HCFC PHASE-OUT MANAGEMENT PLAN
STAGE-I

सत्यमेव जयते

OZONE CELL
MINISTRY OF ENVIRONMENT AND FORESTS
GOVERNMENT OF INDIA
NEW DELHI, INDIA
2013

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FOREWORD

The Montreal Protocol on Substances that Deplete the Ozone Layer has been recognized as the most successful international environment treaty in history. The Protocol is in operation since 1987 with an extraordinary international cooperation. As of January 1, 2010, production and consumption of several major Ozone Depleting Substances (ODS) such as Chlorofluorocarbons (CFCs), Carbon tetrachloride (CTC) and halons have been phased-out globally except some essential and critical uses. The Protocol has been universally ratified and year 2012 marked its 25th Anniversary.

Acknowledgement by the developed countries of their historic responsibility for production, consumption and emissions of ODS leading to the ozone hole has been one of the key factors in success of the Montreal Protocol. At the same time, the developing countries also took on commitments for phasing out production and consumption of ODS with a 10-year grace period. A robust and transparent mechanism was created under the Protocol for providing technical and financial assistance to assist developing countries meet their obligations. Recognition of such common but differentiated responsibilities as in case of the Montreal Protocol, can now serve as an example of excellent international cooperation for addressing other environmental challenges.

India being a Party to the Montreal Protocol and all its amendments has been successfully implementing the Country Program. It has set up well established regulatory and fiscal measures in the country and has also accessed the Montreal Protocol's financial mechanism for this purpose. As a result India has successfully fulfilled all its commitments to the Protocol.

The transition from HCFCs to environment-friendly, technically proven and economically viable alternatives is a challenging task particularly for a developing country like India which needs to achieve its development goals in an environmentally sustainable manner.

India is amongst the first countries to prepare and launch a roadmap for phase-out of HCFCs. The HCFC phase-out Management Plan (HPMP) Stage-I was prepared under the guidance of Ozone Cell, MoEF by UNDP as lead implementing agency in association with UNEP and GIZ in consultation with stakeholders including line Ministries, industry, industry associations, NGOs. The HPMP Stage-I envisages freeze in production and consumption of HCFCs at the baseline level in 2013 and first reduction target of 10% in 2015. The phase-out of HCFCs in HPMP Stage-I will be addressed through several technology conversions at a number of enterprises in the polyurethane foam sector and some activities in the Refrigeration and Air-Conditioning (RAC) servicing sector. In addition, some targeted policy and regulatory actions and awareness programs will also be implemented during the HPMP Stage-I to ensure phase-out of HCFCs on time and sustainable.

It gives me great pleasure to dedicate the HPMP Stage-I to the global cause of reduction of use of ODS and saving the Planet.

(V. RAJAGOPALAN)

जहाँ है हरियाली।
वहाँ है खुशहाली।।

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LIST OF ABBREVIATIONS

CFC	Chloro Fluoro Carbons
CP	Country Programme
CTC	Carbon Tetra Chloride
ExCom	Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol
GIZ	Gesellschaft für Internationale Zusammenarbeit, Germany
GWP	Global Warming Potential
HCFCs	Hydrochlorofluorocarbons
HPMP	Hydrochlorofluorocarbons Phase-out Management Plant
HFCs	Hydrofluorocarbons
IA	Implementing Agency
IPUA	Indian Polyurethane Association
MAC	Mobile Air Conditioning
MLF	Multilateral Fund for the Implementation of the Montreal Protocol
MoEF	Ministry of Environment and Forests
MOP	Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer
MP	Montreal Protocol
MT	Metric Tonnes
ODP	Ozone Depleting Potential
ODSs	Ozone Depleting Substances
R&R	Recovery and Recycling
RAMA	Refrigeration and Air-conditioning Manufacturers Association
REGMA	Refrigerant Gas Manufacturers Association
SMEs	Small and Medium-sized Enterprises
TEAP	Technology and Economic Assessment Panel of the Montreal Protocol
TR	Tons of Refrigeration
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization

EXECUTIVE SUMMARY

India acceded to the Vienna Convention in 1991 and ratified the Montreal Protocol on Substances that deplete the Ozone Layer in 1992. As of March 2003, India has ratified all the amendments to the Montreal Protocol. India 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.

India's Country Programme incorporating the National Strategy and Action Plan for controlling the use of ODSs was approved in 1993. Since then India 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. India has established a comprehensive regulatory framework for controlling ODS. As a result, India 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 and subsequent reduction steps leading to 97.5% phase-out by 2030 and complete phase-out by 2040.

HCFCs are used in India in various industry sectors, such as Air Conditioning, Refrigeration, Foams, Firefighting and Solvents. The overall HCFC consumption in India increased from 3,792 MT in 1994 to 21,863 MT in 2010, indicating an average annual growth rate of about 11.57%. In the past five years (2006 to 2010), the overall HCFC consumption in India has grown from 8,912 MT to 21,863 MT, signifying an average compounded annual growth rate of 19.7%. 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 key 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.

HCFC Consumption Baseline

The calculated HCFC consumption baseline for India is 1,608.2 ODP tonnes, being the average of HCFC consumption for 2009 and 2010.

Phase-out Targets

The successful implementation of the HPMP (Stage-I) for India 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 308.78 ODP tonnes of HCFC consumption will need to be accomplished taking into account the growth in HCFC consumption in sectors and sub-sectors that are unaddressed during Stage-I. This phase-out needs 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 several technology conversions in the Polyurethane Foams Sector. In addition, actions to limit the growth of HCFC consumption in the Servicing Sector will need to be implemented. 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.

Funding

The summary of approved funding for India's HPMP Stage-I, for meeting the 2013 and 2015 control targets is tabulated below:

Component	Agency	Phase-out (tonnes)		Funding (US$)
		Metric	ODP	
Project Management Components	UNDP	N/A	N/A	1,020,000
Polyurethane Foams Sector Plan	UNDP	2,523.09	277.54	17,418,490
Servicing Sector Plan	Germany	443.20	24.38	1,994,400
	UNEP	124.80	6.86	561,600
Enabling Activities	UNEP	N/A	N/A	300,000
Total		**3,091.09**	**308.78**	**21,294,490**

Note: All amounts rounded off to the nearest US$ 1.00 and do not include agency fees

Impact

Upon successful completion, the India HPMP (Stage-I) will result in sustainable reductions of 160.82 ODP tonnes of HCFC consumption from the baseline by 2015, contributing to India'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 CO2-equivalent emission reductions of about 2.42 MT annually from 2015.

INTRODUCTION

1. INTRODUCTION

1.1 OBJECTIVES

The objectives of India's HPMP (Stage-I) are:

- To facilitate India's compliance with the Montreal Protocol control targets for consumption of Annex-C, Group-I substances (HCFCs) for 2013 and 2015, with minimal impacts on the national economy, on environment and on occupational health; and
- To implement a combination of interventions such as technology transfer investments, policy and regulatory actions, technical assistance, training and capacity-building, awareness and education and monitoring and management in selected HCFC consuming sectors, contributing to achieve sustainable reductions in consumption of Annex-C, Group-I substances (HCFCs).

1.2 BACKGROUND

1.2.1 Country profile

India is located in South Asia bordering Bangladesh, Bhutan, China, Myanmar, Nepal and Pakistan. The country has a coastline of about 7,000 km and total area of 3.29 million sq. km (seventh largest in the world). The 2010 population was about 1.19 billion persons (second largest in the world) and the population density is about 364 persons per sq. km, where urban population currently represents around 30% of the total population. India's estimated GDP per capita was US$ 3,500 (2010). The agricultural sector accounts for 19% of GDP, the industry for 26.3% and the services sector for 54.7% (2010). India has experienced an economic growth of about 6-10% annually for the past decade, thus making it one of the top five fastest growing economies in the world.

1.2.2 ODS phase-out activities in India

The dates of accession by India of the Montreal Protocol and its amendments were:

Table-1: Dates of Accession to Montreal Protocol and Amendments

Agreement/Amendment	Ratification
Vienna Convention	18 March 1991
Montreal Protocol	19 June 1992
London Amendment	19 June 1992
Copenhagen Amendment	3 March 2003
Montreal Amendment	3 March 2003
Beijing Amendment	3 March 2003

India's Country Programme for phase-out of ODSs under the Montreal Protocol was finalized in August 1993 with the assistance of UNDP, The Energy and Resources Institute (TERI) and representatives of various ministries, industries and scientific institutions.

India's Country Programme was submitted to and approved at the 11th Meeting of the ExCom, in November 1993. The key principles underlying India's Country Programme were:

- To implement phase-out of ODS without adversely affecting industrial and economic growth in the ODS consuming sectors, while protecting consumer and public interests
- To meet the demand for substitutes for ODSs, as far as possible from indigenous sources
- To reflect India's commitment to achieve compliance with the Montreal Protocol obligations, despite the barriers and problems India would face in the implementation of the Protocol

India's Country Programme implementation was contingent upon availability of adequate technical and financial assistance for mitigating the incremental costs of ODS phase-out. The Country Programme was also intended to be a dynamic document and was to be reviewed and updated at an appropriate time to reflect the status of its implementation.

India requested funding for the preparation of their Country Programme Update under the Montreal Protocol, which was approved at the 36th Meeting of the ExCom in March 2002, with UNDP as the implementing agency. India's Country Programme Update was approved at the 49th Meeting of the ExCom in July 2006.

Since the approval of the original Country Programme for Phase-out of ODSs in 1993, India has made significant progress in controlling the production and consumption of ODS. The Country Programme forecasted an unconstrained demand for ODS of 96,000 MT by 2005, from a level of 10,370 MT in 1991. By 2005, the actual demand was only about 9,000 MT. This was accomplished with technical and financial assistance from the Multilateral Fund, support from implementing and bilateral agencies and due to proactive policy and regulatory actions by Government of India for implementing phase-out activities in various sectors. Table-2 below summarizes the MLF-supported ODS phase-out activities in India from 1993 until 2010.

Table-2: MLF-supported ODS phase-out activities in India until 2010

Sector	Number of Projects	Funding (US$)	Phase-out (ODP tonnes)
Aerosols Sector	38	13,705,006	1,702
Foams Sector	163	37,880,185	5,074
Firefighting Sector (halons)	21	5,176,701	2,719
Institutional Strengthening	8	2,738,166	31
Refrigeration & Air Conditioning Sector	87	31,827,256	3,983
Solvents Sector (includes CTC production)	41	61,358,042	12,966
Production Sector (CFC and halons)	15	84,228,000	20,107
Total	**373**	**236,913,356**	**46,582**

Source: MLF Secretariat – Inventory of approved projects. *Note: HCFC-related activities are not included.*

Almost all of the above-mentioned projects and activities have been successfully completed, either on or ahead of schedule.

The signature achievements of the Montreal Protocol programme implementation in India have been as below:

- Enactment and enforcement of the Ozone Depleting Substances (Regulation and Control) Rules, which were notified in 2000 and represent one of the most comprehensive and forward-looking regulations on ODS among developing countries.
- The phase-out of consumption of CFCs, CTC and halons was accomplished ahead of the Montreal Protocol control schedule.
- The production of CFCs, halons and CTC for controlled uses was ceased two years ahead of the Montreal Protocol control schedule.

1.2.3 Accelerated HCFC Phase-out

HCFCs, which have ODP up to 15% of that of CFCs, are also classified as controlled substances under Annex-C, Group-I of the Montreal Protocol. HCFCs therefore 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.

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. 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 GWP of HCFCs, their increased use was also a potential threat to the global climate system.

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 January 1 2040. The decision confirmed stable and sufficient funding for Article-5 countries to meet these new obligations.

1.2.4 HCFC Survey in India (2005-2007)

The ExCom approved at its 45th 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. India 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 India 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 India's HCFC consumption increased from 3,792 MT in 1994 to 11,027 MT in 2005, signifying a compounded annual growth rate of about 10.2%. HCFC-22 and HCFC-

141b were the two main HCFCs consumed in the country. HCFC-141b was used as a blowing agent in manufacturing of polyurethane and other foams. HCFC-22 was 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, it was estimated that unconstrained consumption of HCFCs in India would reach about 27,103 MT in 2015. This was expected to lead to additional environmental impacts on ozone depletion as well as on global warming due to the ODP and high GWP 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 XIX/6 of the Meeting of the Parties to the Montreal Protocol, referred above, also requested the ExCom to assist Article-5 Parties for preparing and implementing HPMP, to facilitate their compliance with the accelerated control targets.

The 54th Meeting of the ExCom 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.

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

HPMP PREPARATION IN INDIA

2. HPMP PREPARATION IN INDIA

2.1 HPMP PREPARATION FUNDING

In order to assist India for the preparation of its HPMP (Stage-I) for compliance with the 2013/2015 targets, UNDP, on behalf of India, submitted a request for preparation funding to the 56th meeting of the ExCom in November 2008 for the overarching HPMP strategy and preparation of sector-level activities for achieving Stage-I compliance targets. The total funding approved was US$ 573,750. The funds approved for each agency in preparation of India's HPMP is shown below:

Sector	Agency	Funding (US$)
Overarching Strategy	UNDP	113,750
All consumption sectors (except Transport Refrigeration and Air Conditioning)	UNDP	330,000
Transport Refrigeration and Air Conditioning	UNIDO	70,000
Servicing Sector	GIZ	30,000
Enabling components (awareness and communication, enforcement training, etc)	UNEP	30,000
Total		**573,750**

2.2 ROLES OF IMPLEMENTING AND BILATERAL AGENCIES

The Government of India designated UNDP to be the lead agency for the preparation and implementation of the HPMP in India. UNEP, UNIDO, World Bank and GIZ were designated as the cooperating agencies. The allocation of sectors is as below:

Sector	Agency
Lead agency (including overall management, coordination and policy support)	UNDP
All consumption sectors (except Transport Refrigeration and Air Conditioning)	UNDP
Transport Refrigeration and Air Conditioning	UNIDO
Servicing Sector	Germany
Enabling components (awareness and communication, enforcement training, etc.)	UNEP
HCFC Production Sector	World Bank

2.3 ROADMAP FOR HCFC PHASE-OUT IN INDIA

The first ever national stakeholder consultation for HCFC phase-out after adoption of the MOP Decision XIX/6, was held in India as early as in June 2008, involving a wide spectrum of government and industry stakeholders, resulting in a comprehensive proposal from India for preparation funding for the HPMP Stage-I. Following the approval of the preparation funding for HPMP Stage-I in November 2008, and subsequent to further stakeholder consultations, a national stakeholder consultation workshop was arranged in September 2009, in which three Sectoral Working Groups were organized, for the

Foams, Refrigeration and Air Conditioning (Manufacturing) and Refrigeration and Air Conditioning (Servicing) sectors.

The key recommendations of the Sectoral Working Groups are summarized as below:

- Critical evaluation of techno-economically feasible and environment-friendly alternatives technologies
- Updating the HCFC survey carried out during 2005-2007 for establishing consumption profiles and trends in various sectors
- Prioritization of sectors, sub-sectors and applications based on feasible alternative technologies
- Designing forward-looking and targeted policies and regulations
- Enhanced, targeted and coordinated communications and awareness measures
- Adequate technical and financial assistance for supporting phase-out

In November 2009, a national workshop for launching the "Roadmap for Phase-out of HCFCs in India" was organized in New Delhi, India with participation from wide spectrum of industry and government stakeholders. The workshop was attended by more than 200 participants including high-level decision-makers from industry, government and many international participants, making it one of the largest of its kind in the region. The "Roadmap for Phase-out of HCFCs in India" was launched during this workshop, which identified key compliance challenges and opportunities in various sectors and a broad plan, mechanisms, milestones and timelines for actions for HCFC phase-out.

The workshop also served to raise awareness of India'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 start the development of a consensual and stakeholder-driven plan of action India's compliance with the accelerated control targets for HCFCs, particularly the Stage-I targets for 2013 and 2015.

2.4 GOVERNMENT-INDUSTRY PARTNERSHIP FOR HPMP PREPARATION

In order to ensure proactive involvement and ownership of HCFC phase-out by the industry, industry associations, namely, RAMA and IPUA, were involved in the HPMP preparation process, including the responsibility for carrying out sector-level surveys.

2.5 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 at national and sector level
- 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

2.5.1 Formation of the national team

Under the overall supervision and guidance of Ozone Cell, Ministry of Environment and Forests, the national team included:

- Sectoral Working Groups for three main HCFC-consuming sectors, namely, Foams, Refrigeration and Air Conditioning (Manufacturing), and Refrigeration and Air Conditioning (Servicing) were responsible for providing inputs on industry structure, HCFC consumption trends, inputs for data collection and coverage during survey and inputs for HCFC phase-out strategy development for their respective sub-sectors.
- IPUA and RAMA which were responsible for providing sector strategy inputs for achieving HPMP Stage-I targets. They also had the responsibility for carrying out survey of the Foams and Refrigeration and Air Conditioning sectors respectively and for information out-reach at the sector-level.
- Implementing and bilateral agencies provided technical inputs, guidance for HPMP preparation process and policy inputs for HCFC phase-out.

2.5.2 Information dissemination and stakeholder interaction

In order to adequately inform the stakeholders of the challenges and opportunities in complying with the adjusted phase-out schedule for HCFCs, several workshops each were held in various locations in India. These workshops were organized with support from IPUA and RAMA for their respective sectors during 2010. The workshops were well-attended, with an outreach to over 300 enterprises.

These workshops served as a platform for both information outreach and exchanging information with participants on data collection process for preparation of HPMP and prevailing policy guidelines for HPMP. Inputs were provided by technical experts on industry trends and status of alternatives for various applications.

2.5.3 Data Collection

Appropriate questionnaires and formats for reporting information and data were developed with the assistance of implementing agencies. IPUA and RAMA were engaged by Ozone Cell for collecting data at sectoral/sub-sectoral level and for developing sector-level strategies and policy recommendations, for achieving reductions in HCFC consumption.

IPUA and RAMA engaged professional survey agencies for data collection at enterprise-level. While the survey coverage included all the large and medium-sized enterprises, HCFC consumption data from enterprises were obtained through a sample survey and inputs from industry experts, in such a way that at least 75% of the overall sector consumption was covered.

For the Transport Refrigeration and Air Conditioning sub-sector, UNIDO engaged a local technical consulting enterprise to carry out the survey. Enterprises involved in transport refrigeration and air conditioning including railways, marine refrigeration and truck refrigeration were surveyed to assess consumption pattern and trends in this sub-sector.

For the Refrigeration and Air Conditioning Servicing sector, demand was estimated based on inputs from technical and management personnel from Original Equipment Manufacturers (OEMs) in different sub-sectors and service demand assessment based on estimates for different product categories, their system failure rates statistics, refrigerant leak rates, number of occurrences during the product life cycle, topping-up of refrigerants etc. Data for servicing sector was also collected through questionnaire from select set of respondents from servicing enterprises in the field.

Sector-level data was also collected from upstream suppliers of chemicals through telephone, meetings and on-site visits. Inputs from producers, select importers of HCFC and industry experts were obtained for getting supplementary information on HCFC consumption trends in different sub-sectors and end-users.

At the national level, data reconciliation was carried out through interactions with Customs, Ministry of Commerce and Industry, Directorate General of Foreign Trade (DGFT) and Directorate General of Commercial Intelligence and Statistics (DGCIS).

2.5.4 Data Analysis

The data analysis at the sector level included classification based on historical and present HCFC consumption by sub-sector and application, eligible and ineligible enterprises and their consumption, data on first and second conversions, projected growth trends until baseline and thereafter, required reductions in HCFC consumption for meeting the 2013 freeze and 2015 reductions and availability of deployable alternative technologies for each application.

2.5.5 Draft sectoral strategies

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

- Segregation of eligible and ineligible enterprises with their corresponding consumption levels.
- 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 2 years

The prioritized sub-sectors would aim for a complete phase-out, so as to enable targeted, effective and enforceable regulations without distorting the markets and 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.

2.5.6 Stakeholder Consultations and draft national strategy

As mentioned earlier, the stakeholders in industry and associations were periodically consulted for ensuring a transparent and participatory approach for developing the sector strategies. The national strategy was developed based on the outputs of this bottoms-up approach with the involvement of all stakeholder representatives.

2.5.7 Finalization of the HPMP (Stage-I) proposal

The draft national HPMP 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 the implementing agencies under the overall coordination of Ozone Cell, Ministry of Environment and Forests.

The time available for Article-5 parties including India, for meeting the 2013/2015 control targets was considered to be quite limited. It was estimated that there would be maximum of about 2 to 4 years beginning 2012, to implement activities leading to compliance with the 2013 and 2015 targets 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 India was submitted to for consideration at the 66th ExCom meeting in April 2012.

SITUATION ANALYSIS

3. SITUATION ANALYSIS

3.1 HCFC SUPPLY SCENARIO

3.1.1 Production

India produces only HCFC-22. All other HCFCs are imported. HCFC-22 is produced for both feedstock and non-feedstock (controlled) uses. There are five HCFC-22 producers, of which four are engaged in production for controlled uses. The annual production of HCFC-22 for controlled uses during 2006 to 2010 is tabulated below:

Table-3: India HCFC Production 2006-2010

Substance/Year	2006	2007	2008	2009	2010
HCFC-22 (MT)	29,639	40,214	41,057	46,586	40,669

Notes: Source - Article-7 data reporting. All figures rounded off to the nearest one metric tonne.

It may be noted that all the HCFC-22 production facilities are swing plants, which were capable of producing both CFCs and HCFC-22. Until 2007, the facilities produced both CFCs and HCFC-22. India ceased production of CFCs from 01 August 2008. Thus, production of HCFC-22 has increased from 2007 onwards, partly to serve the increased domestic demand, as well as to serve the export market. It may be also noted that as per current regulations in India, expansion of production facilities for controlled uses of HCFC-22 is prohibited.

3.1.2 Exports

India is a significant exporter of HCFC-22. In 2010, exports took place to about 46 countries, including developed countries such as Australia, UK and USA. The annual exports of HCFC-22 during 2006-2010 are tabulated below:

Table-4: India HCFC Exports 2006-2010

Substance/Year	2006	2007	2008	2009	2010
HCFC-22 (MT)	23,502	28,772	30,226	38,478	30,034

Notes: Source - Article-7 data reporting. All figures rounded off to the nearest one metric tonne.

The level of exports is sensitive to price as well as domestic demand for both feedstock and controlled uses, since the overall production capacity is fixed.

3.1.3 Imports

India imports its entire requirement of HCFC-141b, HCFC-142b, HCFC-123 and HCFC-124. In addition, limited quantities of HCFC-22 are also imported, although not every year and mainly as a component in blends.

The annual imports of HCFCs during 2006 to 2010 for controlled uses are shown in Table-5 below:

Table-5: India HCFC Imports 2006-2010

Substance/Year	2006	2007	2008	2009	2010
HCFC-123	20	27	101	238	115
HCFC-124	0	0	0	620	603
HCFC-141b	2,673	4,712	12,589	7,900	7,837
HCFC-142b	82	0	390	3,001	805
HCFC-22	0	2,135	0	1,280	1,868

Notes: Source - Article-7 data reporting. All figures in MT, rounded off to the nearest one metric tonne.

HCFC-124 and HCFC-142b are imported mainly as components of refrigerant blends and mixtures such as R-401A, R-406A, R-409A, etc.

3.1.4 Distribution

The distribution of HCFCs in the domestic market takes place primarily through distributors and retailers. The HCFC-22 producers (and importers in case of other HCFCs and blends) also supply directly to large users. HCFC-22 and other blends are subsequently sold through retailers and servicing establishments, including the dealer network of the OEMs.

In case of HCFC-141b, except for large users who import directly, the distribution is done by systems houses through pre-blending on polyols. In addition to the HCFC-141b quantities imported, as shown in Table-5 above, it is estimated that between 900 and 1,250 MT of HCFC-141b entered the market through imported pre-blended polyols.

3.2 HCFC CONSUMPTION

As mentioned in preceding sections, the overall HCFC consumption in India increased from 3,792 MT in 1994 to 21,863 MT in 2010, indicating an average annual growth rate of about 11.57%. In the past five years (2006 to 2010), the overall HCFC consumption in India has grown from 8,912 MT to 21,863 MT, signifying an average compounded annual growth rate of 19.7%. The main reasons for this growth are sustained economic development and resulting increase in demand and market penetration for consumer, commercial and industrial products that use HCFCs. India's calculated HCFC consumption during 2006 to 2010 is tabulated below:

Table-6: India Calculated HCFC Consumption 2006-2010

Substance/Year	2006	2007	2008	2009	2010
HCFC-123	20	27	101	238	115
HCFC-124	0	0	0	620	603
HCFC-141b	2,673	4,712	12,589	7,900	7,837
HCFC-142b	82	0	390	3,001	805
HCFC-22	6,137	13,577	10,831	9,388	12,503
Total	**8,912**	**18,316**	**23,911**	**21,147**	**21,863**

Note: All figures in MT, rounded off to the nearest one metric tonne.

It is seen that over the past five years, on a MT basis, India's overall calculated HCFC consumption has grown at a compounded annual rate of 19.7%. On the basis of ODP tonnes, the compounded annual growth rate has been about 22% over the same period.

Figure-1 below shows the distribution of calculated consumption for 2010, by substance.

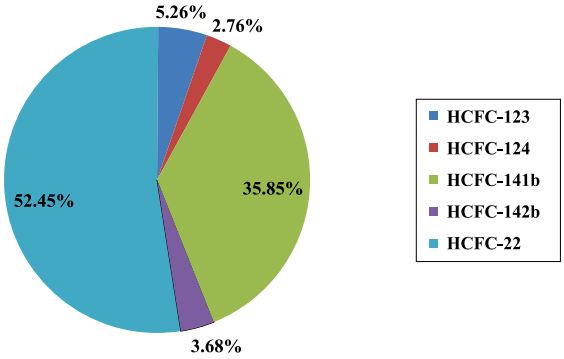

Figure-1: India 2010 Calculated HCFC Consumption by Substance

Based on data for 2010, HCFC-22 (52.45%) and HCFC-141b (35.85%) were the two predominantly used substances on a MT basis. The fluctuations in the consumption of two main substances in the past five years, namely HCFC-141b and HCFC-22, are ascribed to installation of new HCFC-based manufacturing capacities in the Foams and Air Conditioning sectors during 2006 to 2008. The slight downward trend in 2009 is ascribed to the global economic downturn. It may be also noted that in 2005, India's overall calculated HCFC consumption was 11,027 MT.

3.2.1 HCFC Uses

HCFCs and their blends are used as refrigerants, blowing agents, industrial propellants, solvents and cleaning agents and as fire suppressants. Table-7 below shows typical uses:

Table-7: HCFC Uses and Applications

Substance	Uses/Applications
HCFC-123	As a refrigerant in centrifugal chillers in new installations and servicing. Also used as a component of blends used in portable fire extinguishers
HCFC-124	As a component of refrigerant blends for industrial refrigeration applications (R-401A, R-409A) and also as component of blends used in flooded fire extinguishing systems
HCFC-141b	Mainly as a blowing agent in the manufacture of polyurethane and polyisocyanurate foams. Also used as a propellant in industrial aerosols and as a solvent and cleaning agent in specialized cleaning operations for precision metal, optical and electronic equipment
HCFC-142b	As a physical blowing agent in the manufacture of extruded polystyrene foams. Also used as a component of refrigerant blends (R-406A, R-409A) for industrial refrigeration applications
HCFC-22	Widely used a standalone refrigerant in air conditioning and medium-temperature refrigeration systems. Also used as a component of refrigerant blends (R-401A, R-406A, R-409A and R-415B)

3.2.2 Aerosols Sector

In the manufacturing of non-medical aerosols, Hydrocarbons are the preferred propellant technology. For medical aerosols, HFAs are the preferred propellant technology. However, HCFC-141b use as a component of formulated propellants was identified in the manufacture of aerosols used for industrial cleaning applications. The estimated use for HCFC-141b in 2009 for this application was about 80 MT.

3.2.3 Air Conditioning Sector

The Air Conditioning Sector is a large HCFC consuming sector, with the potential for significant future growth considering the low current market penetration of air-conditioners. India has a robust manufacturing base for air conditioning appliances and equipment. HCFC-22 is the predominant refrigerant, followed by HCFC-123. The Sector is classified into various sub-sectors as tabulated below:

Table-8: HCFC Consumption and Sub-sectors in the Air Conditioning Sector

Sub-sector	Estimated 2009 HCFC Consumption in Manufacturing (MT)
Room air-conditioners and non-ducted split air-conditioners	3,414
Packaged air-conditioners	696
Precision air conditioning	177
Industrial air conditioning and chillers	318
Transport air conditioning	12
Total	**4,617**

The HCFC-22 consumption in manufacturing in this sector is estimated at 4,527 MT in 2009. HCFC-123 consumption is estimated at 90 MT.

Room air-conditioners and non-ducted split air-conditioners

This sub-sector covers window air-conditioners and wall/ceiling mounted split air-conditioners, in the capacity range of 9,000 to 36,000 BTU/hr. The most commonly used configuration is of 18,000 BTU/hr capacity.

In 2009, about 2.65 million units were manufactured and 0.65 million units were imported in this sub-sector. There are about 66 small and large manufacturers in the sub-sector. Most of the large manufacturers are multinational or joint-venture enterprises. The top ten manufacturers account for over 80% of the manufacturing in the sub-sector. LG, Samsung and Voltas are the leading brands, followed by Japanese and US multinationals and other local manufacturers.

Due to rapid urbanization, expansion of residential facilities and support services, rising incomes and low market penetration, this sub-sector is experiencing spectacular growth averaging at about 25-30% annually in the past few years. The demand is projected to reach about 6 million units annually by 2013, about 8 million units by 2015 and about 15 million units by 2020 at the current overall rate of growth of the economy.

Packaged Air-conditioners

This sub-sector covers air-cooled and water-cooled ducted air-conditioning systems, typically in the capacity range of 36,000 BTU/hr up to 300,000 BTU/hr, with condensing units incorporating single or multiple compressors. The most commonly sold units are configured in capacities of 36,000 BTU/hr 120,000 BTU/hr. These units are typically used for light commercial and commercial air conditioning applications.

In 2009, about 60,000 units were manufactured in this sub-sector. There are over 20 mainly organized manufacturers in this sub-sector. Blue Star, LG, Voltas, Carrier, Hitachi and Lloyd are the currently prominent brands.

Due to the rapidly increasing demand for commercial infrastructure, the sub-sector is projected to grow at about 15% annually in the coming years. Several multinationals and local enterprises are planning to or are in the process of setting up or expanding manufacturing capacities in the near future, to cater to the growing demand.

Precision Air Conditioning

This sub-sector covers air conditioning equipment for temperature control of data centers, telecommunication relay/switching equipment, instrumentation and control rooms, etc. Due to the rapid growth in coverage of mobile telephony as well due to the expansion of back-office services provided by the IT industry, this particular sub-sector is significant and also specific to India. These units are characterized by high sensible heat ratio and high degree of reliability and automation, thus incorporate the required redundancies in their design and operation.

In 2009, about 35,000 units were manufactured. There are about fifteen medium and large manufacturers in the sub-sector.

The sub-sector experienced spectacular growth in the past several years of over 30% annually. However, in the future, due to design evolution in the telecommunications industry and increasing scale of IT applications, the demand is expected to be steadier at around 10% annually.

Industrial Air Conditioning and Chillers

This sub-sector covers central air conditioning systems for process and comfort cooling applications, incorporating reciprocating, scroll, screw and centrifugal compressors, covering a wide range of capacities from 240,000 BTU/hr to over 12 million BTU/hr. Chillers incorporating centrifugal compressors use HCFC-123 and HFC-134a refrigerants, while reciprocating and scroll chillers use HCFC-22.

In 2009, about 1,500 systems were manufactured in the sub-sector. There are about 38 medium and large manufacturers in the sub-sector. Blue Star, Voltas, Daikin and Hitachi are the major brands.

The sub-sector is expected to grow steadily at about 10% annually in the coming years, due to the expansion of commercial and industrial infrastructural facilities requiring air conditioning and process cooling.

Transport Air Conditioning

This sub-sector covers mainly air conditioning systems for railway coaches. India has one of the largest railroad networks in the world and has dedicated public-sector manufacturing facilities for railway coaches. The air conditioning systems are outsourced. The systems have a standardized capacity configuration of 120,000 BTU/hr and are essentially air-cooled ducted split systems, however, have to incorporate a particularly robust and weatherized design to withstand the extra-ordinary and rough static and dynamic loads, encountered by railway coaches.

In 2009, about 1,800 units were manufactured in the sub-sector. There are about ten medium-sized manufacturers in the sub-sector.

Due to the steady expansion of the state-owned railway sector, the sub-sector is expected to grow at around 15% annually in the coming years.

3.2.4 Firefighting Sector

This sector includes firefighting equipment using flooded and portable systems. After phase-out of halons, a range of alternatives such as dry powder, CO2, etc. have been used in this equipment.

HCFC-123 has been a preferred blend component in portable 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. The most commonly used blends are HCFC Blend E (90% HCFC-123, 8% HFC-125 and 2% isopropyl-1-methyl cyclohexane) and Halotron. HCFC-124 is used as a blend component in flooded systems.

The total HCFC consumption in this sector in 2009 was 256 MT (36 MT of HCFC-123 and 220 MT of HCFC-124).

Due to the proliferation of end-point consumer outlets in recent years, such as standalone vending machines, ATM kiosks, etc., and due progressive regulations on consumer safety, the demand for portable fire extinguishing systems has been consistently increasing in the past few years. Medium and large-sized establishments such as hotels, offices, new business complexes, etc., are also increasingly conscious of occupational safety considerations and the demand for total flooding systems is also growing. It is expected that the consumption of HCFCs in the fire-fighting sector will grow about 10 % annually until 2015.

3.2.5 Polyurethane Foams Sector

Polyurethane foams for various applications have been manufactured in India since the 1960s. The sector has experienced high growth in recent years, due to rapid 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.

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 directly by the foam manufacturers.

Table-9 below shows the HCFC consumption in manufacturing in the Polyurethane Foam Sector by sub-sector in 2009, based on survey data:

Table-9: HCFC Consumption and Sub-sectors in the Polyurethane Foams Sector

Sub-sector	Estimated 2009 HCFC Consumption in Manufacturing (MT)
Rigid Polyurethane Foams	
Domestic Refrigeration (insulation)	1,625
Continuous Sandwich Panels	527
Discontinuous Sandwich Panels	2,209
Thermoware	985
Water Heaters	684
General Insulation	1,080
Spray/In-situ Insulation	520
Integral Skin Polyurethane Foams	
Automotive and furniture applications	415
Total	**8,045**

The HCFC-141b quantities are as identified in the survey from imports by users and systems houses. The HCFC consumption shown above includes about 7,110 MT of HCFC-141b (imported as pure substance), 90 MT of HCFC-142b and 90 MT of HCFC-22. HCFC-142b in conjunction with HCFC-22 is used by some enterprises in the discontinuous sandwich panels and general insulation sub-sectors.

An estimated 755 MT of HCFC-141b is expected to be entering India through pre-blended polyols. The use of HCFC-141b pre-blended polyols is usually by small and medium-sized enterprises in all sub-sectors other than domestic refrigeration and continuous sandwich panel sub-sectors.

More details on individual sub-sectors in the Polyurethane Foams Sector are provided in **Annex-II.**

3.2.6 Refrigeration Sector

Due to the growing demand for infrastructure for food preservation and cold chain, and the linkage of this industry with agriculture, this sector is considered critical in India, in terms of contribution to economic development. The 2009 HCFC consumption in this sector is shown below:

Table-10: HCFC Consumption and Sub-sectors in the Refrigeration Sector

Sub-sector	Estimated 2009 HCFC Consumption in Manufacturing (MT)
Compressors and Condensing Units	0
Commercial Refrigeration	706
Industrial Refrigeration	160
Transport Refrigeration	44
Total	**910**

The above consumption included 340 MT of HCFC-22, 450 MT of HCFC-141b (used for the polyurethane foam insulation) and 60 MT each of HCFC-142b and HCFC-124 (used in refrigerant blends).

Compressors and Condensing Units

There are about 23 manufacturers and suppliers of compressors in India. Only reciprocating hermetic compressors are manufactured in India by one multinational enterprise. There are about seven manufacturers of open-type reciprocating compressors, which are used for air conditioning and refrigeration applications, most of whom are small-scale manufacturers. The demand for screw compressors and scroll compressors is met through imports. As for condensing units, small-sized systems are imported, although there are several manufacturers of custom-built medium and large-sized condensing units

Commercial Refrigeration

This sub-sector covers unitary refrigeration equipment such as beverage coolers, water coolers, deep freezers, display cabinets, small-sized walk-in coolers, etc. During the phase out of CFCs, many manufacturers in this sub-sector converted to HFC-134a technology, however, HCFC-22 continues to be used for medium temperature applications and larger equipment. HCFC-141b is used as a blowing agent for the polyurethane foam insulation in this equipment.

In 2009, about 118,000 units of commercial refrigeration equipment of various sizes and configurations were manufactured in this sub-sector. It is estimated that there are over 100 mainly small and medium-sized manufacturers in the sub-sector. The sub-sector is expected to experience significant growth of over 15% annually due to the expansion of cold chain infrastructure.

Industrial Refrigeration

This sub-sector covers industrial applications such as cold storages and warehouses, freezing rooms, controlled atmosphere storages, ripening chambers, process refrigeration, etc. Large-sized cold storages and warehouses, and also large process refrigeration applications, mainly use ammonia as a refrigerant, however, smaller-sized factory-engineered systems use HCFC-22 as the refrigerant.

In 2009, about 8,000 units of industrial refrigeration systems were manufactured. There are over 20 manufacturers of which only about five are large-sized and others are small and medium-sized. The sub-sector is expected to a growth of about 10% annually due to the expansion of cold chain infrastructure.

Transport Refrigeration

This sub-sector covers refrigeration systems in marine applications and other refrigerated transport applications. The field survey noted that there is awareness of HCFC phase-out in this sub-sector and retrofitting of systems in ships using HCFC-22 and blends for air conditioning and refrigeration is underway whenever ships are in docks for major repairs. The consumption of HCFCs in this sub-sector is small. There are about 53 enterprises engaged in installation of marine air conditioning and refrigeration systems including for defense vessels. The sub-sector is expected to grow at a steady rate of about 10% annually.

3.2.7 Solvents Sector

HCFC-141b is used as a solvent and cleaning agent, in some metal cleaning, electronic cleaning and medical equipment cleaning applications during the manufacturing of such equipment. The estimated consumption of HCFC-141b in 2009 in this sector was 260 MT. The sector is relatively quite small, although the use of HCFC-141b as solvent is emissive from an environmental perspective. The sector is expected to grow at about 10% annually and the current trend is towards using formulated non-ODS solvents.

3.2.8 XPS Foams Sector

Extruded polystyrene insulation foam boards are typically offered as a more cost-effective alternative to polyurethane sandwich panels. However, for several years, the capacity for manufacturing XPS foam insulation boards did not exist in India, although there are several manufacturers of expanded polystyrene and polyethylene foam, who converted to non-ODS alternatives during CFC phase-out. There is one manufacturer of XPS foam insulation boards in India identified during the survey, who is also a producer of the upstream feed material, polystyrene, established in 2006. The 2009 HCFC consumption at this enterprise was about 300 MT, comprising of 150 MT each of HCFC-22 and HCFC-142b.

The sector is expected to grow rapidly and new capacities are expected to be established to meet the increasing demand for cost-effective alternatives to polyurethane sandwich panels. However, it is expected that new capacities in this sector will be established on a large scale and using non-ODS alternatives, keeping with global trends.

3.2.9 Servicing Sector

The Servicing Sector has a significant consumption of HCFCs, namely, HCFC-22, HCFC-123, HCFC-124, HCFC-142b (both used as blend components), due to the extensive and increasing population of refrigeration and air conditioning equipment. The Servicing Sector caters to all sub-sectors of the Air Conditioning and Refrigeration Sectors.

The refrigerant consumption in the Servicing Sector not only depends on the installed base of refrigeration and air conditioning equipment, but also on product quality and the quality of service provided during product life cycle. The variability in product quality is fairly predictable and reasonably accurate rates of failures have been provided by manufacturers. With regard to the service quality there is a wide variation on failure rates depending on knowledge and skill levels of technicians, who are primarily from the unorganized sector without formal access to technology and training. Further, the age of the equipment has a direct impact on the HCFC consumption. Appropriate equipment, tools and skill levels are needed for the servicing of larger and more complex systems.

The total number of enterprises in the Servicing Sector is about 37,000 and the total number of technicians is about 115,000. During servicing, recovery of the refrigerant is not a common practice. The refrigerant is often simply vented out and after repair the equipment is completely recharged. Often the system also just gets topped up with refrigerant without proper leak detection and will continue to leak. There could be potentially significant savings in refrigerant use if proper recovery and good practices are implemented.

The table below shows the estimated population for various types of refrigeration and air conditioning equipment in India from 2008 to 2013:

Table-11: Estimated population of Refrigeration and Air Conditioning equipment (2008-13)

Estimated population of HCFC-22 based equipment (number of units)						
Equipment	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Air-conditioners (< 3 TR)	17,301,000	20,609,000	24,959,000	29,839,000	37,335,000	47,108,000
Air-conditioners (> 3 TR)	32,500	40,000	48,300	57,400	67,400	78,400
Water Coolers	433,156	551,156	680,956	823,756	980,856	1,153,656
Process Chillers	43,500	53,500	64,500	76,600	89,900	104,500
Milk chillers	3,250	4,000	4,830	5,740	6,740	7,840
Cold Storage	19,600	24,100	29,100	34,600	40,700	47,400
Ice Candy	65,500	80,500	97,000	115,200	135,200	157,200
Display cabinets	130,600	160,600	193,600	229,900	269,800	313,700
Industrial Refrigeration	1,090	1,340	1,620	1,930	2,270	2,640

Source: Information from industry stakeholders

As seen above, the population of air-conditioners, particularly of capacity 3 TR and below, is projected to significantly increase in the next few years. Based on the population projections above, the estimated HCFC-22 consumption in servicing until 2013, under an unconstrained scenario is tabulated below:

Table-12: Projected unconstrained demand for HCFC-22 in Servicing (2009-13)

Equipment	**2009**	**2010**	**2011**	**2012**	**2013**
Air-conditioners (< 3 TR)	3,842	5,271	5,968	7,467	9,422
Air-conditioners (> 3 TR)	40	48	57	67	78
Water Coolers	44	54	66	78	92

Process Chillers	32	39	46	54	63
Milk chillers	9	10	12	14	17
Cold Storage	139	168	200	235	274
Ice Candy	129	155	184	216	252
Display cabinets	32	39	46	54	63
Industrial Refrigeration	14	17	21	25	29

Note: All figures in MT

In addition to HCFC-22, other HCFCs used in servicing include HCFC-123 (mainly for centrifugal chillers), HCFC-124 and HCFC-142b (as blends) in industrial refrigeration applications.

The overall HCFC consumption in the Servicing Sector for 2009 is tabulated below:

Table-13: HCFC consumption in the Servicing Sector (2009)

Year/ Substance	HCFC-123	HCFC-124	HCFC-142b	HCFC-22	Total
2009	112	340	2,701	4,281	7,434

From the above, the critical role of the Servicing Sector and its impact on future HCFC consumption in India is evident. More details on the Servicing Sector are provided in Annex-IV of this document.

3.2.10 Summary

Based on the preceding sections, the overall HCFC consumption in India in 2009 is tabulated below:

Table-14: Overall HCFC Consumption in India by Sector and Substance (2009)

Sector/Sub-sector/Substance	2009 HCFC Consumption (MT)					
	22	141b	142b	123	124	Total
MANUFACTURING						
Aerosols Sector		80				80
Air Conditioning Sector	4,527			90		4,617
Firefighting Sector				36	220	256
Polyurethane Foams Sector	90	7,110	90			7,290
Refrigeration Sector	340	450	60		60	910
Solvents Sector		260				260
XPS Foams Sector	150		150			300
Total (Manufacturing)	**5,107**	**7,900**	**300**	**126**	**280**	**13,713**
SERVICING						
All sectors	4,281	0	2,701	112	340	7,434
Total (Servicing)	**4,281**	**0**	**2,701**	**112**	**340**	**7,434**
GRAND TOTAL	**9,388**	**7,900**	**3,001**	**238**	**620**	**21,147**
ODP tonnes	**516.34**	**869.00**	**195.07**	**4.76**	**13.64**	**1,598.81**

Note: HCFC-141b consumption in imported pre-blended polyols is not included.

3.3 INSTITUTIONAL FRAMEWORK

3.3.1 Institutional Arrangements

Government of India has designated the Ministry of Environment and Forests, as the nodal ministry for the Montreal Protocol.

The Ministry of Environment and Forests established a special directorate (Ozone Cell) within the Ministry, dedicated to managing and coordinating the implementation of the Montreal Protocol in India. The functions and responsibilities of the Ozone Cell as the designated national authority, include notification of regulations pertaining to the Montreal Protocol, issues related to international cooperation, maintaining and managing data on production, imports, exports and consumption of ODS, monitoring of implementation of Montreal Protocol activities, interacting with other line ministries on technical and financial matters pertaining to implementation of activities, liaising with scientific, technical and other public institutions for technical matters, representing India at various multilateral meetings and discussions, etc.

The Ministry of Environment and Forests has also established an Empowered Steering Committee (ESC), comprising of representatives of various line ministries and other national stakeholders, which is supported by two Standing Committees, namely the Technology and Finance Standing Committee, and Standing Committee on Monitoring and Evaluation. The ESC is responsible for providing an overall policy direction for implementation of the Montreal Protocol, review of various policy and implementation options, project approvals and project monitoring.

The institutional arrangements for implementation of the Montreal Protocol in India are depicted in the figure below:

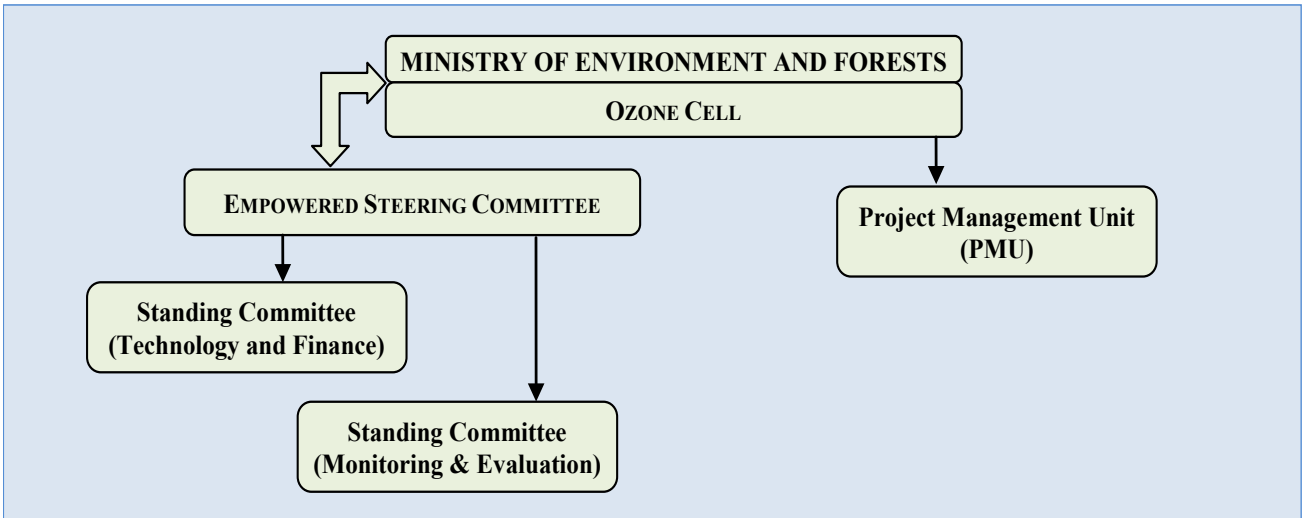

Figure-2: Institutional Arrangements for Montreal Protocol in India

The Ozone Cell is supported by the Project Management Unit (PMU) for monitoring and implementation of phase-out activities.

3.3.2 Existing Policies and Regulations

The guiding principles for various policies as enunciated in the Country Programme reflecting national priorities are as below:

- To strengthen national institutions for monitoring and managing ODS phase-out

- To assist indigenous industries for conversion to non-ODS technologies through the Montreal Protocol financial mechanism, while ensuring that the SMEs and other unorganized tiny enterprises are fully compensated for conversions, including retraining.
- To minimize economic dislocation either through closure of manufacturing units, loss of productive capacity or through major capital expenditure that could become obsolete in future.
- To maximize indigenous production by encouraging technology transfer for and local production of non-ODS substitutes.
- To evaluate alternatives to ODS and the available substitute technologies on a continuing basis, so as to lead to wider adaptation and dissemination.
- To promote recycling, reclamation, retrofitting and drop-in substitutes to prolong economic life of existing equipment, until new replacement technologies become mature, cost-effective and available.
- To institute decentralized management of ODS phase-out activities for smooth implementation.
- To facilitate development of new standards and certification systems for products and processes including those for safety.
- To integrate the ODS phase-out activities closely with the growth in the various industrial sectors, economic reforms and policies, etc.

Recognizing the importance of establishing an effective regulatory framework for the successful implementation of the Country Programme, MoEF initiated a forward-looking programme to create such a framework to support the various ODS phase out measures.

In exercise of the powers conferred by sections 6, 8 and 29 of the Environment (Protection) Act, 1986, Government of India formulated draft ODS regulations termed as the Ozone Depleting Substances (Regulation and Control) Rules, 2000, which were published in the Gazette of India in 1998 for public comments and also circulated in the industry for advance intimation and comments. These have been since been officially notified and have formally come in to effect from January 2000. Five amendments to these rules have been issued from 2001 to 2007. The provisions of these comprehensive regulations are summarized as below:

ODS Production

- Mandatory registration with MoEF.
- Restriction on production levels as per “base level” and specified time-bound reductions.
- Prohibition on creating new capacity or expansion of capacity.

ODS Consumption

- Ban on new capacity or expansion of capacity for manufacturing products and equipment containing designated ODS
- Mandatory registration with designated authorities.
- Declaration requirement in prescribed format at the time of procurement of ODS.
- Restrictions on manufacturing of ODS-based products in various sectors from 2003 to 2010.
- ODS Trade
- Mandatory registration for exporters & importers with designated authorities.
- Import of ODS and ODS containing equipment only against license.
- Export restricted to countries who are parties to the Montreal Protocol and amendments against quota.

Registration and Reporting

- Mandatory registrations for reclamation and destruction of ODS.
- Every entity that produces, uses, imports, sells, stocks, reclaims or destroys ODS has to maintain records and file reports as specified.
- Every entity, which has received technical and/or financial assistance from any international agency or financial assistance from Government of India including duty exemptions, is required to maintain records and file reports as specified.

Other supporting measures initiated by Government of India include:

Trade Measures

- Export of Annex-A and Annex-B substances to Non-Article 5 Parties is prohibited.
- Import and export of all Annex-A and Annex-B substances are subject to licensing.
- Import of equipment containing ODS is subjected to licensing.

Fiscal Measures

- Full exemption from Customs and Excise tariffs on capital goods required to implement ODS phase out projects funded by the Multilateral Fund. This exemption has been extended to ODS phase-out projects, which were eligible for funding under the Multilateral Fund, whether or not such enterprises actually sought assistance from the fund. These also covered projects submitted for retroactive financing. The benefit was available subject to the condition that enterprises should give a clear legal commitment to stop using ODS in all future manufacturing operations after the projects were implemented. The duty exemptions were also extended to items of recurring use, including non-ODS alternatives, for such duration for which, incremental operating costs were committed by the Multilateral Fund in approved projects.

The duty exemptions were also extended to capital goods required for establishing new capacity with non-ODS technology.

- Indian financial institutions were advised not to finance/refinance new ODS consuming enterprises.
- The Tariff Advisory Committee (a statutory body under the Insurance Act, 1938) decided to grant suitable discounts on fire insurance premiums if alternative agents are used to replace halons.

In addition to the above, specific administrative orders are issued from time to time (e.g., quota order for CTC production and consumption) to facilitate ODS phase-out in select chemicals and applications.

3.4 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, solvent 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. Such conversions often bring additional requirements in terms of performance, operation, maintenance and safety.

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 CO2-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.

STRATEGY

4. STRATEGY

4.1 PRINCIPLES

The overarching strategy underlying the HPMP for India 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

Apart from the above, the HPMP will be designed consistent with the policy principles enunciated as part of India's Country Programme for phasing out ODS and its update.

4.2 APPROACH FOR COMPLIANCE

India 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 in the Servicing Sector, capacity-building programmes for technicians and servicing establishments will be carried out in. A national enabling programme to further support the sustainability of reductions to be achieved will be implemented incorporating education, communication and outreach activities, capacity-building for enforcement and targeted stakeholder and public awareness activities will be carried out. In addition, technical assistance and training activities at the enterprise and sector levels would 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 and introduction of additional regulations as necessary

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

India 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 integrated manner.
- Aiming to maximize 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, taking into account national circumstances and industry needs. India has also assumed voluntary national targets for CO2 emission reductions (please refer to Section 4.10 for more details). In view of this, it is of utmost importance that adequate resources 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, India 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 larger HCFC consumption and with good technical and managerial capacity, to ensure maximum impact and implementability within the short timeframe
- Endeavoring 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 Section 3.2, the HCFC consumption in India has been experiencing significant 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 Article-7 HCFC consumption for 2009 and 2010.
- Establish the allowable growth until 2013 for national-level HCFC consumption, to ensure adequate availability of HCFCs for legitimate needs of various sectors, particularly those sectors and sub-sectors that cannot be addressed in Stage-I.
- 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 India (average of 2009 and 2010 consumption levels) is shown below:

Table-15: India HCFC Consumption Baseline

Substance	Consumption (ODP tonnes)		
	2009*	2010*	Baseline
Annex-C Group-I substances (HCFCs)	1,598.81	1,617.64	1,608.23

** A7 data reporting*

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

Table-16: Maximum Allowable Consumption for Stage-I

Target	Maximum Consumption Level (ODP tonnes)
From 01 January 2013	1,608.23
From 01 January 2015	1,447.41

4.4.2 Reductions for Stage-I Compliance

As enumerated in Section 3.2, the average compounded growth in consumption in India over a five-year period during 2006-2010, was 19.7% annually on a MT basis and about 22% on an ODP-tonne basis. It is therefore evident that significant efforts will be needed to restrict the growth in HCFC consumption during 2011 and 2012 and in addition, phase-out will need to be accomplished in selected sectors and sub-sectors, to ensure compliance with the 2013 and 2015 targets.

Table-17 below shows the analysis of reductions needed for compliance with the 2013 and 2015 targets:

Table-17: Reductions for Stage-I Compliance

Parameter/Year	2011	2012	2013	2014	2015
Maximum consumption limit (ODP tonnes)	N/A	N/A	1,608.23	1,608.23	1,447.41
Unconstrained growth (%)	10	7.5	5	5	5
Projected unconstrained consumption (ODP tonnes)	1,769.05	1,901.73	1,996.82	2,096.66	2,201.49
Controlled growth (%)	5	4	0	0	0
Projected consumption with controls (ODP tonnes)	1,688.64	1,756.19	1,608.23	1,608.23	1,447.41
Required reductions (ODP tonnes)			147.96		160.82

The projected unconstrained consumption could reach 2,201.49 ODP tonnes by 2015, in absence of controls, at the projected growth rates indicated above, which are based on growth projections in different sectors and sub-sectors as described in preceding sections.

India will limit the growth of HCFC consumption during 2011 and 2012 at respectively 5% and 4% annually, through introduction of appropriate regulations. Thus the reductions required for achieving the 2013 compliance target would work out to about 147.96 ODP tonnes. An additional 160.82 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 308.78 ODP tonnes.

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 Polyurethanes Foams Sector have been prioritized
- Applications and sub-sectors where mature and relatively benign technologies are available are prioritized
- Wherever possible, complete phase-out at sub-sector or application level is targeted, to enable enforceable regulations
- Enterprises with good technical and managerial capacity and large consumption have been prioritized, to ensure implementability and maximum impact
- 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.

A key strategic consideration is the approach to deal with the HCFC consumption in sectors that would be largely 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. Through carefully designed policies and targeted regulations, India will control the growth in these sectors. Adequate resources will need to be allocated for effective management and monitoring

of implementation, so that the implementation can be accomplished in the limited available timeframe.

Based on the above, the Polyurethane 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 in various sub-sectors will be prioritized.

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

The implementation of the HPMP Stage-I will need effective enforcement of existing and proposed regulations. In addition, considering the large size of the country, stakeholders and public will need to be engaged actively, to ensure their support for the phase-out. Further, linkages between stakeholders and partners engaged in programmes for energy efficiency and product life cycle management will need to be leveraged, to ensure that sustainable technology options are implemented. For this, a national enabling programme, incorporating capacity-building of enforcement officials, targeted communication and information outreach activities as well as stakeholder and public awareness actions will need to be carried out.

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-18: Key Planned Regulatory Actions

Year	Key Planned Regulatory Actions
2013	Amend existing rules for controlling use, manufacturing, assembly and installation of products as applicable to HCFCs
	Restrict the amount of HCFCs that can be sold in the domestic market with effect from 01 January 2013
	Prohibition of establishment new capacities or expansion of existing capacities for manufacturing HCFC-based products with effect from 01 January 2013
	Prohibition imports of polyols pre-blended with HCFCs with effect from 01 January 2013
2015	Prohibition of manufacturing domestic refrigerators and continuous sandwich panels with HCFCs as blowing agents with effect from 01 January 2015
	Prohibition on imports of HCFC-based air-conditioners from 01 January 2015

Management, Coordination and Monitoring

Considering the time need for putting in place the necessary project initiation procedures, agreements,

etc., the earliest date by which field-level activities can commence is by mid-2012. This means that stringent timelines will be encountered for implementing actions for Stage-I compliance, including front-loading of many activities. 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. 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 in various sub-sectors by 2015. The domestic refrigeration and continuous sandwich panel sub-sectors plan to achieve complete phase-out. Conversions are selected discontinuous sandwich panel manufacturers are also included. In addition, a technical assistance component for systems houses is also included. The successful implementation of this plan will contribute 277.54 ODP tonnes (90%) to the phase-out target.

4.6.3 Servicing Sector Plan

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 critical years during which phase-out actions are being implemented. Specific technical assistance and capacity-building interventions will be needed to control the growth in HCFC consumption in servicing until 2015 to acceptable levels. Successful implementation of this plan will result in contributing to reductions in HCFC consumption of 31.24 ODP tonnes (10%) to the overall phase-out target.

4.6.4 Enabling Activities

The implementation of the HPMP Stage-I will need effective enforcement of existing and proposed regulations. In addition, considering the large size of the country, stakeholders and public will need to be engaged actively, to ensure their support for the phase-out. Further, linkages between stakeholders and partners engaged in programmes for energy efficiency and product life cycle management will need to be leveraged, to ensure that sustainable technology options are implemented. For this, a national enabling programme, incorporating capacity-building of enforcement officials, targeted communication and information outreach activities as well as stakeholder and public awareness actions will need to be carried out.

4.7 SUMMARY OF COSTS AND FUNDING

The summary of approved funding for India's HPMP Stage-I, for meeting the 2013 and 2015 control targets is tabulated below:

Component	Agency	Phase-out (tonnes)		Net Funding Request (US$)
		Metric	ODP	
Project Management Components	UNDP	N/A	N/A	1,020,000
Polyurethane Foams Sector Plan	UNDP	2,523.09	277.54	17,418,490
Servicing Sector Plan	Germany	443.20	24.38	1,994,400
	UNEP	124.80	6.86	561,600
Enabling Activities	UNEP	N/A	N/A	300,000
Total		**3,091.09**	**308.78**	**21,294,490**

Note: All amounts rounded off to the nearest US$ 1.00 and do not include agency fees

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 India is taking and will need to take in future, ensuring consistency with national priorities.

The Ozone Cell/MoEF will have the overall coordination role. UNDP is the designated lead implementing agency for India's HPMP and UNEP and Germany are the cooperating agencies. A project management team with dedicated project staff will need to be formed, to undertake day-to-day implementation supervision and project management.

The detailed roles and responsibilities of the stakeholders will be further elaborated at the time of initiation of project implementation.

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
Investment Components																		
Project initiation documentation																		
Establish project management unit																		
Stakeholder consultations																		
Enterprise-level agreements																		
Technology conversions																		
Commissioning and trials																		
Non-investment Components																		
Policy and Regulations																		
Technical Support																		
Technical Assistance for Servicing																		
Awareness and Capacity-building																		
Verification																		
Verification of phase-out																		

Note: Some activities in 2012 may need to be advanced, in view of the limited implementation time-frame.

4.10 ENVIRONMENTAL IMPACT

4.10.1 Ozone Layer Protection

Successful implementation of the HPMP (Stage-I) in India will result in a sustainable phase-out of 308.78 ODP tonnes of HCFCs. After accounting for the controlled growth in consumption of HCFCs until 2013, the net impact would be minimum 160.82 ODP tonnes of sustained reductions in India's national HCFC consumption baseline from 2015.

4.10.2 Global Warming

Direct GHG emissions

Due to the relatively high GWP 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 (MT)	0	2,523
Servicing	568	0
Total (MT)	568	2,523
GWP*	1,810	725
Impact (CO2-eq tonnes)	1,028,080	1,829,175
Total impact (CO2-eq tonnes)/y	**2,857,255**	

After Conversion

Sector/Substance	HC
Foams (MT)	1,976
Servicing	0
Total (MT)	1,976
GWP*	11
Impact (CO2-eq tonnes)	21,736
Total impact (CO2-eq tonnes)	**21,736**
Net Impact (CO2-eq tonnes)/y	**2,835,519**

** Based on IPCC AR-4*

The net direct emission reductions are thus 2,422,773 CO2-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 considerations for safeguarding health and safety in line with local and international regulations and guidelines.

ANNEXURE-I

AGREEMENT BETWEEN THE GOVERNMENT OF INDIA AND THE EXECUTIVE COMMITTEE OF THE MULTILATERAL FUND FOR THE REDUCTION IN CONSUMPTION OF HYDROCHLOROFLUOROCARBONS

ANNEXURE-I

AGREEMENT BETWEEN THE GOVERNMENT OF INDIA AND THE EXECUTIVE COMMITTEE OF THE MULTILATERAL FUND FOR THE REDUCTION IN CONSUMPTION OF HYDROCHLOROFLUOROCARBONS

(Reference: ExCom Document UNEP/OzL.Pro/ExCom/66/38, Annex-XXVII)

1. This Agreement represents the understanding of the Government of India (the "Country") and the ExCom with respect to the reduction of controlled use of the ODSs set out in Appendix 1-A ("The Substances") to a sustained level of 1,447.38 ODP tonnes by 01 January 2015 in compliance with Montreal Protocol schedules.

2. The Country agrees to meet the annual consumption limits of the Substances as set out in row 1.2 of Appendix 2-A ("The Targets, and Funding") in this Agreement as well as in the Montreal Protocol reduction schedule for all Substances mentioned in Appendix 1-A. The Country accepts that, by its acceptance of this Agreement and performance by the ExCom of its funding obligations described in paragraph 3, it is precluded from applying for or receiving further funding from the Multilateral Fund in respect to any consumption of the Substances that exceeds the level defined in row 1.2 of Appendix 2-A as the final reduction step under this Agreement for all of the Substances specified in Appendix 1-A, and in respect to any consumption of each of the Substances that exceeds the level defined in rows 4.1.3, 4.2.3, 4.3.3, 4.4.3, 4.5.3 and 4.6.3 (remaining eligible consumption).

3. Subject to compliance by the Country with its obligations set out in this Agreement, the ExCom agrees, in principle, to provide the funding set out in row 3.1 of Appendix 2-A to the Country. The ExCom will, in principle, provide this funding at the ExCom meetings specified in Appendix 3-A ("Funding Approval Schedule").

4. The Country agrees to implement this Agreement in accordance with the HCFC phase-out sector plans submitted. In accordance with sub-paragraph 5(b) of this Agreement, the Country will accept independent verification of the achievement of the annual consumption limits of the Substances as set out in row 1.2 of Appendix 2-A of this Agreement. The aforementioned verification will be commissioned by the relevant bilateral or implementing agency.

5. The ExCom will not provide the Funding in accordance with the Funding Approval Schedule unless the Country satisfies the following conditions at least eight weeks in advance of the applicable ExCom meeting set out in the Funding Approval Schedule:

   (a) That the Country had met the Targets set out in row 1.2 of Appendix 2-A for all relevant years. Relevant years are all years since the year in which this Agreement was approved. Years for which no obligation for reporting of country programme data exists at the date of the ExCom meeting at which the funding request is being presented are exempted;

(b) That the meeting of these Targets has been independently verified, unless the ExCom decided that such verification would not be required;

(c) That the Country had submitted annual implementation reports in the form of Appendix 4-A ("Format of Implementation Reports and Plans") covering each previous calendar year; that it had achieved a significant level of implementation of activities initiated with previously approved tranches; and that the rate of disbursement of funding available from the previously approved tranche was more than 20 per cent;

(d) That the Country has submitted an annual implementation plan in the form of Appendix 4 A covering each calendar year until and including the year for which the funding schedule foresees the submission of the next tranche or, in case of the final tranche, until completion of all activities foreseen; and

(e) That, for all submissions from the 68th meeting onwards, confirmation has been received from the Government that an enforceable national system of licensing and quotas for HCFC imports and, where applicable, production and exports is in place and that the system is capable of ensuring the Country's compliance with the Montreal Protocol HCFC phase-out schedule for the duration of this Agreement.

6. The Country will ensure that it conducts accurate monitoring of its activities under this Agreement. The institutions set out in Appendix 5-A ("Monitoring Institutions and Roles") will monitor and report on implementation of the activities in the previous annual implementation plans in accordance with their roles and responsibilities set out in Appendix 5-A. This monitoring will also be subject to independent verification as described in paragraph 4 above.

7. The ExCom agrees that the Country may have the flexibility to reallocate the approved funds, or part of the funds, according to the evolving circumstances to achieve the smoothest reduction of consumption and phase-out of the Substances specified in Appendix 1-A:

(a) Reallocations categorized as major changes must be documented in advance either in an annual implementation plan submitted as foreseen in sub paragraph 5(d) above, or as a revision to an existing annual implementation plan to be submitted eight weeks prior to any meeting of the ExCom, for its approval. Major changes would relate to:

(i) Issues potentially concerning the rules and policies of the Multilateral Fund;

(ii) Changes which would modify any clause of this Agreement;

(iii) Changes in the annual levels of funding allocated to individual bilateral or implementing agencies for the different tranches; and

(iv) Provision of funding for programmes or activities not included in the current endorsed annual implementation plan, or removal of an activity in the annual implementation plan, with a cost greater than 30 per cent of the total cost of the last approved tranche;

(b) Reallocations not categorized as major changes may be incorporated in the approved annual implementation plan, under implementation at the time, and reported to the ExCom in the subsequent annual implementation report;

(c) Should the Country decide during implementation of the agreement to introduce an alternative technology other than that proposed in the approved HPMP, this would require approval by the ExCom as part of an Annual Implementation Plan or the revision of the approved plan. Any submission of such a request for change in technology would identify the associated incremental costs, the potential impact to the climate, and any differences in ODP tonnes to be phased out if applicable. The Country agrees that potential savings in incremental costs related to the change of technology would decrease the overall funding level under this Agreement accordingly;

(d) Any enterprise to be converted to non-HCFC technology included in the approved HPMP and that would be found to be ineligible under the guidelines of the Multilateral Fund (i.e., due to foreign ownership or establishment post the 21 September 2007 cut-off date), will not receive assistance. This information would be reported to the ExCom as part of the Annual Implementation Plan;

(e) The Country commits to examining the possibility of using pre-blended hydrocarbon systems instead of blending them in-house, for those foam enterprises covered under the umbrella project, should this be technically viable, economically feasible and acceptable to the enterprises;

(f) Any remaining funds will be returned to the Multilateral Fund upon completion of the last tranche foreseen under this Agreement.

8. Specific attention will be paid to the execution of the activities in the refrigeration servicing sub sector, in particular:

(a) The Country would use the flexibility available under this Agreement to address specific needs that might arise during project implementation; and

(b) The Country and the bilateral and implementing agencies involved will take full account of the requirements of decisions 41/100 and 49/6 during the implementation of the plan.

9. The Country agrees to assume overall responsibility for the management and implementation of this Agreement and of all activities undertaken by it or on its behalf to fulfil the obligations under this Agreement. UNDP has agreed to be the lead implementing agency (the "Lead IA") and UNEP and Government of Germany have agreed to be the cooperating implementing agencies (the "Cooperating IAs") under the lead of the Lead IA in respect of the Country's activities under this Agreement. The Country agrees to evaluations, which might be carried out under the monitoring and evaluation work programmes of the Multilateral Fund or under the evaluation programme of any of the agencies taking part in this Agreement.

10. The Lead IA will be responsible for ensuring co-ordinated planning, implementation and reporting of all activities under this Agreement, including but not limited to independent verification

as per sub-paragraph 5(b). This responsibility includes the necessity to co-ordinate with the Cooperating IAs to ensure appropriate timing and sequence of activities in the implementation. The Cooperating IAs will support the Lead IA by implementing the activities listed in Appendix 6-B under the overall co-ordination of the Lead IA. The Lead IA and Cooperating IAs have reached consensus on the arrangements regarding inter-agency planning, reporting and responsibilities under this Agreement to facilitate a co-ordinated implementation of the Plan, including regular coordination meetings. The ExCom agrees, in principle, to provide the Lead IA and the Cooperating IAs with the fees set out in rows 2.2, 2.4 and 2.6 of Appendix 2-A.

11. Should the Country, for any reason, not meet the Targets for the elimination of the Substances set out in row 1.2 of Appendix 2-A or otherwise does not comply with this Agreement, then the Country agrees that it will not be entitled to the Funding in accordance with the Funding Approval Schedule. At the discretion of the ExCom, funding will be reinstated according to a revised Funding Approval Schedule determined by the ExCom after the Country has demonstrated that it has satisfied all of its obligations that were due to be met prior to receipt of the next tranche of funding under the Funding Approval Schedule. The Country acknowledges that the ExCom may reduce the amount of the Funding by the amount set out in Appendix 7-A ("Reductions in Funding for Failure to Comply") in respect of each ODP kg of reductions in consumption not achieved in any one year. The ExCom will discuss each specific case in which the Country did not comply with this Agreement, and take related decisions. Once these decisions are taken, this specific case will not be an impediment for future tranches as per paragraph 5 above.

12. The Funding of this Agreement will not be modified on the basis of any future ExCom decision that may affect the funding of any other consumption sector projects or any other related activities in the Country.

13 The Country will comply with any reasonable request of the ExCom, the Lead IA and the Cooperating IAs to facilitate implementation of this Agreement. In particular, it will provide the Lead IA and the Cooperating IAs with access to the information necessary to verify compliance with this Agreement.

14. The completion of stage I of the HPMP and the associated Agreement will take place at the end of the year following the last year for which a maximum allowable total consumption level has been specified in Appendix 2-A. Should there at that time still be activities that are outstanding, and which were foreseen in the Plan and its subsequent revisions as per sub-paragraph 5(d) and paragraph 7, the completion will be delayed until the end of the year following the implementation of the remaining activities. The reporting requirements as per sub-paragraphs 1(a), 1(b), 1(d), and 1(e) of Appendix 4-A will continue until the time of the completion unless otherwise specified by the ExCom.

15. All of the conditions set out in this Agreement are undertaken solely within the context of the Montreal Protocol and as specified in this Agreement. All terms used in this Agreement have the meaning ascribed to them in the Montreal Protocol unless otherwise defined herein.

APPENDICES

APPENDIX 1-A : THE SUBSTANCES

Substance	Annex	Group	Starting point for aggregate reductions in consumption (ODP tonnes)
HCFC-123	C	I	3.53
HCFC-124	C	I	13.46
HCFC-141b	C	I	865.54
HCFC-142b	C	I	123.70
HCFC-22	C	I	601.98
Sub-total			**1,608.20**
HCFC-141b pre-blended in imported polyols			83.05
Total			**1,691.25**

APPENDIX 2-A : THE TARGETS AND FUNDING

Row	Particulars	2012	2013	2014	2015	Total
1.1	Montreal Protocol reduction schedule of Annex C, Group I substances (ODP tonnes)	N/A	1,608.20	1,608.20	1,447.38	N/A
1.2	Maximum allowable total consumption of Annex C, Group I substances (ODP tonnes)	N/A	1,608.20	1,608.20	1,447.38	N/A
2.1	Lead IA (UNDP) agreed funding (US$)	10,000,000	7,000,000	0	1,438,490	18,438,490
2.2	Support costs for Lead IA (US$)	750,000	525,000	0	107,887	1,382,887
2.3	Cooperating IA (UNEP) agreed funding (US$)	430,800	344,640	0	86,160	861,600
2.4	Support costs for (UNEP)	52,388	41,910	0	10,478	104,776

2.5	Cooperating IA (Germany) agreed funding US$	925,452	869,508	0	199,440	1,994,400
2.6	Support costs for (Germany) (US$)	106,440	100,006	0	22,938	229,384
3.1	Total agreed funding (US$)	11,356,252	8,214,148	0	1,724,090	21,294,490
3.2	Total support cost (US$)	908,828	666,916	0	141,303	1,717,047
3.3	Total agreed costs (US$)	12,265,080	8,881,064	0	1,865,393	23,011,537
4.1.1	Total phase-out of HCFC-123 agreed to be achieved under this Agreement (ODP tonnes)					0
4.1.2	Phase-out of HCFC-123 to be achieved in previously approved projects (ODP tonnes)					0
4.1.3	Remaining eligible consumption for HCFC-123 (ODP tonnes)					3.50
4.2.1	Total phase-out of HCFC-124 agreed to be achieved under this Agreement (ODP tonnes)					0
4.2.2	Phase-out of HCFC-124 to be achieved in previously approved projects (ODP tonnes)					0
4.2.3	Remaining eligible consumption for HCFC-124 (ODP tonnes)					13.50
4.3.1	Total phase-out of HCFC-141b agreed to be achieved under this Agreement (ODP tonnes)					310.53
4.3.2	Phase-out of HCFC-141b to be achieved in previously approved projects (ODP tonnes)					0
4.3.3	Remaining eligible consumption for HCFC-141b (ODP tonnes)					554.97
4.4.1	Total phase-out of HCFC-142b agreed to be achieved under this Agreement (ODP tonnes)					0
4.4.2	Phase-out of HCFC-142b to be achieved in previously approved projects (ODP tonnes)					0
4.4.3	Remaining eligible consumption for HCFC-142b (ODP tonnes)					123.70
4.5.1	Total phase-out of HCFC-22 agreed to be achieved under this Agreement (ODP tonnes)					31.24
4.5.2	Phase-out of HCFC-22 to be achieved in previously approved projects (ODP tonnes)					0

4.5.3	Remaining eligible consumption for HCFC-22 (ODP tonnes)	570.76
4.6.1	Total phase-out of HCFC-141b contained in imported pre-blended polyols agreed to be achieved under this Agreement (ODP tonnes)	0
4.6.2	Phase-out of HCFC-141b contained in imported pre-blended polyols to be achieved in previously approved projects (ODP tonnes)	0
4.6.3	Remaining eligible consumption for HCFC-141b contained in imported pre-blended polyols	83.05

APPENDIX 3-A : FUNDING APPROVAL SCHEDULE

Funding for the future tranches will be considered for approval at the second meeting of the year specified in **Appendix 2-A**.

APPENDIX 4-A: FORMAT OF IMPLEMENTATION REPORTS AND PLANS

1. The submission of the Implementation Report and Plan for each tranche request will consist of five parts:

   (a) 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 ExCom 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 Annual Implementation Plan(s), such as delays, uses of the flexibility for reallocation of funds during implementation of a tranche, as provided for in paragraph 7 of this Agreement, or other changes. The narrative report will cover all relevant years specified in sub-paragraph 5(a) of the Agreement and can in addition also include information on activities in the current year;

   (b) A verification report of the HPMP results and the consumption of the Substances mentioned in Appendix 1-A, as per sub-paragraph 5(b) of the Agreement. If not decided otherwise by the ExCom, such a verification has to be provided together with each tranche request and will have to provide verification of the consumption for all relevant years as specified in sub-paragraph 5(a) of the Agreement for which a verification report has not yet been acknowledged by the Committee;

   (c) A written description of the activities to be undertaken until and including the year of

the planned submission of the next tranche request, highlighting the interdependence of the activities, and taking into account experiences made and progress achieved in the implementation of earlier tranches; the data in the plan will be provided by calendar year. The description should also include a reference to the overall plan and progress achieved, as well as any possible changes to the overall plan that are foreseen. The description should cover the years specified in sub-paragraph 5(d) of the Agreement. The description should also specify and explain in detail such changes to the overall plan. This description of future activities can be submitted as a part of the same document as the narrative report under sub-paragraph (b) above;

(d) A set of quantitative information for all annual implementation reports and annual implementation plans, submitted through an online database. This quantitative information, to be submitted by calendar year with each tranche request, will be amending the narratives and description for the report (see sub-paragraph 1(a) above) and the plan (see sub-paragraph 1(c) above), the annual implementation plan and any changes to the overall plan, and will cover the same time periods and activities; and

(e) An Executive Summary of about five paragraphs, summarizing the information of the above sub-paragraphs 1(a) to 1(d).

APPENDIX 5-A: MONITORING INSTITUTIONS AND ROLES

1. The monitoring process will be managed by Ozone Cell, Ministry of Environment and Forests, with the assistance of the Lead IA.

2. The consumption will be monitored and determined based on official import and export data for the Substances recorded by relevant government departments.

3. The Ozone Cell, Ministry of Environment and Forests, shall compile and report the following data and information on an annual basis on or before the relevant due dates:

   (a) Annual reports on consumption of the Substances to be submitted to the Ozone Secretariat; and

   (b) Annual reports on progress of implementation of HPMP Stage-I to be submitted to the ExCom of the Multilateral Fund.

4. The consumption will be monitored annually throughout the implementation of HPMP Stage-I and accordingly reflected in the progress report on the implementation of the HPMP Stage-I

5. The Ozone Cell, Ministry of Environment and Forests shall endorse the final report and the Lead IA shall submit the same to the relevant meeting of the ExCom along with the annual implementation plan and reports.

APPENDIX 6-A: ROLE OF THE LEAD IMPLEMENTING AGENCY

1. The Lead IA will be responsible for a range of activities, including at least the following:

   (a) Ensuring performance and financial verification in accordance with this Agreement and with its specific internal procedures and requirements as set out in the Country's HPMP;

(b) Assisting the Country in preparation of the Implementation Plans and subsequent reports as per Appendix 4-A;

(c) Providing independent verification to the ExCom that the Targets have been met and associated annual activities have been completed as indicated in the Implementation Plan consistent with Appendix 4-A;

(d) Ensuring that the experiences and progress is reflected in updates of the overall plan and in future annual implementation plans consistent with sub-paragraphs 1(c) and 1(d) of Appendix 4-A;

(e) Fulfilling the reporting requirements for the annual implementation reports, annual implementation plans and the overall plan as specified in Appendix 4-A for submission to the ExCom. The reporting requirements include the reporting about activities undertaken by the Cooperating IAs;

(f) Ensuring that appropriate independent technical experts carry out the technical reviews;

(g) Carrying out required supervision missions;

(h) Ensuring the presence of an operating mechanism to allow effective, transparent implementation of the Implementation Plan and accurate data reporting;

(i) Co-ordinating the activities of the Cooperating IAs, and ensuring appropriate sequence of activities;

(j) In case of reductions in funding for failure to comply in accordance with paragraph 11 of the Agreement, to determine, in consultation with the Country and the Cooperating IAs, the allocation of the reductions to the different budget items and to the funding of each implementing or bilateral agency involved;

(k) Ensuring that disbursements made to the Country are based on the use of the indicators; and

(l) Providing assistance with policy, management and technical support, when required.

2. After consultation with the Country and taking into account any views expressed, the Lead IA will select and mandate an independent entity to carry out the verification of the HPMP results and the consumption of the Substances mentioned in Appendix 1-A, as per sub-paragraph 5(b) of the Agreement and sub-paragraph 1(b) of Appendix 4-A.

APPENDIX 6-B: ROLE OF THE COOPERATING IMPLEMENTING AGENCIES

1. The Cooperating IAs will be responsible for a range of activities. These activities are specified in the overall plan, including at least the following:

(a) Providing assistance for policy development when required;

(b) Assisting the Country in the implementation and assessment of the activities funded by the Cooperating IAs, and refer to the Lead IA to ensure a co-ordinated sequence in the activities; and

(c) Providing reports to the Lead IA on these activities, for inclusion in the consolidated reports as per **Appendix 4-A**.

APPENDIX 7-A: REDUCTIONS IN FUNDING FOR FAILURE TO COMPLY

In accordance with paragraph 11 of the Agreement, the amount of funding provided may be reduced by US $136.45 per ODP kg of consumption beyond the level defined in row 1.2 of **Appendix 2-A** for each year in which the target specified in row 1.2 of **Appendix 2-A** has not been met.

ANNEXURE-II

EXECUTIVE COMMITTEE DECISION 66/45
APPROVING INDIA'S HPMP STAGE-I

(Extracted from the report of the 66th ExCom meeting Document UNEP/OzL.Pro/ExCom/66/54)

India: HCFC phase-out management plan (stage I, first tranche) (UNDP/UNEP/Germany)

150. The representative of the Secretariat introduced document UNEP/OzL.Pro/ExCom/66/38.

151. In the ensuing discussion, there was general appreciation of the efforts of the Government of India and of the implementing agencies and the overall approach was deemed a good one. Several members, however, expressed concerns relating to: the funding eligibility of the second-stage conversions therein; the percentage of the baseline to be addressed (19.2 per cent); the high-GWP value of some of the proposed alternatives, particularly in relation to the cost-effectiveness-related funding provisions of decision 60/44(f)(iv); the request for substantial funding for technical assistance for systems houses with no associated ODP value; the apparent growth in consumption in 2012 and the role of technical assistance in the servicing sector in curbing that growth; progress in implementing ODS policies and regulations; and the balance of US $1.4 million remaining from CTC phase-out in India, which might be used for implementation of the HPMP.

152. Given the number of issues raised, the ExCom agreed to set up a contact group to consider the matter further.

153. Following the report by the convener of the contact group who indicated that all issues raised by the ExCom had been addressed, the ExCom decided:

(a) To approve, in principle, stage I of the HPMP for India for the period 2012 to 2015 to reduce HCFC consumption by 10 per cent of the baseline, at the amount of US $23,011,537, consisting of US $18,438,490, plus agency support costs of US $1,382,887 for UNDP, US $861,600, plus agency support costs of US $104,776 for UNEP, and US $1,994,400, plus agency support costs of US $229,384 for Germany;

(b) To note that the Government of India had agreed to establish as its starting point for sustained aggregate reduction in HCFC consumption the baseline of 1,608.2 ODP tonnes, calculated using actual consumption of 1,598.7 ODP tonnes and 1,617.6 ODP tonnes reported for 2009 and 2010, respectively, under Article 7 of the Montreal Protocol, plus 83.05 ODP tonnes of HCFC-141b contained in imported pre-blended polyol systems, resulting in 1,691.25 ODP tonnes;

(c) To deduct 341.77 ODP tonnes of HCFCs from the starting point for sustained aggregate reduction in HCFC consumption;

(d) To note that no further funding would be provided from the Multilateral Fund to any systems houses in India;

(e) To note that the Government of India agreed to convert all insular foam enterprises in stage I of its HPMP to cyclopentane technology;

(f) To approve the draft Agreement between the Government of India and the ExCom for the reduction in consumption of HCFCs, as contained in Annex XXVII to the present report*;

(g) To approve the first tranche of stage I of the HPMP for India, and the corresponding implementation plan, at the amount of US $12,265,080, consisting of US $10,000,000, plus agency support costs of US $750,000 for UNDP, US $430,800, plus agency support costs of US $52,388 for UNEP, and US $925,452, plus agency support costs of US $106,440 for Germany; and

(h) To note that the Government of India recognized and would abide by all its Montreal Protocol obligations.

(Decision 66/45)

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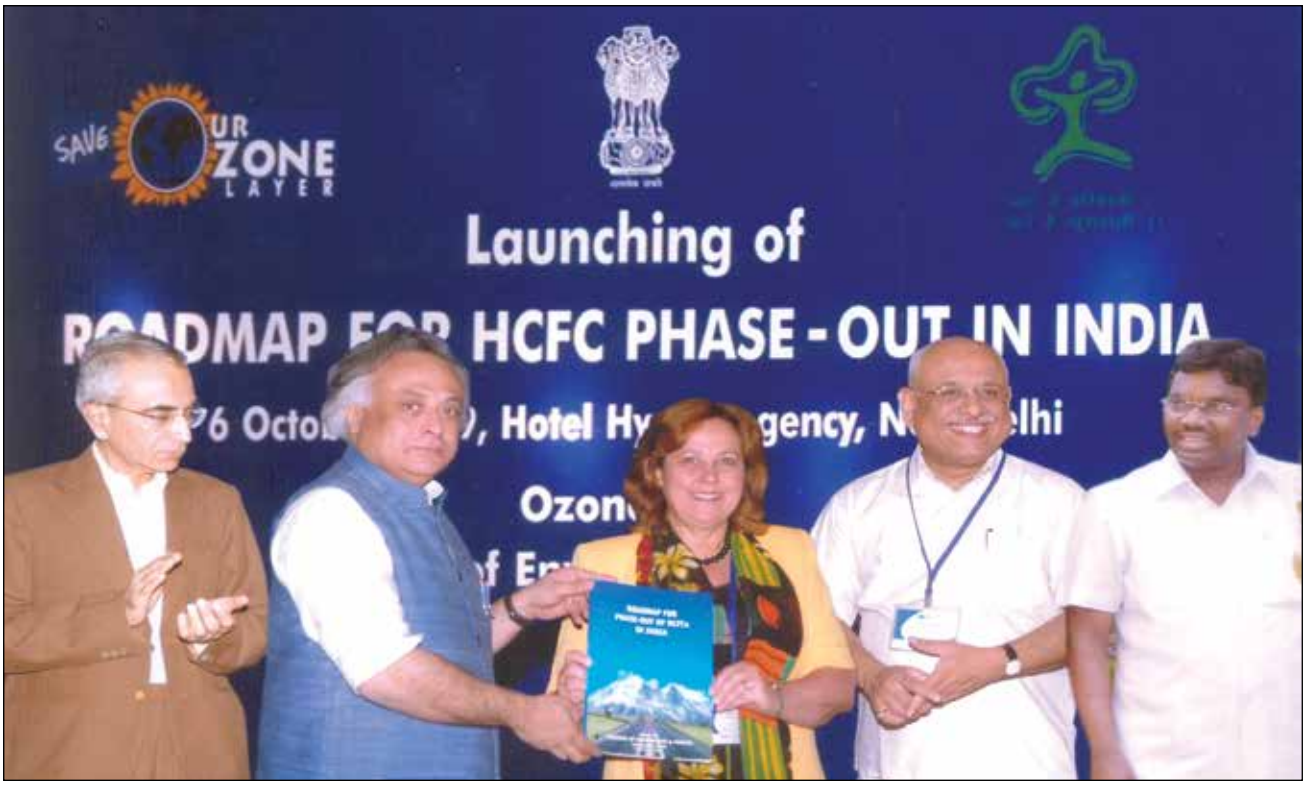
* REFER ANNEXURE - I, pp. 43-46

Shri J.M. Mauskar, Additional Secretary, Ministry of Environment & Forests inaugurating the HPMP Sectoral Working Groups Meeting held on 24-25 September, 2009



Shri Jairam Ramesh, Hon'ble Minister of State for Environment & Forests (Independent Charge) launching the "Roadmap for HCFC Phase-out in India" on 6th October, 2009

Shri Jairam Ramesh, Hon'ble Minister of State for Environment & Forests (Independent Charge) addressing the participants during the launch of "Roadmap for HCFC Phase-out in India" on 6th October, 2009

HCFC Phase-out Management Plan (HPMP) Awareness Seminar on Foam Sector held on 28th June, 2010 at Delhi

Dr. A. Duraisamy, Director, Ozone Cell, Ministry of Environment & Forests, delivering the inaugural address during the HCFC Phase-out Management Plan (HPMP) Awareness Seminar on Refrigeration and Airconditioning Sector held on 19th July, 2010 at Chennai

Dr. A. Duraisamy, Director, Ozone Cell, Ministry of Environment & Forests, delivering the inaugural address during the HCFC Phase-out Management Plan (HPMP) Awareness Seminar on Foam Sector held on 29th July, 2010 at Mumbai

Dr. A. Duraisamy, Director, Ozone Cell, Ministry of Environment & Forests answering the questions from participants during the HCFC Phase-out Management Plan (HPMP) Awareness Seminar on Refrigeration and Airconditioning Sector held on 29th July, 2010 at Mumbai

HCFC Phase-out Management Plan (HPMP) Awareness Seminar on Refrigeration and Airconditioning Sector held on 13th August, 2010 at Delhi

Smt. Jayanthi Natarajan, Hon'ble Minister of State for Environment & Forests (Independent Charge) addressing the participants during the "International Day for the Preservation of the Ozone Layer-2011" held on 16th September, 2011 at New Delhi

"Stakeholders Workshop on HCFC Phase Out Management Plan" held on 21st-22nd October, 2011 at New Delhi

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