would include but not necessarily be limited to the following topics:

- Treaty obligations under the Montreal Protocol
- Nomenclature of refrigerants and blends
- Basics and categories of refrigeration and air conditioning equipment
- Harmonization of databases of refrigerants and blends between enforcement and other departments
- HS Codes
- Labeling standards and practices
- Agreements with HCFC exporting countries and informal PIC (iPIC) system
- Introduction to HCFC regulations in other countries in the region
- Use of refrigerant and blends identifiers

The customs training manuals developed during CFC phase-out will be updated, building upon other similar recent efforts in the region.

The costs for this sub-component are as below:

<b>Cost Component</b>	<b>Funding Request (US\$)</b>
<b>Technician Training</b>	
Training workshops for Master Trainers	15,000
Training workshops for Technicians	30,000
Technical experts	15,000
Documentation and training materials	5,000
<b>Enforcement Officials Training</b>	
Training workshops for enforcement officials	30,000
Technical experts	15,000
Documentation and materials	5,000
Refrigerant Identifiers (20)	50,000
<b>Total</b>	<b>165,000</b>

### **Sub-component 3: Pilot retrofitting/replacement program for end-users**

Based on experience gained during CFC phase-out programs, the actual reduction in ODS consumption in the servicing sector occurs when end-users retire, retrofit or replace ODS-based refrigeration systems. Due to the high investment costs encountered in replacing refrigeration and air conditioning systems, there is a tendency to extend the economic life of the equipment and postpone replacement of equipment. Until HCFC-based equipment remains in service, it remains a source of HCFC consumption for servicing, with an additional potential penalty on energy-efficiency. Demonstration of retrofitting/replacement of air conditioning and refrigeration systems can provide an opportunity for showcasing HCFC reductions using benign and sustainable alternatives, as well as for achieving energy-efficiency gains. It is therefore proposed to carry out a pilot retrofitting/replacement demonstration programme using low-GWP alternatives and potential energy-efficiency gains.

For carrying out retrofitting and/or replacement demonstrations, it is proposed to select two representative users of HCFC-based equipment from each of the following:

- Typical Air Conditioning Sector end-use applications (air conditioning in apartment complexes and commercial air conditioning)
- Typical Refrigeration Sector end-use applications (cold storages and supermarkets)

The selected end-users will need to meet the following criteria:

- Should own and be a continuous operator of HCFC-based air conditioning or refrigeration equipment
- Should be in a stationary business at the particular location since establishment
- Should be financially viable and have competent technicians
- Should undertake to complete permanent retrofitting or replacement (as applicable) of the baseline HCFC-based air conditioning or refrigeration equipment and render inoperable, the replaced HCFC-based equipment (in case of replacement)
- Should undertake to provide free access to the retrofitted/replaced equipment to DOE/UNDP for demonstration or similar information dissemination activities, for at least 3 years.

DOE and UNDP will carry out the qualification and selection of end users for participating in this pilot program. The selected end users would then enter into a binding agreement with the DOE, incorporating appropriate legal, technical and operational provisions. Each end user would be provided financial assistance covering retrofitting/replacement costs of up to US\$ 15,000 against satisfactory completion of conversion and satisfactory documentation justifying the costs. Any balance funds would be applied towards creating additional such demonstration end users, until exhausted. The expected outcomes of this pilot program would be:

- Availability of demonstration cases of successful retrofitting and replacement of HCFC-based air conditioning and refrigeration systems for information dissemination and awareness
- Confidence building in other end users
- Precipitating early retrofitting and/or replacement decisions at other end users
- Reducing HCFC demand for servicing of air conditioning and refrigeration equipment at end-users.

The costs of this sub-component are tabulated below:

<b>Cost Component</b>	<b>Funding Request (US\$)</b>
Pilot retrofitting/replacement (air conditioning)	30,000
Pilot retrofitting/replacement (refrigeration)	30,000
Technical workshops for retrofitting (2)	20,000
Technical experts	15,000
Documentation and materials	5,000
<b>Total</b>	<b>100,000</b>

## SUMMARY OF COSTS

The summary of costs and proposed funding for this component is as shown below:

<b>Cost Component</b>	<b>Funding Request (US\$)</b>
Sustainable refrigerant management (recovery/reclamation)	450,000
Training and capacity-building (technicians/enforcement)	165,000
Pilot retrofitting/replacement program	100,000
<b>Total</b>	<b>715,000</b>

## IMPLEMENTATION

This component will be implemented as a part of the overall HPMP (Stage-I) for Malaysia. The Department of Environment (DOE) will coordinate the implementation. UNDP is the designated implementing agency for the HPMP and this component. More details on implementation and management arrangements are provided in the Overarching HPMP Stage-I document.



**MALAYSIA HPMP (STAGE-I) FOR 2013 AND 2015 COMPLIANCE**

**ANNEX-III**

**TECHNICAL ASSISTANCE FOR THE AIR CONDITIONING AND  
REFRIGERATION (MANUFACTURING) SECTORS**

## **MALAYSIA HCFC PHASE-OUT MANAGEMENT PLAN STAGE-I TECHNICAL ASSISTANCE FOR THE AIR CONDITIONING AND REFRIGERATION (MANUFACTURING) SECTORS**

### **INTRODUCTION**

This component of the Malaysia HPMP (Stage-I) for compliance with the 2013 and 2015 control targets, comprises of technical assistance to the Air Conditioning and Refrigeration (Manufacturing) Sectors.

### **SECTOR BACKGROUND**

Malaysia is one of the manufacturing hubs in Southeast Asia for Air Conditioning and Refrigeration equipment, with over 60% of the production exported. The total HCFC consumption in manufacturing in the Air Conditioning and Refrigeration sectors in Malaysia was 2,245 metric tonnes in 2009. The predominant substance was HCFC-22 followed by smaller quantities of HCFC-123. The Air Conditioning Sector with HCFC consumption of 1,915 metric tonnes was dominant.

There are several multinational and joint-venture enterprises (about 10), which lead the market. There are also a sizeable number of locally-owned enterprises (about 50).

Given the rapidly increasing population of air conditioning and refrigeration equipment, considering that these two sectors are not prioritized for Stage-I, and considering the need to control HCFC consumption in order to meet the 2013 and 2015 compliance targets and the related regulations that would come into effect in 2013 and 2015, it is considered necessary to provide technical assistance to locally manufacturing enterprises to ensure that they are adequately supported in terms of managing HCFC and non-HCFC technologies.

### **PROJECT DESCRIPTION**

Alternative technologies in the manufacturing of Air Conditioning and Refrigeration equipment especially those suited to SMEs and which meet all the ideal selection criteria, are not commercialized fully. Many low-GWP technologies are in various stages of maturity and commercial introduction in the medium-term.

It is therefore considered important for the industry to keep abreast of the latest technological developments, share information and exchange experiences with alternatives and document positive results for wider acceptance. This will be carried out through five technical assistance workshops (one annually) throughout the implementation period of the HPMP. This will ensure engagement of these enterprises in the HCFC phase-out efforts. In addition, alternative technology and best practice technical information would be disseminated through technical fact sheets and other information materials. This is expected to enable the locally-owned manufacturers of air conditioning and refrigeration equipment, to be prepared for cost-effective conversion to such technologies in the HPMP Stage-II. This component is considered critical because it takes 3-4 years to stabilize a technology and ensure cost-effectiveness and market acceptance.

## COSTS

The summary of costs and proposed funding for this component is as shown below:

<b>Cost Component</b>	<b>Funding Request (US\$)</b>
Stakeholder workshops (5)	50,000
Documentation and materials	10,000
Technical experts	30,000
<b>Total</b>	<b>90,000</b>

## IMPLEMENTATION

This component will be implemented as a part of the overall HPMP (Stage-I) for Malaysia. The Department of Environment (DOE) will coordinate the implementation. UNDP is the designated implementing agency for the HPMP and this component. More details on implementation and management arrangements are provided in the Overarching HPMP Stage-I document.

## ANNEX V: UNDP ANNUAL WORK PLAN MONITORING TOOL

Together with project issue/ risk logs, the following AWP Monitoring Tool should be used for the project review purpose.

**Expected Outputs and Indicators:** List all CP outputs and indicators, including annual targets

**Planned Activities:** List all the activities including monitoring and evaluation activities, including evaluations, field monitoring visits, technical backstopping missions, and audits to be undertaken during the year towards stated CP outputs

**Expenditures:** List actual expenditures against activities complete

**Results of Activities:** For each activity, state the results of the activity

**Progress towards Achieving CP Outputs:** Using data on annual indicator targets, state progress towards achieving the CP outputs. Based on the updated project issue/risk logs, comment on factors that facilitated and/or constrained achievement of results including:

- Whether risks and assumptions as identified in the CP M&E Framework materialized or whether new risks emerge
- Internal factors such as timing of inputs and activities, quality of products and services, coordination and/or other management issues

The Annual Work Plan (AWP) Monitoring Tool

Year \_\_\_\_\_

CP Component \_\_\_\_\_

Implementing Partner \_\_\_\_\_

<b>EXPECTED OUTPUTS AND INDICATORS</b> including annual targets	<b>PLANNED ACTIVITIES</b> <i>List all the activities including monitoring and evaluation activities to be undertaken during the year towards stated CP outputs</i>	<i>EXPENDITURES</i> <i>List actual expenditures against activities completed</i>	<b>RESULTS OF ACTIVITIES</b> <i>For each activity, state the results of the activity</i>	<b>PROGRESS TOWARDS ACHIEVING OUTPUTS</b> Using data on annual indicator targets, state progress towards achieving the CP outputs. Where relevant, comment on factors that facilitated and/or constrained achievement of results including: <ul style="list-style-type: none"> <li>▪ <i>Whether risks and assumptions as identified in the CP M&amp;E Framework materialized or whether new risks emerged</i></li> <li>▪ <i>Internal factors such as timing of inputs and activities, quality of products and services, coordination and/or other management issues</i></li> </ul>
<b>OUTPUT 1:</b>				
<b>INDICATOR 1.1 WITH TARGET FOR THE</b>				

<b>YEAR:</b>				
<b>INDICATOR 1.2 WITH TARGET FOR THE YEAR:</b>				
<b>INDICATOR 1.3 WITH TARGET FOR THE YEAR:</b>				
<b>OUTPUT 2:</b>				
<b>INDICATOR 2.1 WITH TARGET FOR THE YEAR:</b>				
<b>ETC.</b>				

## ANNEX VI: Project Annual Report Template

**DATE:**

**Award ID:**

**Description:**

**Implementing Partner:**

**Period Covered:**

### 1. Project Issues:

Status of Project Risks:	Open Project Issues:
--------------------------	----------------------

### 2. Project Performance

<b>OUTPUT 1:</b>						
ID						
Description:						
YYYY target:						
YYYY Achievement:						
<b>Activity ID:</b>						
Deliverable Description:						
Start and End Date:						
% Progress to date						
Quality Criteria		Date	Results of Activities			
			User Perspective	Resource Status	Timeliness	
Financial						
Account	Fund	Donor	R. Party	Budget	Expenditure	Balance
<b>OUTPUT 2:</b>						
Project ID						
Description:						
YYYY Target:						
YYYY Achievement						
<b>Activity ID:</b>						
Deliverable Description:						
Start and End Date:						
% Progress to date						
Quality Criteria		Date	Results of Activities			
			User Perspective	Resource Status	Timeliness	
Financial Summary						
Account	Fund	Donor	R. Party	Budget	Expenditure	Balance

### 3. Lessons Learned

--

# ANNEX VII: FACE FORM

## Funding Authorization and Certificate of Expenditures

UN Agency: XXXXXXXXXX

Date: DD/MM/YYYY

Country: XXXXXXXXXXXXXXXXXXXXXXXXXXXX  
 Programme Code & Title: XXXXXXXXXXXXXXXXXXXXXXXXXXXX  
 Project Code & Title: XXXXXXXXXXXXXXXXXXXXXXXXXXXX  
 Responsible Officer(s): XXXXXXXXXXXXXXXXXXXXXXXXXXXX  
 Implementing Partner: XXXXXXXXXXXXXXXXXXXXXXXXXXXX

**Type of Request:**  
 Direct Cash Transfer (DCT)  
 Reimbursement  
 Direct Payment

Currency: \_\_\_\_\_

		REPORTING				REQUESTS / AUTHORIZATIONS		
Activity Description from AWP with Duration	Coding for UNDP, UNFPA and WFP	Authorised Amount	Actual Project Expenditure	Expenditures accepted by Agency	Balance	New Request Period & Amount	Authorised Amount	Outstanding Authorised Amount
		MM-MM YYYY A	B	C	D = A - C	MM-MM YYYY E	F	G = D + F
XXXXXXXXXXXXXXXXXXXXXXXXXXXX (MM/YYYY - MM/YYYY)								
XXXXXXXXXXXXXXXXXXXXXXXXXXXX (MM/YYYY - MM/YYYY)								
XXXXXXXXXXXXXXXXXXXXXXXXXXXX (MM/YYYY - MM/YYYY)								
<b>Total</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

### CERTIFICATION

The undersigned authorized officer of the above-mentioned implementing institution hereby certifies that:

- The funding request shown above represents estimated expenditures as per AWP and itemized cost estimates attached.
- The actual expenditures for the period stated herein has been disbursed in accordance with the AWP and request with itemized cost estimates. The detailed accounting documents for these expenditures can be made available for examination, when required, for the period of five years from the date of the provision of funds.

Date Submitted: \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_

**NOTES:** \* Shaded areas to be completed by the UN Agency and non-shaded areas to be completed by the counterpart.

### FOR AGENCY USE ONLY:

FOR ALL AGENCIES
Approved by: _____
Name: _____
Title: _____
Date: _____

### FOR UNICEF USE ONLY

Account Charges		Liquidation Information	
Cash Transfer Reference: <u>CRQ ref. no., Voucher ref. no.</u>		DCT Reference: <u>CRQ ref. no., Liquidation ref. no.</u>	
GL codes:		DCT Amount	0
Training	0	Less:	
Travel	0	Liquidation	
Meetings & Conferences	0	Amount	0
Other Cash Transfers	0		
<b>Total</b>	<b>0</b>	<b>Balance</b>	<b>0</b>

### FOR UNFPA USE ONLY

New Funding Release	
Activity 1	0
Activity 2	0
<b>Total</b>	<b>0</b>

## ANNEX VIII: Letter of Agreement for the Provision of Support Service



**DEPARTMENT OF ENVIRONMENT**  
MINISTRY OF NATURAL RESOURCES & ENVIRONMENT  
LEVEL 1-4, PODIUM 2-3, WISMA SUMBER ASLI  
NO. 25, PERSIARAN PERDANA, PRECINCT 4  
62574 W. P. PUTRAJAYA, MALAYSIA

Website : <http://www.doe.gov.my/>

Tel : 03-8871 2000  
Fax : 03-8888 9987 / 8889 1040 (Administrative)  
03-8889 1978 (Finance)  
03-8888 6120 (Hazardous Substances)  
03-8889 1042 (Strategic Communication)  
03-8889 1045 (Environmental Assessment)  
03-8888 4070 (Marine & Water)  
03-8888 0067 (Enforcement)  
03-8888 9964 (Information Technology)  
03-8888 4151 (Air)



CERTIFIED MS ISO 9001:2008 CERTIFICATE NO. AR 5141  
"Environmental Conservation, Our Shared Responsibility"

AS 91/120/004/002 Jld 12

( )  
9 March 2012

Mr. Kevin Hor  
Programme Manager  
United Nations Development Programme (UNDP)  
Wisma UN, Block C, Kompleks Pejabat Damansara  
Jalan Dungun, Damansara Heights  
50490, KUALA LUMPUR

Dear Sir,

**SUPPORT SERVICES PROVIDED BY THE UNITED NATIONS DEVELOPMENT PROGRAMME (UNDP) COUNTRY OFFICE FOR THE IMPLEMENTATION OF HCFC PHASE-OUT MANAGEMENT PLAN (HPMP) STAGE 1 (2011-2015)**

With reference to the above matters, we wish to express our gratitude for the support services rendered by the UNDP country office for the implementation of HCFC Phase-out Management Plan (HPMP) Stage 1 (2011-2015) as stipulated in the Attachment.

2. Your continuous support on this matter is greatly appreciated.

Thank you and best regards.

Yours sincerely,

(HAJAH KALSOM ABDUL GHANI)  
for the Director General of Environment  
Malaysia



## DESCRIPTION OF UNDP COUNTRY OFFICE SUPPORT SERVICES

1. Reference is made to consultations between The Ozone Unit, Department of Environment, Ministry of Natural Resources and Environment, the institution designated by the Government of Malaysia and officials of UNDP with respect to the provision of support services by the UNDP country office for the nationally managed project HCFC Phase-out Management Plan (HPMP) Stage-I for compliance with the 2013 and 2015 control targets for Annex-C, Group-I substances (HCFCs) in Malaysia (MLF Project Numbers: MAL/PHA/65/TAS/168, MAL/PHA/65/INV/169, MAL/PHA/65/TAS/170)
2. In accordance with the provisions of the letter of agreement signed between UNDP and the Economic Planning Unit on the 6 December 2001 and the HCFC Phase-out Management Plan (HPMP) the UNDP country office shall provide support services for the HCFC Phase-out Management Plan (HPMP) Stage-I Project as described below.
3. Support services to be provided:

Support services (insert description)	Schedule for the provision of the support services	Cost to UNDP of providing such support services (where appropriate)	Amount and method of reimbursement of UNDP (where appropriate)
1. Recruitment of project staff	As per AWP	As per UPL	ATLAS Billing
2. Recruitment of consultants	As per AWP	As per UPL	ATLAS Billing
3. Purchase of IT equipment	As per AWP	As per UPL	ATLAS Billing
4. Purchase of travel tickets as and when necessary	As per AWP	As per UPL	ATLAS Billing

4. UNDP CO will provide the services as per stated above upon the request of the implementing partner.



UNIT PERANCANG EKONOMI  
Economic Planning Unit  
JABATAN PERDANA MENTERI  
Prime Minister's Department  
BLOK B5 & B6,  
PUSAT PENTADBIRAN KERAJAAN PERSEKUTUAN  
62502 PUTRAJAYA,  
MALAYSIA

Telefon: 88883333  
Fax:

Ruj. Tuan:  
Your Ref:

Ruj. Kami:  
Our Ref: (2) JUPE801/100/299

Tarikh:  
Date: 13 December 2001

**BY FAX: (03)2552870 / BY HAND**

Resident Representative  
United Nations Development Programme  
Wisma UN  
Blok C Komplek Pejabat Damansara  
Jalan Dungun  
Damansara Heights  
50490 KUALA LUMPUR

REC'D: 26 DEC 2001	
RR	✓ MWO
DRR	
ADMIN	✓ to send HR
FINANCE	
GEN. SVU	
PROG. 1	
PROG. 2	
PROG. 3	
PROG. GEN / NEX	

Dear Madam,

**Letter of Agreement Between UNDP and the Government For the Provision of Support Services under National Execution**

Reference is made to your letter dated 26 October 2001 on the above subject.

2. We are pleased to attach herewith two (2) copies of the duly signed letter of agreement for your further action.

Thank you.

Yours sincerely,

(Patricia Chia Yoon Moi)  
for Director General  
Economic Planning Unit



Dear Sir,

1. Reference is made to consultations between officials of the Government of Malaysia (hereinafter referred to as “the Government”) and officials of UNDP with respect to the provision of support services by the UNDP country office for nationally executed programmes or projects. UNDP and the Government hereby agree that the UNDP country office may provide such support services at the request of the Government through its Executing Agent designated in the relevant project document, as described below.

2. The UNDP country office may provide support services for execution activities, such as assistance with reporting requirements and direct payment. In providing such support services, the UNDP country office shall ensure that the capacity of the Executing Agent is strengthened to enable it to carry out such activities directly. The costs incurred by the UNDP country office in providing such support services shall be recovered from the cost-sharing component of the project where applicable.

3. In addition, the UNDP country office may provide, at the request of the Executing Agent, the following support services for implementation activities:

- (a) Identification and assistance with and/or recruitment of project and programme personnel;
- (b) Identification and facilitation of training activities, including fellowship, short-term training and study tours;
- (c) Procurement of goods and services; and

4. The procurement of goods and services and the recruitment of project and programme personnel by the UNDP country office shall be in accordance with the UNDP regulations, rules, policies and procedures. Support services described in paragraph 3 above shall be detailed in an annex to the project document, in the form provided in Attachment hereto. If the requirements for support services by the country office change during the life of a programme or project, the annex to the project document is revised with the mutual agreement of the UNDP Resident Representative and the Executing Agent.

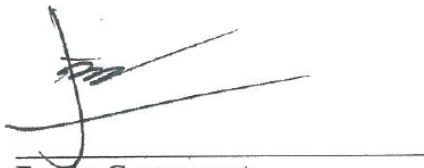
5. The relevant provisions under Article VIII of the Agreement between United Nations Special Fund and the Government of the Federation of Malaya concerning assistance from the Special Fund dated 25 July 1961, regarding facilities, and privileges and immunities, shall apply to the provision of such support services. The Government shall retain overall responsibility for the nationally executed programme or project through its designated Executing Agent. The responsibility of the UNDP country office for the provision of the support services described herein shall be limited to the provision of such support services detailed in the annex to the project document.

6. Any claim or dispute arising under or in connection with the provision of support services by the UNDP country office in accordance with this letter shall be handled pursuant to the relevant provisions under Article IX of the Special Fund Agreement.
7. The manner and method of cost recovery by the UNDP country office in providing the support services described in paragraph 3 above shall be specified in the annex to the project document.
8. The UNDP country office shall submit progress reports on the support services provided and shall report on the costs reimbursed in providing such services, as may be required.
9. Any modification of the present arrangements shall be effected by mutual written agreement of the parties hereto.
10. If you are in agreement with the provisions set forth above, please sign and return to this Office two signed copies of this letter. Upon your signature, this letter shall constitute an agreement between your Government and UNDP on the terms and conditions for the provision of support services by the UNDP country office for nationally executed programmes and projects.

Yours sincerely,



Signed on behalf of UNDP  
Maxine Olson  
Resident Representative



For the Government  
Name/title **Dato' Iskandar Dzakurnain b. Badarudin**  
Date **Director General**  
**Economic Planning Unit**  
**Prime Minister's Department**

**6 DEC 2001**

## **ANNEX IX : TERMS OF REFERENCE: National Steering Committee (NSC)**

*The National Steering Committee (NSC) will monitor the conduct of the project and provide strategic guidance to the project team on the implementation of the project. The NSC will be chaired by the Secretary General or Deputy Secretary General of Ministry of Natural Resource and Environment (MNRE) or someone assigned by the Secretary General.*

The Ministry of Natural Resource and Environment will act as Secretariat to the NSC. Members of the NSC will consist of representatives from Ministry of Finance, Ministry of Foreign Affairs, Ministry of Internal Trade and Consumers Affairs, Ministry of Energy, Green Technology and Water, Ministry of Agriculture, Economic Planning Unit, Ministry of International Trade and Industry, Malaysian Investment Development Authority, Customs Department, Statistic Department, Fire and Rescue Department, DOE, NGO and other relevant stakeholders

*The NSC will meet after the receipt of each project report or at least twice a year, whichever greater. The NSC will have the following duties and responsibilities:*

- Provide policy guidance on matters pertaining to the implementation of the project;
- Monitor and evaluate the implementation of the project towards fulfilment of the objectives stated in the project document;
- Review, approve and endorse proposed work plan and budget;
- Initiate remedial actions to overcome all constraints in progress of the project;
- Review and approve relevant changes to the project design;
- Coordinate the roles of the various organizations involved in the execution of the project and ensure harmony with related activities;
- Advice on the long term sustainability strategy of the project;
- Review and approve all related reports to the projects.