BRAZIL

BRAZILIAN HCFC PHASE-OUT MANAGEMENT PLAN (HPMP)

STAGE I

PROGRESS REPORT 2019/2020

prepared by

THE MINISTRY OF THE ENVIRONMENT

with the support of the

UNITED NATIONS DEVELOPMENT PROGRAMME – UNDP,

the DEUTSCHE GESELLSCHAFT FÜR INTERNATIONALE ZUSAMMENARBEIT (GIZ) GMBH

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PROJECT COVER

COUNTRY	Brazil
LEADING IMPLEMENTATION AGENCY	UNDP
COOPERATING AGENCY	GIZ

SUBMISSION OF THE COMPLETE DOCUMENTATION		
Document	**Yes/No**	**Comments**
Progress Report of the Previous Tranche Stage I	Yes	Approved by the 64th Excom Meeting
Financial Report (disbursements >20% of the previously approved tranche)	Yes	
Verification Report (if applicable)	Yes	
Action Plan	Yes	Stage I
Pluriannual Tables (online)	Yes	
Official Endorsement Letter	Yes	
Revised Agreement (if applicable)	Yes	Stage I – Amended by Decision 75/53, paragraph a (ii)

RATIFICATION OF THE AMENDMENTS TO THE MONTREAL PROTOCOL			
Copenhagen	25 June 1997	**Beijing**	30 June 2004
Comments:			

ADOPTED REGULATIONS ON HCFC		
Regulation	**Yes/No**	**Comments**
HCFC – Licensing System (operational)	Yes	
HCFC – Quota System (operational)	Yes	

SUBMITTED ODS CONSUMPTION REPORTS			
Reports	**Yes/No**	**Year**	**Comments**
Country Programme	Yes	2018	
Data from Article 7 (most recent report)	Yes	2018	
ODS data for the tranche year	Yes	2018	
Explain any discrepancies			

HPMP DOCUMENT - STAGES 1 AND 2					
Phase-Out Commitment (%)	10	**Commitment year**	2016		
Phase-Out Commitment (%)	35	**Commitment year**	2020		
Phase-Out Commitment (%)	45	**Commitment year**	2021		
Servicing only	No	**Manufacturing only**	No	**Service/Manufacturing**	Yes

SUMMARY

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SECTION I.

PROGRESS REPORT

I.1. Introduction

1. The Brazilian HCFC Phase-Out Management Plan (HPMP) is aimed at developing and implementing actions to phase out consumption of ozone-depleting substances (ODS) under Group I, Annex C of the Montreal Protocol, pursuant to Decision XIX/6 agreed on during the 19th Meeting of the Parties to the Montreal Protocol.

2. The 64th Meeting of the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol – held in Montreal, Canada, in July 2011 – approved Stage I of the HPMP (Decision 64/40), with the aim of reducing national HCFC consumption by 10%, by 2015 in relation to the baseline.

3. The 75th Meeting of the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol – held in Montreal, Canada, in November 2015 – approved, in principle, Stage II of the HPMP, with the aim of reducing national HCFC consumption by 35%, by 2020, and by 45%, by 2021, both in relation to the baseline.

4. Implementation of Stages 1 and 2 of the HPMP and compliance with the legislation in force, coupled with the partial and independent conversion of multinational enterprises operating in the Brazilian household refrigeration sector enabled the country to achieve the consumption of 826.26 ODP tonnes in 2018[1], totaling a reduction of 37.75% in relation to the baseline.

5. Table 1 below presents the updated disbursement schedule reflecting the changes made by the MLF upon approval of the 5th tranche and refers to Stage I of the HPMP.

[1] Official data of the Brazilian government for the year of 2019 are available as from April 30, 2020

Table 1 – Tranches and consumption of ODS, 2011 – 2015, Stage I of the HPMP.

DESCRIPTION	2011	2012	2013	2014	2015	Total
	CONSUMPTION (tons ODP)					
ODS Reduction Schedule	*n/a*	*n/a*	1,327.3	1,327.3	1,194.8	***n/a***
Maximum allowed consumption	*n/a*	*n/a*	1,327.3	1,327.3	1,194.8	***n/a***
Consumption phase-out accomplished	*n/a*	-	1,189.25	1,164.74	1,025.81	***n/a***
	TRANCHES IN USD					
Lead Implementation Agency (IA) (UNDP) Funding	4,456,257	3,400,000	3,000,000	3,000,000	1,470,700*	**15,326,957**
Support Costs for Lead IA (UNDP)	334,219	255,000	225,000	225,000	110,303*	**1,149,522**
Cooperating Agency (GIZ) Funding	1,209,091	2,472,727	0	0	409,091	**4,090,909**
Support Costs for Cooperating Agency (GIZ)	153,000	262,000	0	0	45,000	**460,000**
Total Funding Agreed	**6,152,567**	**6,389,727**	**3,225,000**	**3,225,000**	**2,035,094**	**21,027,388**
Approved tranche to be funded by Lead IA (UNDP)	4,456,257	3,400,000	3,000,000	3,000,000	1,470,700*	**15,326,957**
Support Costs for Lead IA (UNDP)	334,219	255,000	225,000	225,000	110,303*	**1,149,522**
Approved tranche to be funded by Cooperating Agency (GIZ)	1,209,091	2,472,727	0	0	409,091	**4,090,909**
Support Costs for Cooperating Agency (GIZ)	153,000	262,000	0	0	45,000	**460,000**
Agreed funding paid	**5,665,348**	**5,872,727**	**3,000,000**	**3,000,000**	**1,879,791**	**19,417,866**
Total support cost paid	**487,219**	**517,000**	**225,000**	**225,000**	**155,303**	**1,609,522**
Total agreed cost paid	**6,152,567**	**6,389,727**	**3,225,000**	**3,225,000**	**2,035,094**	**21,027,388**
Approved tranches	**6,152,567**	**6,389,727**	**3,225,000**	**3,225,000**	**2,035,094**	**21,027,388**

*USD 179,300 and agency support costs of USD 13,448 for UNDP were deducted from the 5th tranche due to ineligibility of enterprise Arinos to access resources under the Multilateral Fund.

6. Table 2 below presents the updated disbursement schedule reflecting the changes made by the MLF upon approval of the 2nd tranche and refers to Stage II of the HPMP.

Table 2 – Tranches and consumption of ODS, 2015 – 2023, Stage II of the HPMP.

DESCRIPTION	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total amount
	CONSUMPTION (tons ODP)									
ODS Reduction Schedule	1,194.6	1,194.6	1,194.6	1,194.6	1,194.6	862.74	862.74	862.74	862.74	***n/a***
Maximum allowed consumption	1,194.6	1,194.6	1,194.6	1,194.6	1,194.6	862.74	730.02	730.02	730.02	***n/a***
Consumption phase-out accomplished	1,025.81	875.29	837.25	826.26						***n/a***
	TRANCHES IN USD									
Lead Implementation Agency (IA) (UNDP) Funding	3,078,900	0	2,627,704	7,168,396	0	3,895,000	0	0	0	16,770,000
Support Costs for Lead IA (UNDP)	215,523	0	183,939	501,788	0	272,650	0	0	0	1,173,900
Cooperating Agency (UNIDO) Funding	1,950,275	0	0	2,647,057*	0	3,619,365*	2,000,000	1,000,000	0	11,216,697
Support Costs for Cooperating Agency (UNIDO)	136,519	0	0	185,294*	0	253,356*	140,000	70,000	0	785,169
Cooperating Agency (GIZ) Funding	1,299,386	0	686,978	2,363,637	0	1,004,545	1,500,000	0	872,727	7,727,273
Support Costs for Cooperating Agency (GIZ)	144,614	0	76,457	263,059	0	111,800	166,941	0	97,129	860,000
Cooperating Agency (Italy) Funding	250,000	0	0	0	0	0	0	0	0	250,000
Support Costs for Cooperating Agency (Italy)	32,500	0	0	0	0	0	0	0	0	32,500
Total Funding Agreed	**7,107,717**	**0**	**3,575,078**	**13,129,131***	**0**	**9,156,716***	**3,806,941**	**1,070,000**	**969,856**	**38,815,539**
Approved tranche forthe Lead IA (UNDP)	3,078,900	0	2,627,704	7,168,396						12,875,000
Support Costs for Lead IA (UNDP)	215,523	0	183,939	501,788						901,250

Approved tranche forthe Cooperating Agency (UNIDO)	1,950,275	0	0	2,647,057*						4,597,332
Support Costs for Cooperating Agency (UNIDO)	136,519	0	0	185,294*						321,183
Approved tranche forthe Cooperating Agency (GIZ)	1,299,386	0	686,978	2,363,637						4,597,332
Support Costs for Cooperating Agency (GIZ)	144,614	0	76,457	263,059						321,813
Approved tranche for the Cooperating Agency (Italy)	250,000	0	0	0						250,000
Support Costs for Cooperating Agency (Italy)	32,500	0	0	0						32,500
Agreed funding paid	**6,578,561**	**0**	**3,314,682**	**12,179,090***						**22,072,333**
Total support cost paid	**529,156**	**0**	**260,396**	**950,141***						**1,739,693**
Total agreed cost paid	**7,107,717**	**0**	**3,575,078**	**13,129,231***						**23,812,026**
Approved tranches	**7,107,717**	**0**	**3,575,078**	**13,129,231***						**23,812,026**

*According to the updated agreement regarding Stage II of the HPMP - Document UNEP/OzL_Pro/ExCom 82/41 – Annex 1

I.2. Policies, Legislation, Institutional and Legal Frameworks on ODS

I.2.1. Status of the Ratification of the Amendments to The Montreal Protocol

7. Brazil adopted the Vienna Convention and the Montreal Protocol through Decree No. 99.280 from June 6, 1990. All amendments to the text of the Montreal Protocol have been ratified and passed by Brazil, with the exception of the Kigali Amendment on HFCs, which is in the process of ratification by the Country. Currently it is under consideration by the National Congress.

I.2.2. Legislation / Regulations on ODSs

I.2.2.1. HCFC Legal Framework

8. Table 3 below provides a list of regulatory acts related to HCFC reduction and phase-out in Brazil, pursuant to the commitments made under the Montreal Protocol:

Table 3 – Regulatory Acts on HCFC Phase-out in Brazil.

Year	Legal Instrument	Entity	Subject
2008	Normative Instruction No. 207 from November 21, 2008.	IBAMA	Provides for the control of imports related to Appendix C, Group I of Hydrochlorofluorocarbons (HCFCs) and mixtures containing HCFCs, from 2009 to 2012.
2010	Ordinance No. 41 from February 25, 2010; Ordinance No. 75 from March 30, 2010; and Ordinance No. 319 from August 30, 2010.	MMA	Establishes the HCFCs Working Group to assist with the preparation and implementation of the HCFC Phase-Out Management Plan and its respective projects.
2012	Ordinance nº 212, from June 26, 2012	MMA	Establishes the Brazilian HCFC Phase-Out Management Plan (HPMP) under the National Plan on Climate Change.
2012	Normative Instruction No. 14 from December 20, 2012	IBAMA	Provides for the control of imports of Hydrochlorofluorocarbons (HCFCs) and mixtures containing HCFCs, according to Decision XIX/6 of the Montreal Protocol, among other provisions.
2013	Normative Instruction No. 06 from March 15, 2013	IBAMA	Regulates the Federal Technical Registration of Potentially Polluting Activities and Activities which Use Environmental Resources (CTF/APP - IBAMA) and modernizes the IT instruments, based on the registration forms for Individuals and Enterprises.
2015	MMA Ordinance no. 179 from June 24, 2015	MMA	Extends the GT-HCFC period to December 31, 2020.
2018	Normative Instruction no. 4 from February 14, 2018	IBAMA	Regulatesd the control of imports of Hydrochlorofluorocarbons (HCFCs) and mixtures containing HCFCs, according to Decision XIX/6 of the Montreal Protocol, among other provisions
2018	Normative Instruction no. 5 from February 14, 2018	IBAMA	Regulates the environmental control of potentially polluting activities related to substances subject to control and phase-out under the Montreal Protocol.
2018	Decree nº 9.398 from June 4, 2018	Presidency of the Brazilian Republic	Amends the Decree from March 6, 2003 that created the Interministerial Executive Committee for the Protection of the Ozone Layer, with the purpose of establishing guidelines and coordinating actions related to the protection of the ozone layer.
2019	Decree nº 9.759 from April 11, 2019	Presidency of the Brazilian Republic	Extinguishes and establishes guidelines, rules and limits for federal public administration collegiate bodies. PROZON and GT-HCFCs were extinguished as per directive set forth by Decree 9.759.

Source: MMA

9. In Brazil, the import quota system for HCFCs and mixtures containing HCFC, established and regulated by IBAMA Normative Instruction no. 14 from December 20, 2012 and updated by IBAMA Normative Instruction (IN) no. 04 from February 14, 2018, coupled with the actions implemented under the HPMP have ensured fulfillment of the country's commitment to gradually phase-out its HCFC consumption. The computerized licensing system to control ODS consumption - whose authorizing agency is IBAMA - has been an important tool for defining action strategies targeted at achieving the Montreal Protocol objectives, for designing related rules and regulations and for planning training activities and awareness campaigns in Brazil.

10. Regarding flammable alternatives, the Brazilian government, along with UNDP and GIZ, has been promoting awareness campaigns about the safe handling of alternatives with a low negative impact on the global climate system and which have some degree of flammability. In the case of 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. In order to assist enterprises to address the safety parameters for flammable technological options, a Guide named "Use of Flammable Blowing Agents for the Preparation of Fully-Formulated Polyols and Foams in the Polyurethane Production Chain" was developed and is in its editing phase before electronic publishing. Currently, a Technical Standard for the safe use of flammable blowing agents in the production chain of the polyurethane foam sector is under internal consultation in the relevant institutions. Additionally, the government has supported the Brazilian Association of Technical Standards (ABNT) in developing and discussing specific technical standards to ensure, at national level, the standardization of handling, installation and maintenance of equipment using flammable HCFC alternatives. Among the initiatives, the revision of the ABNT Standard NBR 16069 on "Safety of Refrigeration Systems" based on the latest version of the international standard ISO 5149, and the development of a technical standard on terminology of refrigerants are highlighted.

I.3. HCFC Consumption and Production

11. Brazil does not produce HCFCs. Therefore, the national consumption is based on imports and exports. Table 4 provides data on HCFC consumption in the country from 2007 to 2018.[1]

Table 4 – HCFC Consumption, Brazil, 2007 – 2018[1].

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
HCFC-22	ODP t.	562.98	582.95	753.10	831.01	627.48	936.10	784.10	787.64	701.67	610.60	552.78	485.69
	ODS t.	10,235.99	10,599.10	13,692.67	15,109.34	11,408.80	17,020.04	14,256.44	14,320.78	12,757.62	11,101.86	10,050.47	8,830.72
HCFC-141b	ODP t.	573.85	432.61	649.31	393.76	408.13	443.06	400.56	371.03	314.94	260.90	284.56	338.38
	ODS t.	5,216.82	3,932.84	5,902.85	3,579.62	3,710.27	4,027.82	3,641.42	3,373.04	2,863.05	2,371.80	2,586.90	3,076.18
HCFC-142b	ODP t.	2.14	1.47	4.37	6.84	4.46	0.78	0.97	3.51	3.96	2.32	-1.33	1.43
	ODS t.	32.98	22.69	67.23	105.28	68.69	12.02	14.88	54.06	60.96	35.74	-20.50	22.02
HCFC-123	ODP t.	0.93	0.41	0.20	0.40	0.89	3.42	0.00	0.06	0.00	-0.06	0.30	0.18
	ODS t.	46.70	20.57	9.99	19.84	44.31	170.79	0.00	3.00	0.00	-2.87	14.89	8.99
HCFC-124	ODP t.	11.45	3.66	8.49	6.97	5.43	4.51	3.62	2.49	5.24	1.52	0.95	0.58
	ODS t.	520.29	166.54	385.72	316.90	246.94	204.83	164.59	113.20	238.12	69.22	42.98	26.21
HCFC-225	ODP t.	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	ODS t.	0.20	0.10	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**ODP t.**	**1,151.37**	**1,021.12**	**1,415.47**	**1,238.98**	**1,046.40**	**1,387.87**	**1,189.25**	**1,164.74**	**1,025.81**	**875.29**	**837.25**	**826.26**
	ODS t.	**16,052.97**	**14,741.84**	**20,058.51**	**19,130.98**	**15,479.01**	**21,435.50**	**18,077.33**	**17,864.08**	**15,919.75**	**13,575.75**	**12,674.74**	**11,964.12**

Source: MMA – 2007 through 2018

12. HCFC consumption in Brazil in 2018 totaled 826.26 ODP tonnes, 37.75% lower than the established baseline (1,327.30 tonnes), thus reflecting the country's phase-out efforts to meet the commitments agreed under the Montreal Protocol through implementation of Stages 1 and 2 of the HPMP and fulfillment of the legislation in force, as well as the partial and independent conversion of multinational domestic refrigeration enterprises operating in Brazil.

13. The Normative Instruction (IN) from IBAMA nº 04, from February 14, 2018, establishes that:

a) For the years 2018 and 2019, the HCFC consumption will maintain the 16.60% reduction as established by IBAMA IN 14 from December 20, 2012;
b) Starting from January 1, 2020, the total HCFC consumption will be reduced by 39.30% in relation to the baseline, with a 90.03% decrease in the specific HCFC-141b quota;
c) Starting from January 1, 2020, HCFC consumption will be reduced by 51.60% in relation to the baseline, with a 27.10% decrease in the specific HCFC-22 baseline;
d) For the other HCFCs imported into Brazil, the consumption for the same period should not exceed the levels established for 2013.

14. Consumption of these HCFCs together should not exceed 642.94 ODP tonnes from 2021 to the next target established by the Montreal Protocol.

15. The above-mentioned IN nº 04 also establishes the ban of HCFC-141b imports for foam manufacturing, starting from January 1, 2020, as well as the ban on both, the import and export of formulated polyol containing HCFC-141b, starting from 1 January 2021.

16. Table 5 provides data on HCFC imports and exports in Brazil by sector in 2018. The information is in line with that presented in the Country Programme Report.

Table 5 – HCFCs Imports and Exports in metric tonnes, by sector in Brazil, in 2018[1].

Substance	Import (ODS t.)				Export (ODS t.)
	Foam	RAC Manufacturing	RAC Servicing	Total	
HCFC-22	0.0	1,324.61	7,506.11	8,830.72	0.00
HCFC-141b	3,095.78	0.0	0.0	3,095.78	19.59
HCFC-142b	0.0	3.96	18.06	22.02	0.00
HCFC-123	0.0	1.8	7.19	8.99	0.15
HCFC-124	0.0	5.5	20.71	26.21	0.00
TOTAL	**3,095.78**	**1,335.87**	**7,552.07**	**11,983.72**	**19.74**

17. In 2018, 19.74 metric tonnes of HCFC-141b were exported to Argentina and 0.15 metric tonnes of HCFC-123 were exported to Uruguay.

18. There are no records of imports or exports of polyol containing HCFC-141b.

I.4. HCFC Phase-out Activities

I.4.1 Stage I of the HPMP

I.4.1.1 Activities in the Polyurethane Foam Manufacturing Sector (progress from previous reports).

19. Individual Projects - Continuous Panels:

a) Panisol declined participation in the HPMP: The company informed that, due to its location in a very densely populated urban area, the use of flammable technology is unfeasible. Additionally, the high cost of non-flammable technologies would make its production economically unfeasible. The remaining resources associated with this project will be returned to the MLF.

20. Individual Projects – Integral Skin, Moulded Flexible Foam and Rigid Polyurethane:

a) Enterprise Espumatec: it has completed its industrial conversion activities of the manufacturing plant in February 2019, as planned.

21. Group Projects – Integral Skin, Moulded Flexible Foam and Rigid Polyurethane:

a) System house Arinos (Univar) is in the conversion phase of its manufacturing plant with its own resources. Currently, 50% of all formulated polyol systems produced are HCFC-141b-free and the company informed that it plans to close the supply of formulated polyol containing HCFC-141b within 6 months of the import ban into Brazil on January 1, 2020.
b) System house Polyurethane, which is specific to the rigid PU sector, completed the industrial conversion of 55 end users under the group project led by the System House;
c) System Houses MCassab and Rodza concluded the industrial conversion activities of their manufacturing plants. There was not sufficient time to put into practice the servicing contract for end users for these two system houses. However, both enterprises established an agreement to end the consumption of HCFC-141b by December 2019.
d) System house Polisystem, which operates specifically in the rigid PU sector, declined participation in the HPMP. The resources associated with this project will be returned to the MLF;
e) The enterprise Termolar initiated its industrial conversion process with the support of the System House Amino. Nevertheless, only now has the enterprise definitively finalized its conversion process, selecting HFO as the blowing agent;
f) By December 2019, a total of 226 end users have been converted to HCFC-free technologies with full support from the MLF resources.

22. Enterprises temporarily using polyol systems containing high-GWP HFCs: As previously reported, two system houses - Shimtek and U-Tech - have requested authorization for the temporary use of polyol systems containing high GWP HFCs, with the commitment to discontinue its use as soon as HFOs are available on the market and polyol systems with HFO have been developed and optimized. For this purpose, they will use resources of their own. Enterprises have reported the

following advancements:

a) Shimtek: the enterprise has opted for water-based technology to replace the use of HFOs for flexible foam applications, using the resources of its own for the necessary adjustments in the formulations. Additionally, the enterprise informs that the high costs of HFOs in the national market continue to be the biggest barrier for Shimtek to produce systems at competitive prices.
b) U-Tech: HFC-134a is still replacing **HCFC-22** as a temporary measure for the production of the Froth system. The process of importing gaseous HFOs samples, as reported previously, was completed at a final FOB cost of USD 22.00/kg. New tests were performed, and the enterprise is currently in contact with the suppliers to organize the final adjustments. The prepared samples will undergo through a six-month evaluation period to evaluate the stability of the product. They held a meeting in July 2019 to discuss the technical and commercial-financial details. In that meeting, they were informed by Honeywell, verbally, that the final cost of the imported product would be around USD 19.75/kg. In a future prospecting scenario, the company informs that this cost would impact 33% of the final cost of the product, rendering its offer in the market unfeasible.

23. Projects under Stage I of the HPMP have resulted, from their inception to December 2019, in the technological conversion of enterprises: Isoeste, Isoblock, Danica, Duoflex, Kalf, Cantegril, Frisokar, Luguez, Cairu, Grupo Spandy (4 companies: Spandy, Espumauto, MPU Poliuretanos, PTP Peças) and Espumatec, and the system houses Polyurethane, Purcom, Ariston, Amino, Ecoblaster, Utech, Shimtek, MCassab, Rodza and Arinos (Univar - self-funded partial conversion), as well as the conversion of 226 end users which converted to HCFC-free technologies, amounting to a total of 249 enterprises converted with full support from the MLF resources, which, in turn, resulted in phasing out the consumption of 164.38 ODP tonnes of HCFC-141b through the industrial conversion projects.

24. Table 6 provides detailed qualitative data on activities implemented in each industrial conversion project until December 2019, under Stage I of the HPMP.

Table 6 – Industrial conversion activities implemented in the PU foam sector as of December 2019, with funds from the five tranches approved under Stage I of the HPMP.

SECTOR	ENTERPRISE	STATUS OF IMPLEMENTATION	OUTCOMES / OUTPUTS (IMPLEMENTED ACTIVITIES)
Continuous Panel	ISOESTE	• Project completed	• Enterprise eligibility validated; • Terms of Reference and Action Plan defined; • Service Contract signed; • Conversion technology defined (hydrocarbon); • Plant conversion plan implemented; • Safety Certificate issued; • Term of Commitment signed; • Final review of processes completed; • Project completed; • 4.95 ODP tonnes phased-out; • Certificate of Completion (COC) signed.
	MBP ISOBLOCK	• Project completed	• Enterprise eligibility validated; • Terms of Reference and Action Plan defined; • Service Contract signed; • Conversion technology defined (hydrocarbon); • Plant conversion plan implemented; • Safety Certificate issued; • Term of Commitment signed; • Final review of processes completed; • Project completed; • 16.78 ODP tonnes phased-out; • Certificate of Completion (COC) signed.
	DANICA	• Project completed	• Enterprise eligibility validated; • Terms of Reference and Action Plan defined; • Service Contract signed; • Conversion technology defined (hydrrocarbon); • Plant conversion plan implemented; • Safety Certificate issued; • Term of Commitment signed; • Final review of processes completed; • Project completed; • 7.66 ODP tonnes phased-out; • Certificate of Completion (COC) signed.
	PANISOL	• Project not implemented; • Enterprise declined participating.	• Enterprise eligibility validated; • Terms of Reference and Target Plan for technology test defined; • Service Contract signed; • Scheduling of four monitoring meetings; • Remote follow-up on the conversion status of the enterprise; • Enterprise declined participating, remaining funds will be returned.

Integral Skin / Moulded Flexible Foam (ISF/ FMF)	LUGUEZ	• Project completed	• Enterprise eligibility validated; • Terms of Reference and Action Plan defined; • Service Contract signed; • Conversion technology defined (Methylal); • Term of Commitment signed; • New Term of Commitment signed (temporary use of HCFC-141b); • Plant conversion plan implemented; • Safety Certificate issued; • Final review of processes completed; • Project completed; • 13.20 ODP tonnes phased-out; • Certificate of Completion (COC) signed.
	FRISOKAR	• Project completed	• Enterprise eligibility validated; • Terms of Reference and Action Plan defined; • Service Contract signed; • Conversion technology defined (Methyl Formate); • Plant conversion plan implemented; • Safety Certificate issued; • Term of Commitment signed; • Final review of processes completed; • Project completed; • 7.06 ODP tonnes phased-out; • Certificate of Completion (COC) signed.
	CAIRU	• Project completed	• Enterprise eligibility validated; • Terms of Reference and Action Plan defined; • Service Contract signed; • Conversion technology defined (Methylal); • Plant conversion plan implemented; • Term of Commitment signed; • Safety Certificate issued; • Final review of processes completed; • Project completed; • 3.30 ODP tonnes phased-out. • Certificate of Completion (COC) signed.
	CANTEGRIL	• Project completed	• Enterprise eligibility validated; • Terms of Reference and Target Plan for technology test defined; • Service Contract signed; • Conversion technology defined (Methylene Chloride); • Plant conversion plan implemented; • Term of Commitment signed; • Final review of processes completed; • Project completed; • 0.84 ODP tonnes phased-out; • Certificate of Completion (COC) signed.

	DUOFLEX	• Project completed	• Enterprise eligibility validated; • Terms of Reference and Action Plan defined; • Service Contract signed; • Conversion technology defined (Methylal); • Plant conversion plan implemented; • Term of Commitment signed; • Safety Certificate issued; • Final review of processes completed; • Project completed; • 3.04 ODP tonnes phased-out; • Certificate of Completion (COC) signed.
	SPANDY	• Project completed	• Enterprise eligibility validated; • Terms of Reference and Action Plan defined; • Service Contract signed; • Conversion technology defined (Methyl Formate); • Plant conversion plan implemented; • Term of Commitment signed; • Safety Certificate issued; • Final review of processes completed; • Project completed; • 3.53 ODP tonnes phased-out; • Certificate of Completion (COC) signed.
	ESPUMATEC	• Project completed	• Enterprise eligibility validated; • Terms of Reference and Action Plan for technology test defined; • Service Contract signed; • Plan for technology selection finalized (Methyl Formate); • Change of technological option to water base; • Plant conversion plan under execution; • Project completed; • 11.98 ODP tonnes phased-out; • Certificate of Completion (COC) signed.
	KALF	• Project completed	• Enterprise eligibility validated; • Terms of Reference and Action Plan defined; • Service Contract signed; • Conversion technology defined (Methyl Formate); • Plant conversion plan implemented; • Term of Commitment signed; • Safety Certificate issued; • Project completed; • 4.40 ODP tonnes phased-out; • Certificate of Completion (COC) signed.

System Houses in the ISF/FMF and Rigid PU Sectors	ARINOS (UNIVAR)	• Conversion of 50% of the plant; • 23 end users converted; • Project completed	• Ineligibility of the enterprise confirmed (non-eligible enterprise); • Service Contract signed; • Plan for technology selection finalized; • Conversion technology defined by the enterprise (Methylal and Methyl Formate); • Term of Commitment signed; • 11.2 ODP tonnes of HCFC-141b phased-out; • Formulation tests carried out in 40 end users; • Information on end users delivered and validated; • Terms of Reference and Action Plans for the conversion of end users defined; • Servicing Contract for the conversion of end users signed (ISF/FMF and Rigid PU); • Conversion of end users completed (ISF/FMF and Rigid PU); • Certificate of Completion (COC) signed.
	PURCOM	• System House conversion to ISF/FMF and rigid PU (solar heaters, thermoware, pipe-in-pipe and packing) completed; • 72 end users converted; • Project completed	• Enterprise eligibility validated; • Terms of Reference and Action Plan for the system house conversion defined; • Service Contract for the System House conversion signed; • Conversion technology defined by the enterprise (Methyl Formate); • Term of Commitment signed; • System House conversion to Integral Skin, Moulded Flexible Foam and Rigid Polyurethane (solar heaters, thermoware, pipe-in-pipe and packing applications) completed; • Safety Certificate issued; • 25.86 ODP tonnes of HCFC-141b phased-out; • Information on end users delivered and validated (ISF/FMF and rigid PU); • Terms of Reference and Action Plans for the conversion of end users defined; • Service Contract for the conversion of end users under implementation (ISF/FMF and Rigid PU); • Conversion of end users completed (ISF/FMF and Rigid PU); • Certificate of Completion (COC) signed.

	ARISTON	• System House conversion to ISF/FMF and rigid PU (solar heaters, thermoware, pipe-in-pipe and packing) completed. • Nine end users converted, and three of them were converted to ISF/FMF and Rigid PU applications, totaling 12 converted enterprises; • Project completed	• Enterprise eligibility validated; • Terms of Reference and Action Plan for system house conversion defined; • Service Contract for the System House conversion signed; • Conversion technology defined (Methyl Formate and Methylal); • Term of Commitment signed; • System House conversion to Integral Skin, Moulded Flexible Foam and Rigid Polyurethane (solar heaters, thermoware, pipe-in-pipe and packing applications) completed; • Safety Certificate issued; • 6.59 ODP tonnes of HCFC-141b phased-out; • Information on end users delivered and validated (ISF/FMF and rigid PU); • Terms of Reference and Action Plans for the conversion of end users defined; • Servicing Contract for the conversion of end users signed (ISF/FMF and Rigid PU); • Conversion of end users completed (ISF/FMF and Rigid PU); • Certificate of Completion (COC) signed.
	AMINO	• System House conversion to ISF/FMF and rigid PU (solar heaters, thermoware, pipe-in-pipe and packing) completed; • 32 end users converted; • Project completed	• Enterprise eligibility validated; • Terms of Reference and Action Plan for system house conversion defined; • Service Contract for the System House conversion signed; • Conversion technology defined (Methyl Formate); • Term of Commitment signed; • System House conversion to Integral Skin, Moulded Flexible Foam and Rigid Polyurethane (solar heaters, thermoware, pipe-in-pipe and packing applications) completed; • Safety Certificate issued; • 9.37 ODP tonnes of HCFC-141b phased-out; • Information on end users delivered and validated (ISF/FMF and rigid PU); • Terms of Reference and Action Plans for the conversion of end users defined; • Servicing Contract for the conversion of end users signed (ISF/FMF and Rigid PU); • Conversion of end users completed (ISF/FMF and Rigid PU); • Certificate of Completion (COC) signed.

	ECOBLASTER	• System House conversion to ISF/FMF and rigid PU (solar heaters, thermoware, pipe-in-pipe and packing) completed. • 17 end users converted; • Project completed.	• Enterprise Eligibility Validated; • Terms of Reference and Action Plan for system house conversion defined; • Service Contract for the System House conversion signed; • Conversion technology defined (Methyl Formate); • Term of Commitment signed; • System House conversion to Integral Skin, Moulded Flexible Foam and Rigid Polyurethane (solar heaters, thermoware, pipe-in-pipe and packing applications) completed; • Safety Certificate issued; • 11.08 ODP tonnes of HCFC-141b phased-out; • Information on end users delivered and validated (ISF/FMF and rigid PU); • Terms of Reference and Action Plans for the conversion of end users defined; • Servicing Contract for the conversion of end users signed (ISF/FMF and Rigid PU); • Conversion of end users completed (ISF/FMF and Rigid PU); • Certificate of Completion (COC) signed.
	SHIMTEK	• System House Conversion to ISF/FMF completed; • Two end users converted; • Project completed; • Temporary use of High-GWP HFC; • HFO tests performed with satisfactory results; • High cost and limited availability of liquid HFO, rendering the final conversion unfeasible; • Technology shift: water-based • Project completed.	• Enterprise eligibility validated; • Terms of Reference and Action Plan for technology test defined; • Service Contract signed; • Revised Service Contract signed; • Conversion technology defined (HFO); • Temporary use of High-GWP HFC until commercial HFOs are available and until systems with HFO are developed and optimized; • Definition of a new conversion plan completed; • System House Conversion completed; • 1.25 ODP tonnes of HCFC-141b phased-out; • Information on end users delivered and validated (ISF/FMF); • Terms of Reference and Action Plans for the conversion of end users defined; • Service Contract for the conversion of end users completed (ISF/FMF); • Change of technological option to water base; • Certificate of Completion (COC) signed.

	M CASSAB	• System House Conversion to Rigid PU completed; • Project completed	• Enterprise eligibility validated; • Terms of Reference and Action Plan for technology test defined; • Holding of five implementation meetings; • Holding of new tests for the definition of technology; • Service Contract for the System House conversion to Rigid Polyurethane (solar heaters, thermoware, pipe-in-pipe and packing applications) signed; • Conversion technology defined: Methyl Formate; • Plant conversion plan defined; • System House conversion to Rigid Polyurethane (solar heaters, thermoware, pipe-in-pipe and packing applications) completed; • Safety Certificate issued; • 1.10 ODP tonnes in the Rigid PU sector phased-out; • Certificate of Completion (COC) signed.
	ECOPUR (RODZA)	• System House Conversion to Rigid PU completed; • Project completed.	• Enterprise eligibility validated; • Terms of Reference and Action Plan for technology test defined; • Holding of eight implementation meetings; • Performance of new tests for the definition of technology; • Service Contract for the System House Conversion of Rigid PU (solar heaters, thermoware, pipe-in-pipe and packings) completed; • Conversion technology defined: Methyl Formate; • Plant conversion plan defined; • System House conversion to Rigid Polyurethane (solar heaters, thermoware, pipe-in-pipe and packing applications) completed; • Safety Certificate issued; • 0.51 ODP tonnes in the Rigid PU sector phased-out; • Certificate of Completion (COC) signed.

	POLYURETHANE	• System House Conversion to Rigid PU completed; • 55 end users converted; • Project completed.	• Enterprise eligibility validated; • Terms of Reference and Action Plan for technology test defined; • Selected technology (Methyl Formate); • Term of Commitment signed; • Service Contract for the System House conversion to Rigid Polyurethane (solar heaters, thermoware, pipe-in-pipe and packing applications) signed; • System House conversion to Rigid Polyurethane (solar heaters, thermoware, pipe-in-pipe and packing applications) completed; • Safety Certificate issued; • 14.93 ODP tonnes of HCFC-141b phased-out; • Information on end users delivered and validated (Rigid PU); • Terms of Reference and Action Plans for the conversion of end users defined; • Service Contract for the conversion of end users completed; • Certificate of Completion (COC) signed.
	POLISYSTEM	• Project not implemented. • Enterprise declined participating	• Enterprise Eligibility Validated; • Terms of Reference and Action Plan for technology test defined; • Plan for technology selection finalized; • New tests for the definition of technology under way; • Remote follow-up on the conversion status of the enterprise. • Enterprise declined participating, project funds will be returned.

	U-TECH	• System House conversion to Rigid PU (solar heaters, thermoware, pipe-in-pipe and packing) completed; • 12 end users converted; • Conversion of the end users completed; • Project completed; • Temporary use of High-GWP HFC; • New tests were performed and results are being analyzed; • High cost and limited availability of gaseous HFO in the market, rendering the final conversion unfeasible.	• Enterprise eligibility validated; • Terms of Reference and Action Plan for technology test defined; • Service Contract for the System House conversion signed; • Conversion technologies defined (Mehtyl Formate replacing HCFC-141b and HFO replacing HCFC-22); • Temporary use of High-GWP HFC replacing HCFC-22 until commercial HFOs are available and until systems with HFO are developed and optimized; • Term of Commitment signed; • System House conversion to Rigid Polyurethane (solar heaters, thermoware, pipe-in-pipe and packing applications) completed; • Safety Certificate issued; • 3.22 ODP tonnes in the Rigid PU sector phased-out; • Information on end users delivered and validated (Rigid PU); • Terms of Reference and Action Plans for the conversion of end users developed; • Service Contract for the conversion of end users (Rigid PU) signed; • Conversion of the end users completed (Rigid PU); • Certificate of Completion (COC) signed.

25. The following publicity pieces have been widely used to sensitize the foam sector about the urgency of their conversion during the implementation of Stage I of the HPMP:

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 UNDP website dedicated to the Brazilian HCFC Phase-Out Management Plan (www.protocolodemontreal.org.br);

b) Countdown - electronic message informing the number of months remaining for the ban on HCFC-141b imports for the foam sector in Brazil. The message is emailed to enterprises in the sectors involved in the HPMP and posted on UNDP website dedicated to the Brazilian HCFC Phase-Out Management Plan (www.protocolodemontreal.org.br).

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 and, also on the testimony of previously converted enterprises, emphasizing the results achieved. 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 e http://www.mma.gov.br/clima/protecao-da-camada-de-ozonio/acoes-brasileiras-para-

protecao-da-camada-de-ozonio/programa-brasileiro-de-eliminacao-dos-hcfcs-pbh/projeto-para-o-setor-de-manufatura-de-espumas-de-poliuretano) and on UNDP website dedicated to the Brazilian HCFC Phase-Out Management Plan (www.protocolodemontreal.org.br).

26. In additon, frequent meetings between the Brazilian NOU (MMA), UNDP and the international project consultant, periodic monitoring field meetings/visits and contacts through official mail, email and telephone continue to be used as tools to sensitize enterprises in the foam sector.

27. With the purpose of publicizing the results achieved during the Stage I of the HPMP, a communication event will be organized in cooperation with the Ministry of the Environment and GIZ foreseen June 2020.

28. In compliance with the ExCom's Decision 84/32, Annex 1 presents:

a) All downstream foam enterprises assisted by the Multilateral Fund under stage I, along with the HCFC-141b consumption phased-out, the sub-sector, the baseline equipment and the technology adopted;
b) Foam enterprises that had phased-out HCFC-141b without Multilateral Fund assistance or had withdrawn from stage I, along with their associated consumption;
c) Foam enterprises that were found to be ineligible for funding by the Multilateral Fund and their associated HCFC-141b consumption;
d) Additional foam enterprises identified as eligible for funding under the Multilateral Fund but that had not been addressed under stage I or stage II of the HPMP;
e) The balances associated with funding that had been approved for conversion of enterprises that had decided to withdraw from stage I of the HPMP, or had been found to be ineligible for assistance from the Multilateral Fund.

I.4.1.2. Activities in the RAC Servicing Sector

I.4.1.2.1. Implemented Activities

Table 7 - Project activities implemented until December 2019, with funds from the 1st, 2nd and 3rd approved tranches

Project	ACTIVITIES Servicing Sector
Training and Capacity Building	• National and international consultants contracted; • Market research on the country's training capacity and potential regional implementation partners conducted; • Training programme planned and developed in close cooperation with experts and industry associations; • Text and layout of best practice handbooks for training of refrigeration technicians prepared and published; • Terms of reference and selection criteria for regional partner institutions prepared; • Tender carried out and six training institutions selected and contracted; • Technical visits to the selected regional training institutions carried out; • Contact and negotiations with manufacturers producing zero ODP and low GWP technologies conducted; • Technical specifications for the purchase of tools and components for mobile training units (educational kits) prepared; • Tender for the acquisition of refrigeration components and tools carried out; suppliers selected and contracted; • Layout of mobile training units defined; • Toolkits and mobile training units assembled and delivered; • Agenda, training materials and list of consumables for training courses prepared; • Seven train-the-trainer courses carried out and 70 instructors trained; • 4,800 technicians trained in best commercial refrigeration practices; • 100 technicians trained in best practices for split air conditioning systems; • Monitoring visits to vocational training institutions carried out; • Evaluation and final report on capacity-building activities prepared.
Technical Assistance and Demonstration Projects	• National and international consultants contracted; • Terms of reference and selection criteria for partner supermarkets prepared; • 29 technical visits to supermarkets carried out; • Scope of the demonstrations identified; • Selection process published in close cooperation with the Brazilian Association of Supermarkets (ABRAS); • Technical evaluation of applications carried out;

Project	ACTIVITIES Servicing Sector
	• Five supermarkets selected and four[2] cooperation agreements signed; • Identification, measurement and performance analysis equipment for refrigeration systems purchased; • Five technical diagnoses for the identification of problems that cause leakages and efficiency loss in the equipment of the supermarkets selected for the North, Northeast, South and Southeast regions carried out; • Five intervention plans to correct identified problems prepared; • Technical specifications for tender and purchase of equipment and components to be installed in supermarkets to correct identified problems developed; • Tenders for the purchase of equipment and components to be implemented in the supermarkets to correct identified problems published in cooperation with UNDP; • Technical and financial evaluation of the proposals received under the tendering process for the purchase of equipment and components to be implemented in the supermarkets to correct identified problems carried out in cooperation with UNDP; • Suppliers of equipment and components to be implemented in the supermarkets contracted in cooperation with UNDP; • Refrigerant consumption monitoring system implemented in the selected supermarkets; • Measurement and analysis of the efficiency of the refrigeration system carried out in the selected supermarkets (measurement of the isentropic efficiency of compressors and measurement of the capacity and efficiency of evaporators); • Pre-existing teaching material adapted to the specific needs of each supermarket; • Training and capacity building of technical teams from the selected supermarkets provided; • Intervention carried out in two supermarkets to correct identified problems; • Case study and factsheets about the interventions carried out in the supermarkets selected in the northern, southeastern and southern region prepared; • Video for the dissemination of results from the demonstration projects for better HCFC-22 containment in supermarkets produced; • Commercial consulting programme for end users aimed at enhancing the enterprise's decision-making process in favour of low GWP alternatives to HCFC implemented;

[2] In the case of the fifth supermarket, no satisfactory agreement for both sides was reached after several months of negociation.

Project	ACTIVITIES Servicing Sector
	• Summary report on assistance provided under the commercial consulting programme for end users prepared; • Support in the review, discussion and development of technical standards for the servicing sector, with participation in monthly meetings of experts at the Brazilian Association of Technical Standards - ABNT provided; • Standards whose development were supported by the Project: 1. ABNT NBR 16186:2013 - Commercial Refrigeration, Leak Detection, Refrigerant Containment, Maintenance and Repair (published in 2013); 2. ABNT NBR 16255:2013 - Refrigeration Systems for Supermarkets - Design, installation and operation guidelines (published in 2013); 3. ABNT NBR 16655:2017 - Installation of residential air conditioning systems - Split and compact (published in three parts in 2018, first amendment to Part 3 published in 2019); 4. ABNT NBR 16666:2017 - Refrigerants: Designation and Safety Classification according to the latest version of ASHRAE Standard 34 (published in 2017); 5. ABNT NBR 16667:2017 – Specifications for Refrigerants according to the latest version of AHRI Standard 700 (published in 2017).
Online Documentation System	• Institution to host and manage the system identified (ABRAS); • Expert Committee for system adaptation established; • Four meetings held with "ABRAS HCFC Committee" (composed of experts) for presentation and discussion of the system; • System translated and proposal for adaptations prepared; • Adaptations implemented; • User manual prepared; • Testing phase carried out; • Three meetings for the introduction of the system conducted with supermarkets and representatives of the following supermarket associations: ABRAS, APAS and AGAS; • System presented in three seminars to supermarket owners; • System published under the domain www.ozoniohcfc.com.br; • Technical assistance provided to users; • *App* for use of the system on Android smartphones developed.[3]
Outreach and Awareness Campaign	• Project logo, visual identity and manual developed; • Folder and flyer on the Training and Capacity Building Programme prepared and distributed;

[3] The technical assistance to users of the system *Pro-Ozônio* and the improvement of the application developed will be continued in Stage II of the HPMP.

Project	ACTIVITIES Servicing Sector
	• Technical material on the application of natural refrigerants in supermarkets prepared and published; • Content of the project website prepared; • Project Website (www.boaspraticasrefrigeracao.com.br) published and continuosly updated; • Project Fanpage on Facebook (https://www.facebook.com/camadadeozonioerefrigeracaoeclima) created and under continuous maintenance; • Press officer contracted and activities and outcomes of Stage I of the HPMP actively disseminated, with publication of articles in regional sectoral journals; • Regional scope defined through local groups and associations; • Meetings with national stakeholders in the servicing sector held; • Participation and presentation of the project in sectoral events, workshops and fairs (e.g. FEBRAVA, FORIND NE, ASBRAV/ASHRAE Workshop, ABRAVA/AHRI Workshop, ABRAVA Panel- Low-GWP Refrigerants, EXPOAGAS, Mercofrio, Symposium Danfoss: energy efficiency and sustainability for supermarkets, Technological Week SENAI, Workshop APAS, ABRAS Convention, among others); • Technical publication "Guidelines for the Safe Use of Hydrocarbons " prepared and published; • Three best practice guides (Leak Control, Sealed System Design, Planned Preventive Maintenance) prepared and published; • Materials and publications printed and disseminated; • Coordination meetings held.
Management, Monitoring and Evaluation	• Agreement with the Brazilian government signed; • Administration carried out; • Data processing carried out; • Quality control carried out; • Reports prepared.

29. Table 8 below provides a summary of the training institutions selected for each pilot region and the number of technicians trained in best practices under the Training and Capacity-Building Project for refrigeration technicians.

Table 8 - Summary of Training Activities

Region*	State	Technicians trained (Commercial Refrigeration)	Technicians trained (Air Conditioning)	Regional Partner Institution
North	Amazonas, Tocantins	361	20	SENAI Amazonas SENAI Goiás
Northeast	Bahia	1,340	20	IFBA
Central-West	Goiás, Mato Grosso and Mato Grosso do Sul	812	20	SENAI Goiás
Southeast	Minas Gerais São Paulo	1,960	16	SENAI Minas Gerais SENAI São Paulo
South	Rio Grande do Sul	327	24	SENAC/SENAI Rio Grande do Sul in cooperation with SENAI-RS
Brazil		**4,800**	**100**	

* The regional distribution of training courses was discussed and developed in close cooperation with the Brazilian Association of Supermarkets (ABRAS), by identifying the states with the largest market share in terms of total annual revenues in each of the five regions of Brazil according to "Ranking ABRAS 2012".

30. Regarding the outcomes of the Technical Assistance and Demonstration Project in the supermarket sector, the focus in all case studies lies on the improvement of maintenance practices for the containment of leaks in refrigeration systems. However, the case studies differ from one another in terms of refrigerant charge, type of system and critical components. As investment costs to correct the problems affecting the leaks are comparatively low in relation to replacing the system, the applied methodology is expected to be replicated in other supermarkets with similar refrigeration systems. The refrigeration technicians involved in the implementation of intervention plans were very interested in the methodology used and intend to offer it to other supermarket chains in the region with high leakage rates in their refrigeration systems.

31. Some improvements and activities planned for the Demonstration Projects are described below:

a) Provision of a sealed refrigeration system;
b) Reduction of flange mechanical connections in expansion valves, solenoid valves, filters, etc.;
c) Installation of thermoplastic pipes and industrial manufactured flanges and connectors;
d) Training of technicians and mechanics in best maintenance and repair practices for implementation of leak prevention procedures;

e) Verification of existing piping (brazing conditions, supports, vibration eliminators, insulation, siphons, etc.);
f) Accessibility of pipes;
g) Verification of pressure vessels (receivers, separators, accumulators), safety valves, fuse plug, etc.;
h) Installation of safety valves independent of back pressure which, when activated, will return the refrigerant to the suction line instead of releasing it to the environment;
i) Installation of a fixed leak detection and monitoring system;
j) Verification of corroded components;
k) Verification of thermal insulation;
l) Leak tightness testing;
m) System recharge scheduled only when leaks are identified;
n) Regular inspection, planned preventive maintenance according to a comprehensive checklist and enforcement of existing standards;
o) Registration of operating conditions and monitoring references (description of repairs, refrigerant consumption, spare parts used, etc.).

Proposal to Improve Energy Efficiency in Demonstration Projects:

a) Selection and use of controls suitable for the defrost system;
b) Adjustments to the superheating of expansion valves;
c) Cleaning of condensers;
d) Increase of evaporation temperatures and reduction of condensation temperatures (check for potential adjustments);
e) Coverage of refrigerated environments at night;
f) Proper selection of components;
g) Optimization of Thermal Load;
h) Proper pipe dimensioning.

32. The following groups of components and equipment have been purchased for the demonstration projects in supermarkets:

- Hermetic components (braze-in) for cooling positions (e.g. expansion valves, ball valves, solenoid valves, brazing adapters, liquid sight glasses, filters, piping components, etc.);
- General refrigeration circuit components (e.g. flexible process control lines and adapters, control and safety devices, vibration eliminators, compressor gaskets, etc.);
- Overflow safety valves for pressure vessels (discharge to low side of the system);
- Fixed gas detection system for all cooling positions and machinery room;
- Tools for environmentally sound and safe handling of refrigerants and implementation of the intervention plan (e.g. refrigerant and oil contamination detection equipment, brazing, piping and refrigerant recovery tools, etc.);
- Insulation, pipe/component support and fixation material;
- Compression fitting and accessories;
- Testing instruments, data collection and monitoring/quality control equipment and tools (e.g. ClimaCheck Performance Analyzer).

33. A summary of the main results achieved by the implementation of the intervention plans is

given below:

Result 1: Social benefits, with the technical qualification of personnel

34. During the post-intervention visit, carried out after 45 days, the technical team from GIZ verified the improvement of HCFC-22 containment practices for commercial refrigeration systems performed by the maintenance and operation teams of the partner supermarkets (own staff and outsourced servicing companies). It is worth noting that the outsourced technical teams, which serve these stores and others, also provide services for dozens of other supermarket chains in the capital and in the countryside of the States of Pará and São Paulo. Thus, the acquired knowledge about best practices can be replicated. With this, social gains in professional qualification have been achieved. Moreover, the provided knowledge can be shared with other technicians, multiplying the positive effects of best leak containment practices.

Result 2: Environmental benefits, with drastic leakage reduction

35. As main result achieved, it is noted that the refrigeration system installations of the partner stores switched to an annual leakage rate close to zero, with the installation in "sealed conditions", obtained after the intervention. By eliminating the perennial leakages and consequently by eliminating the massive upfilling of HCFC-22, the obtained gains regarding environmental conservation are expressive:

- Supermarket 1 (northern region): The store had an annual leakage rate of 62% in relation to the installed charge size. The containment of 118 kg of HCFC-22, which were annually released into the atmosphere, represents a reduction in direct emissions of 213,580 CO_2 equivalent.
- Supermarket 2 (southeast region): The store had an annual leakage rate of 130% in relation to the installed charge size. The containment of 156 kg of HCFC-22, which were annually released into the atmosphere, represents a reduction in direct emissions of 282,360 CO_2 equivalent.

Result 3: Economic gains, reduced costs with refrigerants and higher energy efficiency

36. It is noted that the price of HCFC-22 is around 50.00 R$/kg, which can represent savings in the upfilling of refrigerant of:

- up to R$ 5,900.00 per year for Supermarket 1 (118 kg annual leakage rate); and
- up to R$ 7,800.00 per year for Supermarket 2 (156 kg annual leakage rate).

37. Measurements have also proven improvements in system performance, which allows for more longevity and minimizes future costs. Superheating has been reduced, contributing to a lower discharge temperature within the manufacturer recommended range. The condensing temperature was reduced, and the evaporation temperature was increased, improving system performance.

38. Compressor control adjustments have resulted in a decrease in cycling, which provides longer life and reduced energy consumption, an increasingly expensive supply in the country. Thus, there has been an average increase of the Coefficient of Performance (COP):

- 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[4]);

39. Increasing energy efficiency, and thus, decreasing energy consumption, offers significant savings to the supermarket and indirect reduction of greenhouse gas emissions, which result in environmental and economic gains.

40. The main challenges faced during the implementation of the intervention plans are given below:

41. The technical analyses 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.

42. The focus of the project is the control of refrigerant leaks. The annual refrigerant consumption in RAC systems of the supermarkets evaluated were up to 200% of the initial charge. Most of the selected systems have hundreds of mechanical connections and constant refrigerant leak points. The practices used in the design, selection and installation of refrigeration circuit components cause abrupt losses of large amounts of refrigerant. The insulation of pipes and components (filter elements, suction headers, liquid accumulators, etc.) is generally inadequate, allowing corrosion points to appear. In many cases, pressure vessels are undersized in terms of the maximum allowable working pressure - PS (for HCFC-22 refrigerant) and the safety valves are not properly sized. The operating conditions of primary controllers are not balanced. Most RACK systems are not energy-efficient and minimum storage temperatures for frozen and chilled products are not properly maintained. Usually, there is no strategic planning for scheduled and preventive maintenance.

43. Delays in the delivery of purchased equipment and components have demanded special attention from the project's technical team. Because of the changes made to the original layout of the refrigeration system, the project needed to be re-evaluated and additional technical visits and data collection were necessary.

44. The management team of the supermarket selected for the southern region decided after the elaboration of the Intervention Plan to fully replace the existing HCFC-22-based refrigeration system with a subcritical CO_2 cascade system with HFC-134a from a deactivated store. The outcomes, challenges and lessons learned related to the implementation of a refrigeration system, which had been designed and sized for another store, are being documented by the project in cooperation with the supermarket in a case study.

45. A summary of the main results of this case study can be found below:

Result 1: Social benefits, with technical qualification of personnel

[4] The Supermarket 2 only operates with plus cooling system (medium temperature).

46. A training course for the use of best refrigeration practices and safe use of the new subcritical cascade system based on carbon dioxide (CO_2) and HFC-134a was realized for the maintenance and operation teams of the supermarket (own personnel and outsourced staff). It is highlighted that the outsourced technical teams which serve the Project Store and the other stores from the same supermarket group also serve dozens of supermarket chains in the region, where these trained technicians will be able to apply the best practices learned in this Project. With this, social gains in professional qualification have been achieved. The available knowledge may be shared with other technicians trained by these companies, expanding the positive effects of best leak containment practices and the use of new technologies with more environmentally friendly refrigerants.

Result 2: Environmental benefits, with leakage reduction

47. Before replacing the refrigeration system, the average annual leakage rate of HCFC-22 was 89% in relation to the installed charge, releasing 578 kg of HCFC-22 per year into the atmosphere. The HCFC-22 leakages resulted in direct emissions of 1,045,637.00 kg of CO_2 equivalent and 31.77 kg of ODP per year.

48. The use of more environmentally friendly refrigerants and the reduction of leakages (current system with 55 kg of HFC-134a and 90 kg of CO_2 per year) resulted in a reduction of direct emissions of 966,897 kg of CO_2 equivalent and 31.77 kg of ODP per year. Even with the increase of power consumption by 7% after replacing the refrigeration system, the reduction of direct emissions is much bigger than the increase of indirect emissions arising from the power consumption increase, which is estimated to be 39,740 kg of CO_2 equivalent. Moreover, improvements in the cascade system aimed at reducing power consumption are still under assessment by the supermarket managers (e.g. installation of variable speed compressors).

Result 3: Economic gains, reduced costs with refrigerants

49. It is noted that the HCFC-22 price is around R$ 50.00/kg, whereas the HFC-134a and the CO_2 price is approximately R$ 36.00/kg, and R$ 13.00/kg, respectively. The reduction of leakages and the lower cost of refrigerants resulted in average annual savings of approximately R$ 25,735.00. Besides, it provides a longer service life of the system components.

50. In addition to to the difficulties reported above, two supermarkets announced in the end of August/beginning of September of 2018, that they would like to decline from the project due to changing of corporate governance strategy, which intends to change the whole refrigeration system within the next two years to a CO_2/ R134a subcritical cascade system. One of these supermarkets was immediately replaced by another store with the same technical needs, which enabled the use of the previously purchased equipment. After the elaboration of a new technical analysis and intervention plan, the project activities were implemented during 2018.

51. In order to identify a suitable replacement for the second store, additional technical visits were made. However, given that all equipment purchased was designed and specified in accordance with the originally selected store and its refrigeration system, the project could not be implemented without additional investments in the vast majority of stores. Negotiations with some suitable supermarkets were not successful.

52. Considering this context and the higher-than-initially-expected implementation costs (see also paragraphs 41, 43, 51, 65 and 66), the implementation of the last demonstration project will no longer be possible (financially and technically).

53. In order to make the best possible use of the equipment and materials, which were already purchased for the implementation of the last demonstration project, vocational training institutions, among the ones that are already partners in the implementation of the HPMP best practice training program, were identified to receive the equipment as donation. The functional and sustainable use of the equipment was ensured through a careful selection process, which considered qualification criteria, such as: sustainability, proposed design and work plan, regional importance, synergies with activities already underway within the HPMP.

54. As HPMP Stage II has given priority to HCFC-22 containment trainings in the AC sector, some of the partner schools are still not offering training courses for commercial refrigeration. Therefore, the donation of the equipment will improve the technical infrastructure for demonstration of best practices and sealed system design, thus improving national capacities for training of technicians who work with commercial refrigeration. Besides that, it will facilitate the multiplication of the training contents developed for the commercial refrigeration sector under the framework of the HPMP to a much broader audience.

55. With the purpose of disseminating the results achieved during Stage I of the HPMP, an outreach event will be organized in cooperation with the Ministry of the Environment and UNDP. The event is estimated to take place in June 2020.

I.4.2. Lessons learned and main challenges

Foam Sector

Lessons Learned

a) The consent of the enterprises in regard to the technologies to be implemented in the investment projects should always be given, before submitting them to be approved by the FML Executive Committee.

b) The Projects have to be targeted at meeting the demands of sectors and of the country;

c) 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;

d) With the purpose of enhancing the application of this instrument, since July 2019, Long Term Agreements are being signed between UNDP and the System Houses, in order to make the contract implementation and the end users' conversion more agile, considering the frequent switching of suppliers (System Houses), a characteristic of the PU foam production sector.

e) The execution of service contracts signed between UNDP and HPMP beneficiary enterprises requires continuous monitoring by UNDP at the enterprise level; Along these lines, it is of utmost importance to consider the conversion execution schedules defined by the enterprises, so as to prevent mismatches;

f) The implementation of group projects requires constant and programmed in situ monitoring, in addition to a focal point representative allocated at the System House and exclusively dedicated to executing the conversion of end users;

g) Training sessions on the group project implementation must be given to the system house teams assigned to the project as soon as the servicing contracts are signed;

h) The dissemination of information through different communication media is of great importance to raise awareness among micro and small enterprises benefiting from the project. In this context, the experience of enterprises which finalized their industrial conversion projects should be used and announced to the other enterprises (e.g. by awarding the enterprises which completed their conversions with a commemorative plaque, by producing videos which demonstrate the progress accomplished by the project, etc.);

i) The technological conversions should only take place if there are economically-feasible alternatives available.

j) It is important to promote campaigns on the safe management of alternatives with a certain grade of flammability, in addition to seeking to establish rules and regulations for the safe use of flammable blowing agents in the PU foam production sector.

k) The policies and the legal framework are elements which drive the market;

l) An efficient control of imports is needed;

m) External cooperation efforts supports the learning of new technologies;

n) The strengthening of teams is an indispensable tool for the technological conversion process;

o) The interest and commitment of the country is required for the execution of projects;

p) The specificities of each country must be respected, as well as the competences of each institution;

q) The institutional strengthening projects are fundamental for maintaining the government's governance throughout the process.

Main challenges

56. As informed in previous progress reports, one of the main challenges faced in the implementation of activities in the foam sector is related to the economic crisis experienced by the Country during Stage I of the HPMP, which has slowed down the production process of enterprises in all sectors and consequently affected the conversion process of some HPMP beneficiary enterprises.

57. Other challenging factors were:

a) The pulverized PU market hindered the harmonization of information in the schedule for HCFC phasing out in the country, which influenced the enterprises' decision regarding their participation in the project;
b) The geographical distribution, the number of HPMP beneficiary enterprises, and the constant switching of system vendors by the end users are all factors which hindered the implementation of the project in the end user companies by the system houses;
c) The belief of the enterprises that the use of ODS-free substances will make the final product price higher, beyond the period covered by the IOC, resulting in delayed implementation of the project;
d) The limited availability of HFOs at commercial scale at a reasonable cost is the major barrier for enterprises that have selected this technology for their conversion process. Monitoring meetings and contacts through email and telephone are frequently held with the three HFO's suppliers operating in Brazil. The companies continue confirming the high costs of the substances, from USD 13.00 to USD 20.00 per kg;
e) There are difficulties in validating formulations due to the lack of availability of blowing agents in the national market (gaseous HFO), and to the high final importation cost of the product.

58. As a strategy to overcome these challenges, the dissemination of information has been enhanced since 2016 with the creation of new publicity pieces to help raise awareness among enterprises, as mentioned under item 25 of this report.

RAC Servicing Sector

Lessons Learned

a) Material and equipment procurement processes require continuous monitoring of potential suppliers, as they tend not to participate in tenders;

b) 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;

c) 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 was much more complex. The cooperation established during Stage I served as the basis for enhancing best practice training activities during Stage II of the HPMP;

d) The structure of the servicing sector is mostly informal. This fact has to be considered in preparing and implementing activities for this sector;

e) A lack of availability of proper equipment to demonstrate best practices was identified, especially in technical schools located in less economically developed regions. Therefore, tool kits and mobile training units have been provided as a donation, with the aim of ensuring the long-term sustainability of the project. Courses on better leakage containment are expected to continue to be part of the partner institutions' programmes, including after the completion of the Project.

f) In order to monitor and evaluate the knowlede acquired by the 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;

g) During the training, it is important to disseminate information about available technological alternatives;

h) Policies and legal framework are elements which drive the market;

i) An efficient control of imports is necessary;

j) External cooperation contributes to the knowledge of new technologies;

k) It is important to create specific communication strategies for each sub-sector, as there are different target groups that require different information and media to draw their attention. The use of short videos within the communication strategy is an essential tool to disseminate content to the servicing sector;

l) The identification and establishment of strategic partnerships for awareness campaigns are essential in order to harmonize the content of the developed materials, to increase the capillarity of information and to identify the needs of the sector;

m) Interest and commitment of the country are necessary for the execution of projects;

n) Particularities of each country, including cultural and environmental issues must always be respected;

o) Institutional strengthening projects are essential for the Government to keep the governance of the entire process;

p) The competences of each institution must be respected;

q) Actions must be discussed with all stakeholders (including training centers, industry, associations, among others) to ensure a positive participation and support of activities.

Key challenges

Interinstitutional Arrangements

59. The official authorization and compliance with the formal requirement for cooperation with industry associations and training institutions were stronger than expected. Difficulties were faced regarding the authorization, circulation and discussion of documents due to complex 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.

60. Therefore, the following activities were delayed but completed:

a) Cooperation agreement with the Brazilian Association of Supermarkets - ABRAS (established in December 2013);
b) Discussion and publication of the selection process of supermarkets for participation in better containment demonstration projects, in close cooperation with ABRAS;
c) Discussion and definition of needs for adapting and changing the online documentation system, in cooperation with industry experts and ABRAS;
d) Contracts with training institutions;
e) Cooperation agreements with four supermarkets for the implementation of demonstration projects.

Regional Training Approach

61. Based on the training experience gained during the implementation of the NPP, a regional training approach has been chosen 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.

62. 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 and sign individual contracts.

Technical

63. The mobile training units include a demonstration refrigeration system to simulate the real operating conditions of a supermarket refrigeration system, as well as to demonstrate best practices and characteristics of leak-free refrigeration system projects.

64. Finding the proper components for a demonstration unit to work as a model for supermarket refrigeration systems was more difficult than expected, especially 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.

65. Components and equipment for implementation of the intervention plans in the framework of 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 supplies in accordance with the project's technical specifications and requirements has proven to be a difficult task.

66. Therefore, the procurement process for acquisition of the components needed to implement the intervention plans in the first two supermarkets (North and Southeast) was published three times and required special attention from UNDP and GIZ local teams. Despite additional efforts with potential suppliers (e.g., extension of deadlines, previous hearings, bilingual technical specifications, among others), the contracting for the supply of all items listed in the tender notice took almost one year to be completed. In addition, most of the contracted suppliers did not meet the agreed delivery schedules.

67. Despite the difficulties faced, the positive results of the demonstration projects 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.

68. 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.

69. By contracting of additional technical consultants, the implementation of demonstration projects progressed significantly and all actions were completed by the end of 2019.

70. As a result of the increased number of courses and expansion of the Training Project to other Brazilian states, the training target foreseen for Stage I of the HPMP was met on August 31, 2016, as shown below.

- Training of 4,800 refrigeration technicians in best practices for commercial refrigeration in supermarkets;
- Training of 100 refrigeration technicians in best practices for split air conditioning systems.

I.4.2.3. *Alternative Technologies*

71. In a first stage, priority was given to containment, best practices and leak control in supermarket installations, as well as to the use of the respective technical standards required.

72. Technical information was also compiled on alternative technologies available on the

market such as CO_2, HC, NH_3. Particularly for CO_2, a growing number of installations were observed, as well as an increased interest by the commercial refrigeration sector in adopting this technology.

73. However, the following challenges must be faced when using natural alternatives:

a) Higher costs of initial investment;
b) Availability of skilled technicians trained in new alternatives;
c) Guarantee of the quality and safety of installation, operation and maintenance.

74. Capacity building (training in best practices) and promotion of alternative technologies for the refrigeration and air conditioning industry are part of the strategy of Stage II of the HPMP.

I.4.3. Other environmental impacts, including impacts on the climate system

75. As mentioned earlier, HCFC consumption in 2018 was below the established consumption limit, thus contributing to reducing negative impacts on the climate system. In addition, the conversion projects implemented under HPMP aim only at low GWP alternatives, thus excluding alternatives that contribute negatively to the global climate system.

I.4.4. Implementation and Monitoring

76. The Ministry of the Environment (MMA) is the focal point in Brazil for issues related to ozone layer protection and is responsible for enforcing the decisions of the Multilateral Fund and Parties to the Montreal Protocol. Based on data provided by IBAMA (Brazilian Institute of Environment and Renewable Natural Resources), it is also in charge of completing and submitting forms related to the "Country Programme" and to Article 7 of the Montreal Protocol, whose information enables controlling the achievement of goals, thus helping the country to fulfill its obligations under the Montreal Protocol.

77. Institutional Strengthening projects are under the coordination and implementation of the Ministry of the Environment (MMA) and serve as a support instrument for the Brazilian government initiatives related to the implementation of the Montreal Protocol in Brazil.

78. The MMA, through its Department of Environmental Economics and International Agreements, acting as the National Ozone Unit (NOU), is also responsible for the general coordination of activities implemented under the HPMP. It tracks projects and plays a leading role in coordinating interactions with different stakeholders (implementing agencies, private sector, associations, etc.).

79. IBAMA, an institution linked to the Ministry of the Environment, is responsible for controlling ODS imports, exports and trade, and for the on-site monitoring of enterprises that have completed their technological conversion using HPMP funds.

80. The UNDP (PMU/UNDP) Project Monitoring Unit has one project manager, one technical advisor, and one project assistant. The PMU provides permanent assistance to MMA and to HPMP

beneficiary enterprises in actions related to the implementation of investment projects in the PU foam sector through the following technical, administrative and operational activities:

a) International and national technical assistance to the government and eligible enterprises;
b) Management in the implementation of investment projects in the foam sector;
c) Organization of missions, meetings and technical visits to enterprises;
d) Preparation of periodic reports at the request of the MMA and ABC;
e) Organization of tripartite meetings (ABC, MMA and UNDP) to report on the implementation of activities related to approved tranches;
f) Preparation of technical documentation and organization of meetings of the Process Assessment Committee for evaluating and making recommendations to the local UNDP office regarding the drafting of service contracts agreed upon with enterprises (review of terms of reference and commitment, schedule and selection process);
g) Drafting, execution and monitoring of service contracts for signature by eligible enterprises listed in the project document (preparation, drafting, printing, posting, tracking, and signature by the enterprise and the Resident Representative) – Since the beginning of implementation of Stage I of the HMPH, 43 service contracts have been signed with HPMP beneficiary enterprises, of which 43 have been completed up to December 2019.
h) Preparation of terms of commitment;
i) Technical analysis of products presented;
j) Administration of payment for analysed products, approved by senior international and national advisors;
k) Monitoring of schedules agreed upon in signed contracts;
l) Budget and financial control of approved funds using the ATLAS system;
m) Preparation of annual budget reviews pursuant to UNDP rules and regulations;
n) Awareness raising campaigns and organization of a seminar on alternatives to HCFCs in the rigid PU sector.

I.5. Consolidated Financial Report

I.5.1. Stage I of the HPMP

81. Table 9 shows consolidated financial data for Stage I of the HPMP until December 2019. As shown, UNDP disbursements in the foam manufacturing sector, regulatory actions and implementation and monitoring activities total USD 13,232,679.22, representing 86.73% of the total amount of the five tranches received.

82. In the RAC servicing sector, disbursements for the activities implemented by GIZ account for USD 4,090,909.00, representing 100% of the three tranches received.

Table 9 – HPMP Financial Report until December 2019 – Stage I.

Component	Activities	Tranches	Disbursements (D)	% disbursement	Commitments (C)	Total (D +C)	% Implementation	Balance
		(USD)						
PU Manufacturing	Industrial Conversion	**15,326,957.00**	12,372,679.22	**86.73%**	0.00	**13,292,679.22**	**86.73%**	**2,034,277.78**
Regulatory Actions	Improvement of the HCFC control system		120,000.00		0.00			
Implementation and Monitoring	Implementation		800,000.00		0.00			
UNDP Sub-total			**13,292,679.22**		0.00			
RAC Servicing	Training and Capacity Building	**4,090,909.00**	2.059.733,00	**100.00%**	0	**4,090,909.00**	**100.00%**	**0**
	Technical Assistance and Demonstration Projects		870.736,00		0			
	Online Documentation System		209.723,00		0			
	Awareness Campaigns		646.487,00		0			
	Management, monitoring and evaluation		304.230,00		0			
GIZ Sub-total			**4,090,909.00**		**0**			
Total		**19,417,866.00**	**17,383,588.22**	**89.52%**	**0.00**	**17,383,588.22**	**89.52%**	**2,034,277.78**

83. In compliance with item 5(c) of the Associate Agreement between the Brazilian Government and the Executive Committee of the Multilateral Fund for the reduction in consumption of Hydrochlorofluocarbons - HCFCs, Table 10 provides the time series of the financial disbursement levels under the HPMP for each tranche received until December 2019.

Table 10 – Time series of financial disbursements for conversion projects until December 2019 by tranche received.

Tranches	First tranche		Second tranche		Third tranche		Fourth tranche		Fifth tranche		Total	
	Approved	Disbursement	Approved	Disbursement	Approved	Disbursement	Approved	Disbursement	Approved	Disbursement	Approved	Disbursement
UNDP	4,456,257	4,018,123	3,400,000	2,826,386	3,000,000	2,604,686	3,000,000	2,918,703	1,470,700	924,782	15,326,957	13,292,679
Subtotal (%)	90%		83%		87%		97%		63%		86.73%	
GERMANY	1,209,091	1,209,091	2,472,727	2,472,727	0	0	0	0	409,091	409,091	4,090,909	4,090,909
Subtotal (%)	100%		100%		0%		0%		100%		100%	
TOTAL	**5,665,348**	**5,227,214**	**5,872,727**	**5,299,113**	**3,000,000**	**2,604,686**	**3,000,000**	**2,918,703**	**1,879,791**	**1,333,873**	**19,417,866**	**17,323,588**
TOTAL (%)	**92%**		**90%**		**87%**		**97%**		**71%**		**89.52%**	

SECTION II.

HCFC CONSUMPTION VERIFICATION REPORT

Not applicable

SECTION III.

ACTION PLAN

III.1 Stage I of the HPMP

Not applicable

SECTION IV.

AMENDMENTS TO THE AGREEMENT BETWEEN THE BRAZILIAN GOVERNMENT AND THE MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL

Not applicable.

ANNEX 1 – INFORMATION REQUESTED BY EXCOM'S DECISION 84/32

a) All enterprises from the foam sector assisted by the Multilateral Fund during Stage I, with the consumption level of HCFC-141b phased-out, the subsector, the baseline of equipment and the adopted technology.

b) The enterprises from the foam sector which discontinued the use of HCFC-141b without the support of the Multilateral Fund or which declined participating in Stage I, as well as the respective consumption.

c) The enterprises from the foam sector deemed ineligible to receive funding from the Multilateral Fund and their consumption of HCFC-141b.

d) The enterprises from the foam sector identified as eligible for funding from the Multilateral Fund, but which were not converted during Stages I and II of the HPMP:

e) The balance connected to approved funds allocated to the conversion of enterprises which decided to decline participating in Stage I of the HPMP, or which were deemed ineligible to receive assistance from the Multilateral Fund.

ANNEX 2 – TABLE SHOWING THE PROGRESS REPORT OF THE ACTIVITES OF THE RAC SERVICING SECTOR

Annex 2.1 RAC Servicing Sector - Stage I of HPMP

Agency	Project/component	Activities completed and description of the impact	Remaining activities to be implemented in the following year	Total budget for the next implementation period	Note
GIZ	Training and Capacity Building	Assembly and delivery of 10 toolkits and 10 mobile training units with reduced capacity for simulation of a mini-rack refrigeration system for supermarkets. Seven train-the-trainer courses delivered and 70 trainers trained; 4800 technicians trained in best commercial refrigeration practices; 100 technicians trained in best practices for split air conditioning systems; 8 Monitoring visits to vocational training institutions carried out; Evaluation and final report on training activities prepared. Impact: Trained and evaluated technicians confirmed having increased their knowledge of ozone depletion and the importance of leak containment and use of best practices during services. They also confirmed having learned how to use new tools and practices that help them in applying best practices in their daily activities.		0.00	

GIZ	Technical Assistance and Demonstration Projects	29 technical visits to supermarkets carried out; 5 supermarkets selected and 4 cooperation agreements formalized; Identification, measurement and performance analysis equipment for refrigeration systems purchased; 5 technical diagnoses for the identification of problems that cause leakages and efficiency loss in refrigeration systems prepared for the supermarkets selected in the Northern, Northeastern, Southern and Southeasternregion; 5 intervention plans to correct identified problems prepared; Technical specifications for tender and purchase of equipment and components to be installed in supermarkets to correct identified problems developed; Tenders for the purchase of equipment and components to be implemented in the supermarkets to correct identified problems published in cooperation with UNDP; Technical and financial evaluation of the proposals received under the tendering process for the purchase of equipment and components to be implemented in the supermarkets to correct identified problems carried out and suppliers contracted, in cooperation with UNDP; Refrigerant consumption monitoring system implemented in the selected supermarkets;		0.00	

		Measurement and performance analysis of the refrigeration system carried out in the selected supermarkets (measurement of the isentropic efficiency of compressors and measurement of the capacity and efficiency of evaporators); Adaptation of the existing teaching material to the specific needs of each supermarket. Training and capacity-building of technical teams from the selected supermarkets. Intervention to correct identified problems conducted in two supermarkets. Case studies and factsheets about the interventions carried out in the supermarkets selected in the northern, southeastern and southern region prepared; Video for the dissemination of results from the demonstration projects for better HCFC-22 containment in supermarkets produced; Commercial consulting programme for end users aimed at enhancing the enterprise's decision-making process in favour of low GWP alternatives to HCFC implemented; 19 end users assisted under the commercial consulting programme; Summary report on assistance provided under the commercial consulting programme for end users prepared; Support in the design and/or review of 8 technical standards for the servicing sector.			

		Impact: Practices and concepts of sealed system design presented to supermarkets participating in the demonstration projects. Two supermarkets have already confirmed that they will replicate the concept in their other chain stores and are supporting dissemination among other supermarkets. The Commercial Consulting Programme provides relevant information on alternative refrigerants for end users, thus improving the enterprises' capacity to make decisions in favour of alternatives with low environmental impact. The sector has new technical standards guiding the promotion of best practices on refrigerant containment as well as safe refrigerant handling practices.			
GIZ	Online Documentation System (Pró-Ozônio)	4 meetings held with "ABRAS HCFC Committee"; System translated; Adaptations implemented; User manual prepared; Testing phase; Implementation of required adaptations after the testing phase; Three meetings for the introduction of the system conducted with supermarkets and representatives of the		0.00	

		following supermarket associations: ABRAS, APAS AND AGAS; System presented in three seminars to supermarket owners; System published under the domain www.ozoniohcfc.com.br; Technical assistance provided to users; App for use of the system on Android smartphones developed. **Impact:** The online Documentation System (Pró-Ozônio) - 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 leaks and the demand for virgin substances through registration and monitoring of the relationship between the amounts of refrigerants recovered and recharged; - supports the management and collection of maintenance and repair data.			
GIZ	Outreach and Awareness Campaign	Folder on the Training and Capacity Building Programme prepared and 2,000 copies printed; Flyer on the Training and Capacity Building Programme prepared and 25,000 copies printed; Publication about the application of natural refrigerants in supermarkets prepared, published and 500 copies printed; Operation of the project website (www.boaspraticasrefrigeracao.com.br);		0.00	

		Maintenance of the Project fanpage on Facebook (https://www.facebook.com/camadadeozonioerefrigeracaoeclima); Active regional dissemination with publication of articles in regional sectoral journals; 10 Meetings with national stakeholders in the servicing sector held; Participation and presentation of the Project in 25 sectoral events, workshops and fairs; Technical publication "Guidelines for the safe use of hydrocarbons" prepared and 500 copies printed; Publication of three best practice guides and 500 copies of each printed; 11 Coordination meetings. **Impact:** The dissemination of activities and distribution of materials and technical publications drew the sector's attention to the activities implemented. Handbooks on best refrigeration practices for commercial refrigeration equipment and split air conditioning systems are available to the whole sector, with a focus on leak containment and improvement of preventive maintenance activities. In addition, information and publications are available on the safe use of natural refrigerants. Materials are being used and disseminated by industry associations and professional technical training institutions. Supermarkets, in particular, have contacted the Project seeking additional information on alternative refrigerants with low environmental impact as well as on refrigerant containment practices.			

GIZ	Management, Monitoring and Evaluation	Administration; Management and Monitoring; Data processing; Quality control; Reports.		0.00	
		Total		0.00	