

PROJECT COMPLETION REPORT

SECTION 1: HPMP OVERVIEW			
1.1 COUNTRY:	Brazil		
1.2 AGREEMENT TITLE:	HCFC Phase Out Management Plan (Stage I)		
1.3 DATE APPROVED (first tranche):	Friday, July 01, 2011		
	PLANNED (as per agreement)	APPROVED (as per inventory)	ACTUAL (as per progress report)
1.4 DATE OF COMPLETION (last tranche):		Wednesday, November 11, 2015	Tuesday, December 31, 2019
1.5 CONVERSION/ALTERNATIVE TECHNOLOGY USED			
From:	HCFC-141b	HCFC-141b	HCFC-141b
To:	Hydrocarbons (HC)	Methyl Formate	Methylal
From:	HCFC-141b	HCFC-141b	HCFC-141b
To:	Hydrofluoroolefin (HFO)	Water base (CO ₂)	Methylene Chloride
From:	HCFC-22		
To:	Multiple actions		
1.6 ODP PHASE-OUT:	220.3	220.3	215.88
1.7 TOTAL MLF FUNDING:	19,417,866	19,417,866	17,383,588.22
1.8 TOTAL COUNTERPART FUNDING (FOR ELIGIBLE INCREMENTAL COST):			
1.9 TOTAL PROJECT COST:	19,417,866	19,417,866	17,383,588.22
1.10 OVERALL ASSESSMENT (ACHIEVEMENT OF PROJECT OBJECTIVE):	Satisfactory as planned		
1.11 NO-COMPLIANCE Y/N	N		
	AGENCY	DATE SUBMITTED	
1.12 IMPLEMENTING AGENCY:	UNDP	Date information was inserted in the system by each agency	
1.13 COOPERATING AGENCY:	Germany		

SECTION 2: EVALUATION OF THE AMOUNT OF ODS CONSUMED BY YEAR													
	Substance	Year											
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Montreal Protocol Limit	HCFC					1,327.3	1,327.3	1,194.8					
Maximum allowable consumption	HCFC					1,327.3	1,327.3	1,194.8					
Phase-out per agreement (ODP tonnes)				64.2746	66.6274		34.0357	55.3623					220.3
Approved phase-out (ODP tonnes) (inventory)				14.8	0	5	40.7	42.4	49.13	16	42.35		210.38
Actual phase-out (ODP tonnes) (progress report)				14.8	0	5	40.7	42.4	49.13	16	42.35	5.5	215.88

SECTION 3: FATE OF ODS-BASED PRODUCTION EQUIPMENT			
LIST OF EQUIPMENT RENDERED UNUSABLE (the baseline)			
Name of equipment	Description	Disposal Type	Date of disposal (mm/dd/yyyy)
2 (two) High Pressure Dispensers at Danica	Krauss Maffei, 2003 / Cannon, 2003	Retrofit of equipment	06/01/2015
High Pressure Foam Line at Isoeste	HPD: PUMA, 2006	Retrofit of equipment	10/01/2013
2 (two) High Pressure Dispensers and 1 (one) Low Pressure Dispenser at MBP Isoblock	HPD: Krauss Maffei, 2000 / Cannon, 1996 LPD: Sulpol, 2006	Retrofit of equipment	03/05/2015
1 (one) High Pressure Dispenser and 2 (two) Low Pressure Dispensers at Cairu	HPD: ASK, January/2007 LPD: Pumer, 2003/ Pumer 2003	Retrofit of equipment	10/15/2015
2 Low Pressure Dispensers at Cantegrill (K1 colchões)	LPD: Coforma, 1999 /Coforma 2005	No action required	12/12/2014

1 (one) High Pressure Dispenser and 1 (one) Low Pressure Dispenser at Duoflex (Opetra)	HPD: Sulpol, 2005 LPD: Sulpoll 2004	Retrofit of equipment	07/17/2014
9 (nine) High Pressure Dispensers at Espumatect	HPD: Krauss Maffei, 2001 / Kraus Maffei, 2000 / Cannon, 2001, Cannon, 1999 / Cannon 1999 / Cannon 1999 / Elastrogran, 1999/ Hennecke, 1997 / Hennecke, 1997	No action required	02/20/2019
6 High Pressure Dispensers and 7 Low Pressure Dispensers at Frisokar	HPD: Krauss Maffei, 2001 / Hennecke, 1998 / Hennecke, 1998 / Hennecke, 1995 / Hennecke, 1995 / Thelma, 1997 LPD: own brand, 1995 / own brand, 1995 / own brand, 2000 / own brand, 2000 / own brand, 2000 / own brand, 2002	Retrofit of equipment (HPD) / Physical Destruction (LPD)	06/30/2015
1 (one) High Pressure Dispenser and 1 (one) Low Pressure Dispenser at Kalf	HPD: Cannon, 1995 LPD: Barmag, 1999	Retrofit of equipment	02/26/2015
2 (two) High Pressure Dispensers and 3 Low Pressure Dispensers at Liguez	HPD: Sulpol, 2003 / Sulpo, August 2007 LPD: Transtécnica, 2003 / Sulpol, 2002 / Sulpol, 2002	Retrofit of equipment (HPD) / Physical Destruction (LPD)	05/08/2014
3 (three) High Pressure Dispensers and 17 (seventeen) Low Pressure Dispensers at Spandy, Espumauto, PTP and MPU	HPD: Hennecke, 1995 / Hennecke, 2000 / own brand 2003 LPD: 15 Transtécnica from 1981 to 2006 / Sintor, 2001 / Sintor, 2003 /	Retrofit of equipment	08/19/2015
13 (thirteen) High Pressure Dispensers and 19 (nineteen) Low Pressure Dispenser at Amino's end users	HDP: Cannon / Hennecke/ Sulpol/ Elastrogran, from 1997 to 2005 LPD: Transtécnica, Sulpol, Pumer, Tecusi, Graco, own brand from 1997 to 2007	Retrofit of equipment	From August 2015 to July to 2018

11 (eleven) High Pressure Dispensers and 27 (twenty-seven) Low Pressure Dispenser at Arinos' (Univar) end users	HPD: Sulpol, Cannon, Elastogran, Pumer, Graco from 1999 to 2006 LPD: Transtécnica, Sulpol, Fibermaq, Pumer, Tetralon from 1995 to 2007	Retrofit of equipment	From February 2016 to December 2018
9 (nine) High Pressure Dispensers and 6 (six) Low Pressure Dispenser at Ariston's end users	HPD: RMPA, Krines Seeger, Fkarys Maffei from 1983 to 2003 LPD: Fibermaqu, Sulpol from 1999 to 2006	Retrofit of equipment	From December 2012 to July 2016
8 (eight) High Pressure Dispensers and 12 (twelve) Low Pressure Dispenser at Ecoblaster's end users	HPD: Sulpol, Kraus Maffei, Pumer from 2001 to 2005 LPD: Sulpol, Fibermaq, Transtécnica from 1990 to 2006	Retrofit of equipment	From July 2015 to October 2019
17 (seventeen) High Pressure Dispensers and 18 (eighteen) Low Pressure Dispenser at Polyurethane's end users	HPD: Pumer, Sulpol, Gosmer, Tecusi from 2002 to 2005 LPD: Pulmer, Transtécnica from 1993 to 2007	Retrofit of equipment	From May 2018 to December 2019
39 (thirty-nine) High Pressure Dispensers and 49 (forty-nine) Low Pressure Dispenser at Purcom's end users	HPD: Sulpol, RMPA, ASK, Kraus Maffei, Cannon, Fibermaqu, Elastogran, Wang Machine, Afros-Cannon, Puromat from 1989 to 2007 LPD: Equifiber, Sintenor, Transtécnica, Sulpol, Cannon, OMS, Baslima, House, Gusmer from 1980 to 2007	Retrofit of equipment	From December 2014 to December 2018
2 (two) High Pressure Dispensers at Shimtek's end users	HPD: Saip 2004, Sulpol 2003	No action required	From August 2016 to May, 2017
16 (sixteen) Low Pressure Dispenser at Utech's end user	LPD: Utech, Olin from 1991 to 2006	Retrofit of equipment	From November 2015 to December, 2018

SECTION 4: BUDGET AND EXPENDITURE OF HPMPs			
Implementing Agency	Project Budget	Total	Balance
UNDP ***	Funding as per agreement	15,326,957	2,034,278
	(a) Funds approved (inventory)	15,326,957	2,034,278
	(b) Funds disbursed (progress report)	13,292,679	
Germany ***	Funding as per agreement	4,090,909	0,00
	Funds approved (inventory)	4,090,909	0,00
	Funds disbursed (progress report)	4,090,909	0,00
Total MLF funding		19,417,866	17,383,588
Explanation if needed			

SECTION 5: IMPLEMENTATION EFFECTIVENESS					
5.1 Results					
Agency	Type of activity	Planned output	Actual activity output	Evaluation	Explanation (if necessary)
UNDP	A. Investment				
	Sector: Polyurethane foam manufacturing				
	Individual project for the conversion from HCFC-141b to cyclopentane in Isoeste, Isoblock and Danica enterprises	HCFC-141b phase-out consumption in the production of continuous panels	HCFC-141b phased-out consumption in the production of continuous panels	Satisfactory, as planned	n/a
	Individual project for the conversion from HCFC-141b to cyclopentane in Panisol enterprise	HCFC-141b phase-out consumption in the production of continuous panels	Enterprise declined participation in the project	Unsatisfactory	The enterprise performed formulation tests with cyclopentane, methyl formate and HFOs in 2013/2014. However, the enterprise reported that, because of its geographical location, in a very dense urban area, the use of a flammable technology is unfeasible. In addition, the high costs of non-flammable technologies would make the production economically unfeasible, leading the enterprise to decline the project.
	Individual project for the conversion from HCFC-141b to methyl formate in Kalf, Frisokar and Spandy Group	HCFC-141b phase-out in the production of integral skin and moulded flexible foam	HCFC-141b phased-out in the production of integral skin and moulded flexible foam	Satisfactory, as planned	n/a

	Individual project for the conversion from HCFC-141b to methylal in Cairu, Duoflex (currently Opetra) and Luguez enterprises	HCFC-141b phase-out in the production of integral skin and moulded flexible foam	HCFC-141b phased-out in the production of integral skin and moulded flexible foam	Satisfactory, as planned	After performing formulation tests with methyl formate, methylal, HFO and water base, the mentioned enterprises opted for using methylal in their conversion process
	Individual project for the conversion from HCFC-141b to methylene chloride in Cantegril enterprise (currently K1 Colchões)	HCFC-141b phase-out in the production of integral skin and moulded flexible foam	HCFC-141b phased-out in the production of integral skin and moulded flexible foam	Satisfactory, as planned	After performing formulation tests with methyl formate, methylal and methylene chloride, the mentioned enterprise opted for using methylene chloride in its conversion process
	Individual project for the conversion from HCFC-141b to HFO in Espumatec enterprise	HCFC-141b phase-out in the production of integral skin and moulded flexible foam	HCFC-141b phased-out in the production of integral skin and moulded flexible foam	Satisfactory, as planned	After performing formulation tests with methyl formate, methylal, methylal, HC and HFO, the mentioned enterprise opted for using HFO in its conversion process
	Group project to phase-out HCFC-141b in Amino System House and their end users	HCFC-141b phase-out in the production of integral skin and moulded flexible foam and rigid polyurethane for applications in thermoware, pipe-in-pipe, packing applications and solar panels	HCFC-141b phased-out in the production of integral skin and moulded flexible foam and rigid polyurethane for applications in thermoware, pipe-in-pipe, packing applications and solar panels	Satisfactory, as planned	After performing formulation tests with methyl formate and methylal, Amino opted for using both technological options in its conversion process.

					32 end users were converted within the scope of this project.
	Group project to phase-out HCFC-141b in Arinos System House (currently Univar) and their end users	HCFC-141b phase-out in the production of integral skin and moulded flexible foam and rigid polyurethane for applications in thermoware, pipe-in-pipe, packing applications and solar panels	HCFC-141b phased-out in the production of integral skin and moulded flexible foam and rigid polyurethane for applications in thermoware, pipe-in-pipe, packing applications and solar panels	Satisfactory, as planned	Arinos, currently Univar, became eligible in 2011. After performing formulation tests with methyl formate, methylal, water base and HFO, Arinos opted for using all above-mentioned technological options, according to the choice of the end user. 23 end users were converted within the scope of this project.
	Group project to phase-out HCFC-141b in Ariston System House and their end users	HCFC-141b phase-out in the production of integral skin and moulded flexible foam and rigid polyurethane for applications in thermoware, pipe-in-pipe, packing applications and solar panels	HCFC-141b phased-out in the production of integral skin and moulded flexible foam and rigid polyurethane for applications in thermoware, pipe-in-pipe, packing applications and solar panels	Satisfactory, as planned	After performing formulation tests with methyl formate and methylal, Ariston opted for using both technological options in its conversion process. 9 end users were converted within the scope of this project, among these and , 3 of them were converted to ISF/FMF and PUR

					applications, totaling 12 end users converted.
	Group project to phase-out HCFC-141b in Ecoblaster System House and its end users	HCFC-141b phase-out in the production of integral skin and moulded flexible foam and rigid polyurethane for applications in thermoware, pipe-in-pipe, packing applications and solar panels	HCFC-141b phased-out in the production of integral skin and moulded flexible foam and rigid polyurethane for applications in thermoware, pipe-in-pipe, packing applications and solar panels	Satisfactory, as planned	After performing formulation tests with methyl formate, methylal and water base, EcoBlaster opted for using methyl formate in its conversion process. 17 end users were converted within the scope of this project.
	Group project to phase-out HCFC-141b in Purcom System House and its end users	HCFC-141b phase-out in the production of integral skin and moulded flexible foam and rigid polyurethane for applications in thermoware, pipe-in-pipe, packing applications and solar panels	HCFC-141b phased-out in the production of integral skin and moulded flexible foam and rigid polyurethane for applications in thermoware, pipe-in-pipe, packing applications and solar panels	Satisfactory, as planned	After performing formulation tests with methyl formate, methylal, water base, HCs and HFOs, Purcom opted for using methyl formate in its conversion process. 72 end users were converted within the scope of this project.
	Group project to phase-out HCFC-141b in Shimtek System House and its end users	HCFC-141b phased-out in the production of integral skin and moulded flexible foam	HCFC-141b phased-out in the production of integral skin and moulded flexible foam	Satisfactory, but not as planned	After performing formulation tests with HFO, Shimtek opted for the use of this technology, with the adoption of HFCs in the transition period. However, in 2018, due to the high HFOs costs, the

					<p>system house performed new formulation tests with water base technology with its own resources and opted for the definitive migration to this technology (water base).</p> <p>2 end users were converted within the scope of this project.</p>
	<p>Group project to phase-out HCFC-141b in Polyurethane System House and its end users</p>	<p>HCFC-141b phase-out in the production of rigid polyurethane for applications in thermoware, pipe-in-pipe, packing applications and solar panels</p>	<p>HCFC-141b phased-out in the production of rigid polyurethane for applications in thermoware, pipe-in-pipe, packing applications and solar panels</p>	<p>Satisfactory, as planned</p>	<p>After performing formulation tests with methyl formate and methylal, Polyurethane opted for using methyl formate in its conversion process.</p> <p>55 end users were converted within the scope of this project.</p>
	<p>Group project to phase-out HCFC-141b in U-Tech System House and its end users</p>	<p>HCFC-141b phase-out in the production of rigid polyurethane for applications in thermoware, pipe-in-pipe, packing applications and solar panels</p>	<p>HCFC-141b phased-out in the production of rigid polyurethane for applications in thermoware, pipe-in-pipe, packing applications and solar panels</p>	<p>Satisfactory, but not as planned</p>	<p>After performing formulation tests with methyl formate and methylal to replace HCFC-141b, and gaseous HFO to replace HCFC-22, U-Tech opted for the use of methyl formate and HFO in its conversion process.</p>

					<p>The enterprise has been facing problems to validate the formulation with gaseous HFO. 12 end users were converted within the scope of this project, among those, 11 have not received IOC yet and continue to use HFC in the transition period.</p>
	<p>Group project to phase-out HCFC-141b in Ecopur System House (currently Rodza) and its end users</p>	<p>HCFC-141b phase-out in the production of rigid polyurethane for applications in thermoware, pipe-in-pipe, packing applications and solar panels</p>	<p>HCFC-141b phased-out in the production of rigid polyurethane for applications in thermoware, pipe-in-pipe, packing applications and solar panels</p>	<p>Satisfactory, but not as planned</p>	<p>After performing formulation tests with methyl formate and methylal, Ecopur (currently Rodza) opted for using methyl formate in its conversion process. No end users were converted within the scope of this project.</p>
	<p>Group project to phase-out HCFC-141b in MCassab System House and its end users</p>	<p>HCFC-141b phase-out in the production of rigid polyurethane for applications in thermoware, pipe-in-pipe, packing applications and solar panels</p>	<p>HCFC-141b phased-out in the production of rigid polyurethane for applications in thermoware, pipe-in-pipe, packing applications and solar panels</p>	<p>Satisfactory, but not as planned</p>	<p>After performing formulation tests with methyl formate and methylal, MCassab opted for using methyl formate in its conversion process. No end users were converted within the scope of this project.</p>

	Group project to phase-out HCFC-141b in Polisystem System House and its end users	HCFC-141b phase-out in the production of rigid polyurethane for applications in thermoware, pipe-in-pipe, packing applications and solar panels	Enterprise declined participation in the project	Unsatisfactory	The enterprise reported that, for commercial reasons, is evaluating the conversion to HFC, declining access to the available resources within the scope of the project.
Germany	A. Investment				
	Sector: Servicing Sector				
	Training and capacity building for refrigeration technicians in best practices for commercial refrigeration and air conditioning systems	4800 technicians trained in best practices for commercial refrigeration systems; 100 technicians trained in best practices for air conditioning systems; 40 instructors trained to teach best practice courses.	4800 technicians trained in best practices for commercial refrigeration systems; 100 technicians trained in best practices for air conditioning systems; 70 instructors trained to teach best practice courses.	Satisfactory, as planned	N/A
	Technical assistance and demonstration projects for better HCFC-22 containment in supermarkets	Implementation of five demonstration projects for better HCFC-22 containment in supermarkets; Implementation of commercial consulting programme for end users aimed at enhancing the enterprise's decision-making	Three demonstrations projects for better HCFC-22 containment in supermarkets implemented; Implementation of commercial consulting programme for end users aimed at enhancing the enterprise's decision-making process in favour of HCFC alternatives with low GWP; Five technical standards, created within the ABNT (Brazilian	Satisfactory, but not as planned	Two supermarkets announced that they would like to decline from the project due to changing of corporate governance strategy, as they intended to change the whole refrigeration system for a sub-critical CO ₂ /R-134a cascade system within the next two years.

		<p>process in favour of HCFC alternatives with low GWP;</p> <p>Support in the review, discussion and development of technical standards for the servicing sector.</p>	<p>Association for Technical Standards), with support of the Project.</p>	<p>Given this context and considering the higher, than initially expected, implementation costs, the successful implementation of three demonstration projects was possible from the technical and financial point of view.</p> <p>Below is the summary of the good results:</p> <ul style="list-style-type: none"> - The refrigeration systems of the partner stores changed to an annual leakage rate close to zero, with the installation in “sealed conditions”, obtained after the intervention, representing a reduction in direct emissions of more than 500,000 kg of CO₂ equivalent; <p>It is highlighted that the outsourced technical teams, which serve these stores and others, also provide services for dozens of other supermarket chains of the capital and interior of the states of Pará, São Paulo</p>
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					<p>and Santa Catarina. Thus, the acquired knowledge about best practices can be replicated;</p> <ul style="list-style-type: none">- In two stores, compressor control adjustments have resulted in cycling decrease, which provides longer life and reduced energy consumption. Thus, there has been an average increase of the Coefficient of Performance (COP):<ul style="list-style-type: none">• of 13% for the plus cooling system and of 4% for the minus cooling system (Supermarket 1);• of 7.4% for the plus cooling system (Supermarket 2);- Increasing energy efficiency, and thus decreasing energy consumption, offers significant savings to the supermarket and indirect reduction of greenhouse gas emissions, which results in environmental and economic gains.
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	<p>Online documentation system for better control and monitoring of refrigerant consumption</p>	<p>Implementation of an interactive application for the administration, documentation and maintenance of refrigeration and air conditioning equipment (logbook for refrigerant consumption and maintenance and repair activities).</p>	<p>"Pró-Ozônio" system published for free of charge use at the domain www.ozoniohcf.com.br;</p> <p>Technical assistance for users;</p> <p>Development of app for use of the system on Android smart phones.</p>	<p>Satisfactory, as planned</p>	<p>The online documentation system (Pró-Ozônio) allows the following activities:</p> <ul style="list-style-type: none"> - supports the management, operation and monitoring of refrigeration systems through a better control of data on refrigerant consumption and costs involved; - supports the reduction of refrigerant leakages and the demand for virgin substance through registration and monitoring of the relation between the amounts of refrigerants recovered and recharged; - supports the management and collection of maintenance and repair data.
	<p>Outreach and Awareness Campaign</p>	<p>Distribution of printed materials and technical publications;</p> <p>Participation and presentation of the project in</p>	<p>Project Website (www.boaspraticasrefrigeracao.com.br) published and continuously updated;</p> <p>Project Facebook Fanpage (https://www.facebook.com/camad)</p>	<p>Satisfactory, as planned</p>	<p>The divulgation of activities and distribution of materials and technical publications contribute to the dissemination of</p>

		<p>events, workshops and trade fairs of the sector;</p> <p>Publication and operation of website.</p>	<p>adeozonioerefrigeracaoeclima) created and under continuous maintenance;</p> <p>Active regional dissemination of activities and results of HPMP Stage I with publication of articles in sector and regional journals;</p> <p>Participation and presentation of the project in events, workshops and trade fairs of the sector;</p> <p>Technical publication “Guidelines for the safe use of hydrocarbons” prepared and printed;</p> <p>Technical publication on the application of natural refrigerants in supermarkets, prepared and published;</p> <p>Three best practice guides (Guide 1: Leak Control, Guide 2: Sealed System Design, Guide 3: Preventive Planned Maintenance) prepared and published;</p> <p>Printed materials and publications disseminated.</p>	<p>information and training of the sector about the developed activities .</p> <p>Handbooks on best refrigeration practices for commercial refrigeration equipment and split air conditioning systems with focus on leak containment and improvement of preventive maintenance activities are available for free download,. In addition, information and publications are available on the safe use of natural refrigerants. The materials are being used and were disseminated by industry associations and technical training institutions.</p> <p>Supermarkets have contacted the Project seeking additional information on alternative refrigerants with low environmental impact as</p>
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					well as on refrigerant containment practices.
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5.2 Delays in implementation							
Project number	Tranche	Actual date of approval	Planned date of completion	Planned duration (months)	Actual date of completion	Actual duration (months)	Delay (months)
BRA/PHA/64/INV/296	1 st	Friday, July 01, 2011	Tuesday, July 31, 2012	13 months	Tuesday, September 01, 2015	50 months	37 months
BRA/PHA/68/INV/299	2 nd	Saturday, December 01, 2012	Thursday, December 31, 2015	36 months	Sunday, December 31, 2017	48 months	12 months
BRA/PHA/75/INV/316	3 rd	Sunday, November 01, 2015	n/a		Tuesday, December 31, 2019		
BRA/PHA/64/INV/295	1 st	Friday, July 01, 2011	Tuesday, July 31, 2012	13 months	Wednesday, July 01, 2015	49	36
BRA/PHA/68/INV/298	2 nd	Saturday, December 01, 2012	Wednesday, December 31, 2014	25	Tuesday, December 01, 2015	36	11
BRA/PHA/73/INV/306	3 rd	Saturday, November 01, 2014	Wednesday, November 30, 2016	25	Friday, December 01, 2017	38	12
BRA/PHA/74/INV/307	4 th	Friday, May 01, 2015	Monday, May 01, 2017	24	n/a	n/a	n/a
BRA/PHA/75/INV/315	5 th	Sunday, November 01, 2015	Thursday, November 01, 2018	37	n/a	n/a	n/a

5.3 Causes of Delays of HPMP by Category			
Agency	Category	Causes of delays	Measures to overcome delay
UNDP			
	Implementing/cooperating agency	<p>Adoption of formal and administrative procedures to internalize the project;</p> <p>Definition of mechanisms to be adopted to allocate financial resources in enterprises benefited by the project.</p>	<p>Constant articulation with stakeholders to streamline the implementation of all necessary procedures;</p> <p>Definition of Guide for the development of a specific mechanism to implement projects under the Montreal Protocol by UNDP (<i>Internal Review Direct Contracts Guidelines for MP and GEF</i>)</p>
	Delays in funding following tranches approval		
	Low disbursement of funds		
	Project design		
	Enterprise delay	<p>The highly fragmented PU market makes it difficult to harmonize information about the HCFC phase-out schedule in Brazil, which influences the enterprises' decision-making on their participation in the project;</p> <p>The geographical distribution and the number of enterprises that benefit from the HPMP are obstacles for implementing the project in end users by these system houses;</p> <p>Enterprises believe that the use of ODS-free substances will lead to higher prices of final products beyond the period covered by the IOC, causing a delay in the adherence to the project.</p>	<p>Dissemination campaign through the distribution of folders, handbooks, posters and video, created and distributed since the beginning of Stage 1, in addition to the organization of technical events and information campaigns.</p> <p>Highlight to the following dissemination materials:</p> <p>a) Newsletter on the Brazilian HCFC Phase-Out Management Plan - published monthly. The newsletter presents the main actions implemented in Brazil under the HPMP. It is sent electronically to enterprises in the sectors involved in the HPMP and posted on the website of the Ministry of the Environment (www.mma.gov.br/ozonio) and on the UNDP website dedicated to the Brazilian HCFC Phase-Out Management Plan (www.protocolodemontreal.org.br);</p> <p>b) Countdown - electronic message informing the number of months remaining to the ban on HCFC-141b imports for the foam sector in Brazil. The</p>

			<p>message is emailed to enterprises in the sectors involved in the HPMP and posted on the UNDP website dedicated to the Brazilian HCFC Phase-Out Management Plan (www.protocolodemontreal.org.br);</p> <p>c) Informative videos - in addition to presenting information on the international effort to phase-out HCFCs and the substance phase-out schedule for the foam sector in Brazil, the videos provide information on how enterprises can access HPMP funds to assist in their plant conversion process. The informative videos were sent electronically to enterprises in the foam sector and posted on the website of the Ministry of the Environment (http://www.mma.gov.br/clima/protecao-da-camada-de-ozonio/difusao-de-informacao/videos-informativos) and http://www.mma.gov.br/clima/protecao-da-camada-de-ozonio/acoes-brasileiras-para-protecao-da-camada-de-ozonio/programa-brasileiro-de-eliminacao-dos-hcfc-HPMP/projeto-para-o-setor-de-manufatura-de-espumas-de-poliuretano) and on the UNDP website dedicated to the Brazilian HCFC Phase-Out Management Plan (www.protocolodemontreal.org.br).</p> <p>Highlight to the following events:</p> <p>a) Celebration of the International Day for the Preservation of the Ozone Layer: organized annually by the Brazilian Ministry of the Environment (MMA) with support of implementing agencies; the event highlights the implementation of actions adopted by the Brazilian government within the scope of the Montreal Protocol and acknowledges the efforts of</p>
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			<p>enterprises of the production sectors to phase-out the consumption of HCFCs awarding them with ceremonial plaques.</p> <p>b) Seminar on formulations of PU rigid foams: organized by the Brazilian Ministry of the Environment (MMA) and UNDP with support of the PU Sector Commission of the Brazilian Association of Chemical Industry (ABIQUIM), in May 2017; the seminar goal was to offer to the sector of rigid foams the opportunity to access deeper knowledge about the formulation of these products. Approximately 50 people participated of the event, including PU formulation specialists and foam manufacturing entrepreneurs. Recordings of all talks and discussions of the seminar may be accessed on the UNDP website dedicated to the Brazilian HCFC Phase-Out Management Plan; (www.protocolodemontreal.org.br);</p> <p>c) International workshop on environmentally-friendly alternatives to the foams sector - organized by the Brazilian Ministry of the Environment (MMA) and UNDP in April 2018, the workshop aimed at encouraging the international exchange of information and presented the results of the Colombian demonstration project for the use of HFO as blowing agent in the manufacturing of continuous panels. Approximately 35 people participated of the event, including PU formulation specialists and foam manufacturing entrepreneurs. Recordings of all talks and discussions of the workshop may be accessed on the UNDP website dedicated to the Brazilian HCFC Phase-Out Management Plan; (www.protocolodemontreal.org.br);</p>
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	Supplier delay	Difficulties to evaluate the formulation due to the non-availability of the gas HFO blowing agent in the national market and the high final cost of the imported product.	Contact with the gaseous HFO supplier to check the commercial availability and the cost trends in the medium term. Permanent contact with the beneficiary enterprise, assisting in the dialogue with the supplier of the substance of interest.
	ODS legislation		
	Verification audit report		
	External (regional, global factors)		
	Other (describe)	<p>The long-lasting economic crisis experienced by Brazil has affected several sectors, including the sector of PU foams;</p> <p>The interconnection between Stages I and II of the Brazilian HCFC Phase-Out Management Plan, since several enterprises operate in sectors covered by both stages;</p> <p>The availability of low-cost technologies in the national market and the high potential of global warming of the HFC mixtures.</p>	The same measures informed in the item Enterprise delay above.
Germany			
	Implementing/cooperating agency		
	Delays in funding following tranches approval		
	Low disbursement of funds		
	Project design		
	Enterprise delay		
	Supplier delay	Delays in the delivery of equipment and components purchased for the implementation of the demonstration projects for better HCFC-22 containment practices in supermarkets demanded special attention from the project's technical team. Changes were made to the	Suppliers were continuously monitored in order to speed up the delivery process. Additional technical visits and data collection were carried out to reevaluate the project.

		original layout of the refrigeration system. The project needed to be re-evaluated and additional technical visits and data collection were necessary.	
	ODS legislation		
	Verification audit report		
	External (regional, global factors)	<p>Commercial refrigeration was not the focus of previous activities under the National CFC Phase-Out Plan (NPP) and had to be planned from scratch in the HPMP. Workshops in this industry are very different from those in the domestic sector, and the establishment of cooperation networks in the supermarket sector is much more complex.</p> <p>Based on the training experience gained during implementation of the NPP, a regional training approach had been chosen to meet the specific needs of each of the five regions of Brazil, as well as to improve the enhancement of activities for Stage II in Brazil. However, the participation of regional training institutions in the tender and contracting process complicated the process. Most regional partners had no experience with this type of contract and needed previous authorization from national agencies to participate in tenders as individual contracts.</p> <p>The official authorization and compliance with the formal requirement for cooperation with industry associations and training institutions were harder than expected. Difficulties were faced regarding the authorization, circulation and discussion of documents due to complex</p>	Constant articulation with involved actors in order to speed up the progress of necessary procedures.

		<p>public administration requirements. In addition, between the planning and implementation of the HPMP several changes were made in partner institutions in terms of responsibility. The completion and/or legal analysis of agreements and contracts with public institutions and supermarkets posed additional difficulties.</p>	
	Other (technical)	<p>The technical analysis performed in the selected supermarkets showed that the operating conditions of the refrigeration systems were more critical than planned and that interventions to correct the identified problems would be more costly and complex.</p> <p>Finding the proper components for a demonstration unit to work as a model for supermarket refrigeration systems was more difficult than expected in terms of pressure, temperature, settings and performance of the system. It was also difficult to find suppliers willing to offer products that met the specifications required.</p> <p>Components and equipment for implementation of the intervention plans in the framework of the better HCFC containment demonstration projects such as the fixed leak detection and monitoring system were not always available in the national market. Selecting alternative components and contacting potential national suppliers was harder than expected. Moreover, finding suppliers interested in participating in tenders and offering</p>	<p>Hiring of additional technical consultants.</p> <p>Additional efforts with potential suppliers (e.g., extension of deadlines, previous hearings, bilingual technical specifications, continuous dialogue, among others).</p>

		supplies in accordance with the project's technical specifications and requirements has proven to be a difficult task.	
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SECTION 6: LESSONS LEARNED

Below is a non-exhaustive list of possible lessons learned topics:

Agency	Lessons learned	
UNDP		
	From the project implementation	<p>Always have the approval of enterprises on the technologies to be implemented in investment projects before submitting them for approval of the MLF Executive Committee.</p> <p>Consider the execution schedule established by the enterprises in their conversions to not generate any imbalance.</p>
	In relation to national and sectoral approach	Projects must be designed to meet the national and sector need.
	In relation to execution of sub-projects	<p>The process of contracting foam enterprises for the conversion of their plants, which is the key mechanism used for the implementation of projects in this sector, requires close cooperation with enterprises to define the Terms of Reference and Action Plans for conversion;</p> <p>Need to promote mechanisms with more agility and flexibility for the conversion of end users, considering the rotation of suppliers (System Houses) that characterizes the PU foam manufacturing sector;</p> <p>Use the experience of enterprises that finalized their industrial conversion projects and disseminate it to other enterprises (ex. ceremonial plaques for enterprises that concluded their conversion, videos showing the advances achieved by the project etc.).</p>
	In relation to supervision and monitoring of sub-project	The execution of service contracts signed between UNDP and HPMP beneficiary enterprises requires continuous monitoring by UNDP at the enterprise level;

		<p>The implementation of group projects requires constant and regular on-site monitoring, besides the necessity of defining a focal point located at the System Houses exclusively dedicated to the conversion of end users;</p> <p>Training on the implementation of group projects should be carried out with dedicated teams in System Houses, as soon as the service contracts are executed.</p>
	In relation to technical issues	<p>It is important to promote campaigns on the safe handling of alternatives that present any degree of flammability, in addition to establishing regulations and technical standards for the safe use of flammable blowing agents in the productive chain of PU foams. Considering this premise, for technological conversion projects in the polyurethane foams sector, the adoption of national and international parameters of industrial safety demonstrated by a safety certificate issued by a qualified enterprise is a sine-qua-non condition for the approval of technological conversion and for the disbursement of funds to HPMP beneficiary enterprises that opt for flammable alternatives. A Guide with the title of "Use of Flammable Blowing Agents on the PU Foam Productive Chain" was created and is currently in the final stage of electronic publication; the draft of the technical standard is currently being prepared.</p>
	In relation to availability of alternative technologies	<p>Technological conversions will only happen if there are available economically feasible alternatives.</p>
	In relation to policy and regulatory framework	<p>Policies and legal framework are the elements that drive the market.</p>
	In relation to import control	<p>There must be an efficient control of imports.</p>
	In relation to external cooperation	<p>External cooperation contributes for the knowledge of new technologies.</p>
	In relation to capacity building	<p>The strengthening of teams is an essential tool for the process of technological conversion.</p>
	In relation to public awareness	<p>The dissemination of information, to the population in general or to the productive sector, about the importance of not using ODS in products and</p>

		services, contribute to raise the awareness on responsible consumption and production, in addition to being an extremely important mechanism for influencing micro and small enterprises beneficiaries of the project. The dissemination of information must be performed on a regular basis.
	In relation to government commitment	Interest and commitment by the Country are necessary tool for the execution of projects.
	In relation to Executive Committee policy, implementing agency performance, inter-agency cooperation, etc.	Particularities of each country and competences of each institution should always be respected.
	In relation to institutional strengthening	Institutional strengthening projects are essential for the Government to keep the governance of the whole process.
	In relation to project design and preparation	Between the project design and kick-off, four years have passed and therefore there were changes in implementation costs and conditions. In this sense, flexibility is needed to implement investment projects, so as not to stop execution due to the lack of interest by beneficiaries.
	In relation to geo-political issues	Particularities of each country should be understood and respected.
	In relation to environmental issues	Environmental issues should be respected.
	In relation to cultural issues	Cultural issues should be understood and respected.
	In relation to variability in energy savings (for chillers projects)	Particularities of each country should be understood and respected.
Germany		
	From the project implementation	The positive results of the demonstration projects for better HCFC-22 containment demonstrate that HCFC-22 based systems in sealed conditions (following best refrigeration practices) can be used for many years by supermarket companies until they choose to invest in refrigeration systems with environmentally friendly technologies/refrigerants. Therefore, it becomes an efficient alternative in the medium term. The approach of the demonstration projects may be replicated in its entirety or in specific parts, serving as a model for a huge number of stores throughout Brazil operating under similar conditions. It is noteworthy that the methodology used may

		be replicated for other types of refrigerants, such as HFC-404A, which is also widely used in Brazilian supermarkets.
	In relation to national and sectoral approach	Due to the size of Brazil, it is important to adopt a regional training approach in order to meet the specific needs of each of the five regions of Brazil, as well as to improve the expansion of activities for Stage II in Brazil.
	In relation to execution of sub-projects	The structure of the servicing sector is mostly informal. This fact must be considered during preparation and implementation of activities for this sector.
	In relation to supervision and monitoring of sub-project	For local management activities, project monitoring and evaluation, the support of a local team with appropriate infrastructure is necessary. With the goal of monitoring and evaluating the knowledge acquired by technicians during the training courses, it is essential to establish a strategy of continuous follow-up, including interviews of participants and monitoring visits during the implementation of courses.
	In relation to technical issues	Material and equipment procurement processes require continuous monitoring of potential suppliers, as they tend not to participate in tenders.
	In relation to availability of alternative technologies	During training, it is important to disseminate information about the technological alternatives available.
	In relation to policy and regulatory framework	Policies and legal framework are elements that drive the market.
	In relation to import control	An efficient control of imports is necessary.
	In relation to external cooperation	External cooperation contributes to the knowledge of new technologies.
	In relation to capacity building	The dissemination of technology occurs relatively quickly. However, changing the mindset and behaviour of technicians in their daily work can take several years. Therefore, awareness-raising and training activities should be carried out from the beginning.
	In relation to public awareness	Awareness and educational activities at several institutional levels and a permanent dialogue among public and private stakeholders are part of the most important activities for the success of the performed actions.

		It is important to create communication strategies adapted to each sub-sector, as these are different target groups that require different information and media. The use of short videos within the communication strategy are an essential tool to disseminate content to the servicing sector. The identification and establishment of strategic partnerships for awareness campaigns are essential to harmonize the content of the developed materials, to increase the capillarity of information and to identify the sector needs.
	In relation to government commitment	Interest and commitment of the Country are necessary for the execution of projects.
	In relation to Executive Committee policy, implementing agency performance, inter-agency cooperation, etc.	Particularities of each country and competences of each institution should always be respected.
	In relation to institutional strengthening	Institutional strengthening projects are essential for the Government to keep the governance of the whole process.
	In relation to project design and preparation	Particularities of each country should be understood and respected. In addition to that, all actions must be discussed with all the stakeholders (including training centers, industry, associations and others) to make sure that there is positive participation and that the activities are supported.
	In relation to geo-political issues	Particularities of each country should be understood and respected.
	In relation to environmental issues	Environmental issues should be respected.
	In relation to cultural issues	Cultural issues should be understood and respected.
	In relation to variability in energy savings (for chillers projects)	Particularities of each country should be understood and respected.

SECTION 7: COMMENTS	
Agency	Comments
UNDP	Stage I of the HPMP was successfully implemented in Brazil and contributed to meet the freeze goals in 2013 and consumption reduction in 2015 in comparison with the HCFCs baseline.
Germany	All lessons learned and cooperation established during the successful implementation of HPMP Stage I served as basis for expanding training and dissemination activities during HPMP Stage II.
National counterpart	The implementation of the HPMP Stage I allowed Brazil to comply with the goals established by the Montreal Protocol.

SECTION 8: SUMMARY OF KEY DATA ON TRANCHES IN HPMP										
Project number	Sector	Tranche	Agency	Date approved	Date completed	Funds approved	Funds disbursed	ODF phase-out (approved)	ODP phase-out (actual)	Remarks
BRA/PHA/64/INV/296	Refrigeration Sector - Service	1 st	Germany	Friday, July 01, 2011	Tuesday, September 01, 2015	1,209,091	1,209,091	14.8	14.8	N/A
BRA/PHA/68/INV/299	Refrigeration Sector - Service	2 nd	Germany	Saturday, December 01, 2012	Sunday, December 31, 2017	2,472,727	2,472,727	0.00	0.00	N/A
BRA/PHA/75/INV/316	Refrigeration Sector - Service	3 rd	Germany	Sunday, November 01, 2015	n/a	409,091	409,091	36.7	36.7	N/A
BRA/PHA/64/INV/295	Foam Sector – Manufacture	1 st	UNDP	Friday, July 01, 2011	Wednesday, July 01, 2015	4,456,257	4,018,123	48.7	48.7	N/A
BRA/PHA/68/INV/298	Foam Sector – Manufacture	2 nd	UNDP	Saturday, December 01, 2012	Tuesday, December 01, 2015	3,400,000	2,826,386	0	0	N/A
BRA/PHA/73/INV/306	Foam Sector – Manufacture	3 rd	UNDP	Saturday, November 01, 2014	Friday, December 01, 2017	3,000,000	2,604,686	32.7	32.7	N/A
BRA/PHA/74/INV/307	Foam Sector – Manufacture	4 th	UNDP	Friday, May 01, 2015	n/a	3,000,000	2,918,703	32.9	32.9	N/A
BRA/PHA/75/INV/315	Foam Sector – Manufacture	5 th	UNDP	Sunday, November 01, 2015	n/a	1,470,700	924,782	54.5	50.1	N/A