BRAZIL

BRAZILIAN HCFC PHASE-OUT MANAGEMENT PLAN (HPMP)

STAGES 1 AND 2

PROGRESS REPORT 2017/2018

Prepared by

the MINISTRY OF THE ENVIRONMENT

with the assistance of

the UNITED NATIONS DEVELOPMENT PROGRAMME (UNDP),

the DEUTSCHE GESELLSCHAFT FÜR INTERNATIONALE ZUSAMMENARBEIT (GIZ) GMBH

and

the UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION (UNIDO)

August 2018

PROJECT COVER SHEET

COUNTRY NAME	Brazil
LEAD IMPLEMENTING AGENCY	UNDP
COOPERATING IMPLEMENTING AGENCY	GIZ
COOPERATING IMPLEMENTING AGENCY	UNIDO
COOPERATING IMPLEMENTING AGENCY	Italy

SUBMISSION OF COMPLETE DOCUMENTATION		
Document	**Yes/No**	**Comments**
Progress report for previous Tranche Stage 1	Yes	Approved by the 64th Excom Meeting
Stage 2	Yes	Approved by the 75th Excom Meeting
Financial report (disbursements >20% from the previously approved tranche)	Yes	
Verification Report (where applicable)	Yes	
Plan of Action	Yes	Stage 1 and Stage 2
MYA tables (online)	Yes	
Official endorsement letter	Yes	
Revised Agreement (where applicable)	Yes	Stage 1 – Amended by Decision 75/53, paragraph a (ii) Stage 2 – Amended by Decision 80/64, paragraph a (ii)

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

HCFC REGULATIONS IN PLACE		
Regulation	**Yes/No**	**Comments**
HCFC Licensing System (operational)	Yes	
HCFC Quota System (operational)	Yes	

SUBMISSION OF ODS DATA REPORTS			
Report	**Yes/No**	**Year**	**Comments**
Country Programme	Yes	2017	
Article 7 data (latest report)	Yes	2017	
ODS data for tranche year	Yes	2017	

Explain any discrepancies

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

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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) in 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 1 of the HPMP (Decision 64/40), with the aim of reducing national HCFC consumption by 10%, by 2015.

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 2 of the HPMP, with the aim of reducing national HCFC consumption by 35%, by 2020, and by 45%, by 2021.

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 refrigeration sector enabled the country to achieve the consumption of 837.25 ODP tonnes in 2017, totalling a reduction of 36.92% over 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 1 of the HPMP.

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

DESCRIPTION	2011	2012	2013	2014	2015	Total
	CONSUMPTION (ODP TONS)					
ODS reduction schedule	*n/a*	*n/a*	1,327.3	1,327.3	1,194.8	***n/a***
Maximum allowable 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 IA (UNDP) agreed 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 IA (GIZ) agreed funding	1,209,091	2,472,727	0	0	409,091	**4,090,909**
Support Costs for Cooperating IA (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 for 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 for Cooperating IA (GIZ)	1,209,091	2,472,727	0	0	409,091	**4,090,909**
Support Costs for Cooperating IA (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 costs paid	**487,219**	**517,000**	**225,000**	**225,000**	**155,303**	**1,609,522**
Total agreed costs 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 2 of the HPMP.

Table 2 – Tranches and ODP consumption, 2015-2023, Stage 2 of the HPMP.

DESCRIPTION	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
	CONSUMPTION (ODP TONS)									
ODP 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 allowable 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 reduction accomplished	1,025.81	875.29	837.25							***n/a***
	TRANCHES IN USD									
Lead IA (UNDP) agreed 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 IA (UNIDO) agreed funding	1,950,275	0	0	3,420,039	0	2,846,383	2,000,0000	1,000,000	0	11,216,697
Support Costs for Cooperating IA (UNIDO)	136,519	0	0	239,403	0	199,247	140,000	70,000	0	785,169
Cooperating IA (GIZ) agreed 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 IA (GIZ)	144,614	0	76,457	263,059	0	111,800	166,941	0	97,129	860,000
Cooperating IA (Italy) agreed funding	250,000	0	0	0	0	0	0	0	0	250,000
Support Costs for Cooperating IA (Italy)	32,500	0	0	0	0	0	0	0	0	32,500
Total Funding Agreed	**7,107,717**	**0**	**3,575,078**	**13,956,321**	**0**	**8,329,625**	**3,806,941**	**1,070,000**	**969,856**	**38,815,539**
Approved tranche for Lead IA (UNDP)	3,078,900	0	2,627,704							5,706,604
Support Costs for Lead IA (UNDP)	215,523	0	183,939							399,462
Approved tranche for Cooperating IA (UNIDO)	1,950,275	0	0							1,950,275
Support Costs for Cooperating IA (UNIDO)	136,519	0	0							136,519

Approved tranche for Cooperating IA (GIZ)	1,299,386	0	686,978							1,986,367
Support Costs for Cooperating IA (GIZ)	144,614	0	76,457							221,071
Cooperating IA (Italy) agreed funding	250,000	0	0							250,000
Support Costs for Cooperating IA (Italy)	32,500	0	0							32,500
Agreed funding paid	**6,578,561**	**0**	**3,314,682**							**9,893,243**
Total support costs paid	**529,156**	**0**	**260,396**							**789,552**
Total agreed costs paid	**7,107,717**	**0**	**3,575,078**							**10,682,795**
Approved tranches	**7,107,717**	**0**	**3,575,078**							**10,682,795**

I.2. ODS Policy, Legislation and Institutional and Legal Framework

I.2.1. Status of ratification of amendments to the Montreal Protocol

7. Brazil adopted the Vienna Convention and the Montreal Protocol through Decree No. 99,280 of 6 June 1990. All amendments to the text of the Montreal Protocol have been ratified and promulgated by Brazil, with the exception of the Kigali Amendment on HFCs, which is in the process of ratification by the Country.

I.2.2. ODS Legislation/Regulations

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	IBAMA Normative Instruction No. 207 of 21 November 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 of 25 February 2010; Ordinance No. 75 of 30 March 2010; and Ordinance No. 319 of 30 August 2010.	MMA	Creates the HCFCs Working Group to assist with the preparation and implementation of the HCFC Phase-Out Management Plan and respective projects.
2012	Ordinance No. 212 of 26 June 2012	MMA	Establishes the Brazilian HCFC Phase-Out Management Plan (HPMP) under the National Plan on Climate Change.
2012	Normative Instruction No. 14 of 20 December 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 of 15 March 2013	IBAMA	Regulates the Federal Technical Registration of Potentially Polluting Activities and 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 of 24 June 2015	MMA	Extends the GT-HCFC period to 31 December 2020.
2018	Normative Instruction No. 4 of 14 February 2018	IBAMA	Regulates 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 of 14 February 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 of 4 June 2018	Presidency of the Republic	Amends the Decree of March 6, 2003 that created the Interministerial Executive Committee for the Protection of the Ozone Layer, for the purpose of establishing guidelines and coordinating actions related to the protection of the ozone layer.

Source: MMA

9. In Brazil, the import quota system for HCFCs and mixtures containing HCFC established and regulated by IBAMA Normative Instruction No. 14 of 20 December 2012 and updated by IBAMA Normative Instruction (IN) No. 04 of 14 February 2018, coupled with the actions implemented under the HPMP have ensured fulfilment of the country's commitment to gradually phase out its HCFC consumption. The computerized licensing system to control ODS consumption - which has IBAMA as the authorizing agency - 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. As previously informed to the Multilateral Fund Secretariat, since August 2013 interministerial meetings have been held between the Ministry of the Environment (MMA) and the Ministry of Industry, Foreign Trade and Services (MDIC) in order to discuss the issue of import control of air conditioning and refrigeration equipment containing HCFCs. These meetings have led to a common understanding of the actions needed to implement a legal measure banning the import of equipment containing HCFCs. At the GT-HCFC meeting held in February 2014, MDIC informed that it could only take action upon submission of an official request by the private sector area concerned which, as of the writing of this report has not been received. Issues related to the import and manufacturing of new RAC equipment containing HCFCs are slated to be addressed in Stage 3 of the HPMP.

11. As for flammable alternatives, the Brazilian government, along with UNDP and GIZ, has promoted awareness raising campaigns about the safe handling of alternatives with a low negative impact on the global climate system that have any level of flammability. 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. Initiatives include reviewing Standard ABNT NBR 16069 "Security in refrigeration systems", in accordance with the latest version of ISO 5149; developing a technical standard for the safety designation and classification of refrigerants based on ANSI/ASHRAE 34; discussing the standard "Installation of Residential Air Conditioning Systems – Split and compact", which will address procedures and recommendations for installation, operation and safe maintenance (including electrical safety) of residential air conditioning systems, with a special focus on flammable refrigerants; and reviewing Standard ABNT NBR 15833 - "Reverse Production of Refrigerators". It should be noted that for technological conversion projects in the polyurethane foams sector, the adoption of national and international parameters of industrial safety demonstrated by a safety certificate issued by a qualified enterprise is a *sine qua non* condition for the approval of technological conversion and for the disbursement of funds to HPMP beneficiary enterprises that opt for flammable alternatives. Currently, a Technical Standard for the safe use of flammable blowing agents in the production chain of the polyurethane foam sector is being drafted and will be submitted to ABNT.

I.3. HCFC Consumption and Production

12. Brazil does not produce HCFCs. Therefore, national consumption is based on imports and exports. Table 4 provides data on HCFC consumption in the country from 2007 to 2017.

Table 4 –HCFC Consumption, Brazil, 2007 – 2017.

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
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
	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
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
	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
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
	ODS t.	32.98	22.69	67.23	105.28	68.69	12.02	14.88	54.06	60.96	35.74	-20.50
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
	ODS t.	46.70	20.57	9.99	19.84	44.31	170.79	0.00	3.00	0.00	-2.87	14.89
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
	ODS t.	520.29	166.54	385.72	316.90	246.94	204.83	164.59	113.20	238.12	69.22	42.98
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
	ODS t.	0.20	0.10	0.05	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**
	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**

Source: MMA

13. HCFC consumption in Brazil in 2017 totalled 837.25 ODP tonnes, 36.92% 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 fulfilment of the legislation in force, as well as the partial and independent conversion of multinational domestic refrigeration enterprises operating in Brazil.

14. IBAMA IN 4 of 14 February 2018 establishes that:

a) For the years 2018 and 2019, the total HCFC quota will maintain the 16.60% reduction as established by IBAMA IN 14 of 20 December 2012;
b) Starting from 1 January 2020, the total HCFC quota will be reduced by 39.30% over the baseline, with a 90.03% decrease in the specific HCFC-141b quota over the baseline of this substance;
c) Starting from 1 January 2021, the total quota HCFC will be reduced by 51.60% over the baseline, with a 27.10% reduction of the specific HCFC-22 quota over the baseline established for this substance;
d) For other HCFCs imported into Brazil, the quotas for the same period should not exceed the levels established for 2013.

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

16. The above-mentioned IN 4 also provides for the ban on HCFC-141b imports for foam manufacturing starting from 1 January 2020, as well as for the ban on both the import and export of formulated polyol containing HCFC-141b starting from 1 January 2021.

17. Table 5 provides data on HCFC imports and exports by sector in 2017. The information is in line with that presented in the Country Programme Data.

Table 5 – HCFC Import and Export in metric tonnes by sector in Brazil, 2017

Substance	Import (ODS t.)				Export (ODS t.)
	Foam	RAC Manufacturing	RAC Servicing	Total	
HCFC-22	0.0	1,530.71	8,674.05	10,204.76	154.29
HCFC-141b	2,586.90	0.0	0.0	2,586.90	0.00
HCFC-142b	0.0	0.2	0.9	1.10	21.60
HCFC-123	0.0	2.97	11.92	14.89	0.00
HCFC-124	0.0	9.46	33.52	42.98	0.00
	2,586.90	**1,543.34**	**8,720.39**	**12,853.63**	**175.89**

18. In 2017, 154.29 metric tonnes of HCFC-22 were exported to Argentina, China and the United States and 21.60 metric tonnes of HCFC-142b were exported to China.

19. There are no records of imports and exports of polyol containing HCFC-141b.

I.4. HCFC Phase-Out Activities

I.4.1 Stage 1 of the HPMP

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

20. Individual Projects – Continuous Panels:

a) Project ongoing: Panisol has been facing difficulties to define the conversion plan of its plant as it is located in a very densely populated urban area, which may preclude the use of flammable technology and render its production economically unfeasible. UNDP has been monitoring the situation closely and assisting the enterprise in seeking a feasible alternative.

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

a) Project ongoing: Espumatec reported that, after reassessing the decision on the technological option, the enterprise has chosen to carry out the conversion to water-based technology. The engineering project for plant conversion has been finalized and it's currently under implementation. The project is expected to be completed in February 2019.

22. Group Projects – Integral Skin, Molded Flexible Foam and Rigid Polyurethane:

a) System house Arinos (Univar) has advanced in the conversion of its manufacturing plant. Currently, 40% of all formulated polyol systems produced are HCFC-141b-free.
b) System house Shimtek has completed the industrial conversion of its end users. Two end users have been fully converted under the subproject in a group led by the system house. The third enterprise previously included in the service contract has chosen to use methyl formate and has been transferred for conversion in another group project;
c) System house Polyurethane, which is specific to the rigid PU sector, has completed the industrial conversion of its manufacturing plant and is currently in the process of transferring technology, conducting formulation tests and converting 17 end users. Twelve end users have been fully converted under the subproject in group led by the system house;
d) System houses Arinos (Univar), Purcom and Amino are in the process of transferring technology, conducting formulation tests and converting end users:
    i. Under the service contract signed between Purcom and UNDP, in addition to the end-users already informed in the last progress report, another 11 enterprises have been fully converted, totalling 69 end users converted to HCFC-free technologies;
    ii. In addition to the end users informed in previous reports, system houses Arinos (Univar) and Amino have conducted the conversion of 10 and seven end users, respectively, totalling 17 converted enterprises;
e) By August 2018, a total of 170 end users had been converted to HCFC-free technologies under the Project;

f) The service contract with system house MCassab is in the final stage of negotiation. The project is expected to be completed in August 2019;
g) System house Polisystem, which operates specifically in the rigid PU sector, is gradually moving towards the conversion of its manufacturing plant;
h) Negotiations with system house Ecopur, which is specific to the rigid PU sector, has advanced and the industrial conversion of its manufacturing plant is expected to begin by December 2018;

23. 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 use, with their own resources, as soon as HFOs are available on the market and polyol systems with HFO have been developed and optimized. The enterprises have reported the following advances:

a) Shimtek: HFC 365/227 blend is being used temporarily instead of HCFC-141b. The tests performed by the enterprise in 2018 with liquid HFO presented satisfactory results. However, the enterprise informs that the costs currently practiced in the domestic market would make it impossible for Shimtek to produce systems at competitive prices. In addition, contrary to what is stated by the substance producers, Shimtek reports that the HFO product is not available on a large scale.

b) U-Tech: HFC-134a is temporarily replacing HCFC-22, which was previously used by the enterprise in the production of the Froth system. In the first tests conducted using gaseous HFO in October 2017, a problem of instability of the polyurethane system was identified, which resulted in the loss of reactivity and collapse of the foam. Possibilities for adjusting the formulation by replacing additives in the system were discussed with the supplier. However, new tests conducted in 2018 also failed to present satisfactory results, as stability and system reactivity problems remained. The enterprise is currently awaiting delivery of new samples of gaseous HFO and additives that are being imported by U-Tech into Brazil for further testing. They also report that in the current scenario of gaseous HFO costs, the substitution would make it impossible for the enterprise to operate in this market segment.

24. Projects under Stage I of the HPMP have resulted, from their inception to the first half of August 2017, in the technological conversion of enterprises Isoeste, Isoblock, Danica, Duoflex, Kalf, Cantegril, Frisokar, Luguez, Cairu, and Spandy Group (Spandy Peças, Espumauto, MPU and PTP Peças) and of system houses Polyurethane, Purcom, Ariston, Amino, Ecoblaster, Utech, Shimtek, and Arinos (partial conversion using own resources), as well as of 170 end users, totalling 191 enterprises converted and 126.33 ODP tonnes of phased-out HCFC-141b through industrial conversion projects. More enterprises have phased out the use of HCFC-141b but cannot be accounted for until the "Term of Commitment" has been signed.

25. Table 6 provides detailed qualitative data on activities implemented in each industrial conversion project as of the second half of August 2018, under Stage 1 of the HPMP.

Table 6 – Industrial conversion activities implemented in the PU foam sector as of the second half of August 2018, with funds from the five tranches approved under Stage 1 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 (hydrocarbon); • 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 in progress; • Difficulties in defining the plant conversion plan	• Enterprise eligibility validated; • Terms of Reference and Action Plan defined; • Service Contract signed; • Four monitoring meeting held; • Remote monitoring of enterprise conversion status.

Integral Skin / Flexible Moulded 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; • 3.3 ODP tonnes phased out; • Certificate of Completion (COC) signed.
	CANTEGRIL	• Project completed	• Enterprise eligibility validated; • Terms of Reference and Action Plan for technology testing 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 t phased out; • Certificate of Completion (COC) signed.
	ESPUMATEC	• Project in progress; • Expected completion date: February 2019.	• Enterprise eligibility validated; • Terms of Reference and Action Plan for technology testing defined; • Service Contract signed; • Technology selection plan completed (Methyl Formate); • Change of technological option to water base; • Plant conversion plan in progress; • Expected project completion date: February 2019.
	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. • 4.4 ODP tonnes phased out; • Certificate of Completion (COC) signed.

System Houses in the ISF/FMF and Rigid PU Sectors	ARINOS	• Conversion of 40% of the plant; • 23 end users converted; • seven end users in conversion phase; • Conversion of end users in progress (ISF/FMF e rigid PU).	• Enterprise eligibility validated; • Service Contract signed; • Plan for technology selection completed; • Conversion technology defined by the enterprise (Methylal and Methyl Formate); • Term of Commitment signed; • 5.8 ODP tonnes of HCFC-141b phased out; • Formulation tests carried out at 40 end users; • Information on end users delivered and validated; • Terms of Reference and Action Plans for conversion of end users defined; • Service Contract for Conversion of end users signed (ISF/FMF and rigid PU).
	PURCOM	• System House conversion to ISF/FMF and rigid PU (solar heaters, thermoware, pipe-in-pipe and packing) completed; • Implementation kick-off of Action Plan for conversion of end users (ISF/FMF and rigid PU): • 69 End Users converted; • 31 End Users in the conversion phase; • Conversion of end users in progress (ISF/FMF and rigid PU).	• Enterprise eligibility validated; • Terms of Reference and Action Plan for system house conversion defined; • Service Contract for 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; • 11.78 ODP tonnes phased out in the ISF/FMF sector; • 4.71 ODP tonnes phased out in the rigid PU sector; • Formulation Tests performed at 50 end users; • Information on end users delivered and validated (ISF/FMF and rigid PU); • Terms of Reference and Action Plan for conversion of end users defined; • Service Contract for Conversion of end users signed (ISF/FMF and rigid PU).

	ARISTON	• System House conversion to ISF/FMF and rigid PU (solar heaters, thermoware, pipe-in-pipe and packing) completed; • Implementation of Action Plan for conversion of end users (ISF/FMF and rigid PU) completed; • Nine End Users converted; • Project completed.	• Enterprise eligibility validated; • Terms of Reference and Action Plan for system house conversion defined; • Service Contract for 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; • 1.36 ODP tonnes phased out in the ISF/FMF sector; • 2.69 ODP tonnes phased out in the rigid PU sector; • Formulation Tests performed at six end users; • Information on end users delivered and validated (ISF/FMF and rigid PU); • Terms of Reference and Action Plan for conversion of end users defined; • Service Contract for conversion of end users signed (ISF/FMF and rigid PU); • Conversion of end users completed (ISF/FMF and rigid PU); • Certificate of Completion (COC) in preparation phase.
	AMINO	• System House conversion to ISF/FMF and rigid PU (solar heaters, thermoware, pipe-in-pipe and packing) completed; • Implementation kick-off of the Action Plan for conversion of end users (ISF/FMF and rigid PU): • 25 end users converted; • 21 end users in the conversion phase; • Conversion of end users in progress (ISF/FMF and rigid PU).	• Enterprise eligibility validated; • Terms of Reference and Action Plan for system house conversion defined; • Service Contract for 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; • 6.85 ODP tonnes phased out in the ISF/FMF sector; • 4.22 ODP tonnes phased out in the rigid PU sector; • Formulation Tests performed at 10 end users; • Information on end users delivered and validated (ISF/FMF and rigid PU); • Terms of Reference and Action Plan for conversion of end users defined; • Service Contract for conversion of end users in the preparation phase (ISF/FMF and rigid PU).

	ECOBLASTER	• System House conversion to ISF/FMF and rigid PU (solar heaters, thermoware, pipe-in-pipe and packing) completed. • Implementation kick-off of the Action Plan for conversion of end users (ISF/FMF and rigid PU): • 18 end users converted; • Project completed.	• Enterprise eligibility validated • Terms of Reference and Action Plan for system house conversion defined; • Service Contract for 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; • 5.70 ODP tonnes phased out in the ISF/FMF sector; • 2.71 ODP tonnes phased out in the rigid PU sector; • Formulation tests performed at 11 end users; • Information on end users delivered and validated (ISF/FMF and rigid PU); • Terms of Reference and Action Plan for conversion of end users defined; • Service Contract for conversion of end users signed (ISF/FMF and rigid PU); • Conversion of end users completed (ISF/FMF and rigid PU); • Certificate of Completion (COC) in the preparation phase.
	SHIMTEK	• Conversion of the System House to ISF/FMF completed; • Implementation kick-off of the Action Plan for conversion of end users (ISF/FMF): • Two end users converted; • Project completed; • Temporary use of high GWP HFC; • Tests with HFO performed with satisfactory results; • High cost and limited availability of liquid HFO make final conversion not feasible.	• Enterprise eligibility validated; • Terms of Reference and Action Plan for technology testing defined; • Service Contract signed; • Service Contract adjusted and signed; • Conversion technology defined (HFO); • Temporary use of high GWP HFC until such time as HFOs are available on the market and HFO systems are developed and optimized; • Definition of new conversion plan completed; • System House conversion completed; • 2.94 ODP tonnes phased out in the ISF/FMF sector; • Information on end users delivered and validated (ISF/FMF); • Terms of Reference and Action Plan for conversion of end users defined; • Service Contract for conversion of end users signed (ISF/FMF); • Certificate of Completion (COC) in the preparation phase.

	M CASSAB	• Project in progress; • Expected project completion date: August 2019.	• Enterprise eligibility validated; • Terms of Reference and Action Plan for technology testing being defined; • Five implementation meeting held; • New testing for technology definition performed; • Service contract for System House conversion to rigid PU (solar heaters, thermoware, pipe-in-pipe and packing applications) signed; • Expected project completion date: August 2019.
	POLYURETHANE	• System House conversion to rigid PU completed; • Implementation kick-off of the Action Plan for conversion of end users (rigid PU); • 12 end users converted; • 5 end users in the conversion phase; • Conversion of end users in progress (rigid PU).	• Enterprise eligibility validated; • Terms of Reference and Action Plan for technology testing being defined; • Technology defined (Methyl Formate); • Term of Commitment signed; • Service Contract for 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; • 1.39 ODP tonnes phased out in the rigid PU sector; • Formulation tests performed at 10 end users; • Information on end users delivered and validated (rigid PU); • Terms of Reference and Action Plans for conversion of end users defined; • Service contract for conversion of end users completed (rigid PU).
	POLISYSTEM	• Project in progress.	• Enterprise eligibility validated; • Terms of Reference and Action Plan for technology testing being defined; • Plan for technology selection completed; • New tests for technology definition in progress; • Remote monitoring of enterprise conversion status.

	U-TECH	• System House conversion to rigid PU (solar heaters, thermoware, pipe-in-pipe and packing) completed; • Implementation kick-off of the Action Plan for conversion of end users (rigid PU): • 12 end users converted; • Conversion of end users completed; • Project completed; • Temporary use of high GWP HFC; • Tests performed with negative results; • Formulation adjustment, high cost and limited availability of gaseous HFO on the market make final conversion infeasible.	• Enterprise eligibility validated; • Terms of Reference and Action Plan for technology testing being defined; • Service Contract for System House conversion signed; • Conversion technologies defined (Methyl formate instead of HCFC-141b and HFO instead of HCFC-22); • Temporary use of high GWP HFC until such time as HFOs are available on the market and HFO systems are developed and optimized; • Term of Commitment signed; • System House conversion to Rigid PU (solar heaters, thermoware, pipe-in-pipe and packing) completed; • Safety Certificate issued; • 0.11 ODP tonnes phased out in the rigid PU sector; • Formulation Tests performed at 12 end users; • Information on end users delivered and validated (rigid PU); • Terms of Reference and Action Plans for conversion of end users defined; • Service Contract for the conversion of end users (rigid PU) signed. • Conversion of end users completed (rigid PU); • Certificate of Completion (COC) in the preparation phase.
	RODZA (ECOPUR)	• Project in progress.	• Enterprise eligibility validated; • Terms of Reference and Action Plan for technology testing being defined; • Service Contract for System House conversion being negotiated.

26. Notwithstanding the advances made since the last progress report, the implementation of industrial conversion projects at end users, especially small and medium-sized enterprises, has proven to be a very challenging task due to the following factors:

- The prolonged economic crisis faced by the country, which has affected several sectors, including the PU foam sector;
- The interrelationship between Stages 1 and 2 of the HPMP, since many enterprises operate in sectors covered by both stages;
- The fragmentation of the PU market, which makes it difficult to harmonize information on the HCFC phase-out schedule in the country and influences the enterprise's decision regarding its participation in the project;
- The geographical distribution and the number of HPMP beneficiary enterprises, which makes it difficult for system houses to implement the project of end users;
- The belief by these enterprises that the use of ODS-free substances would result in higher prices for the final product beyond the period covered by the IOC;
- The availability on the domestic market of low cost and high global warming potential technological solutions, with HFC blends;

- IOC paid one year after conversion of end users.
- Limited availability of HFOs at commercial scale and at a reasonable cost

27. Because the actions for the conversion of these enterprises are moving at a slow pace, there have been delays in the execution of service contracts signed with three large system houses (Amino, Purcom and Univar). In addition, the late start in the conversion of end users associated with system house Polyurethane and delays in defining the conversion technology of two system houses (MCassab and Polisystem), coupled with difficulties to conclude negotiations with system house Rodza (Ecopur) due to the reluctance of its owner to join the project have also had an impact on the conversion of end users.

28. Furthermore, the interrelation between Steps 1 and 2 of the HPMP needs to be taken into consideration as beneficiary enterprises operate in sectors covered by both stages, thus hindering the partial and/or fragmented conversion of their manufacturing plant.

29. In order to overcome the difficulties faced, the information campaign has been intensified since 2016 through the introduction of new dissemination elements. Thus, in addition to information materials (folders, booklets, commemorative posters and video) that have been prepared and distributed since the beginning of Stage 1 in 2011, the following publicity pieces have been produced and disseminated:

a) Newsletter on the Brazilian HCFC Phase-Out Management Plan - published monthly, the newsletter presents the main actions implemented in Brazil under the HPMP. It is sent electronically to enterprises in the sectors involved in the HPMP and posted on the website of the Ministry of the Environment (www.mma.gov.br/ozonio) and on the UNDP website dedicated to the Brazilian HCFC Phase-Out Management Plan (www.protocolodemontreal.org.br);
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 the UNDP website dedicated to the Brazilian HCFC Phase-Out Management Plan (www.protocolodemontreal.org.br);
c) Informative video - 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 video provides information on how enterprises can access HPMP funds to assist in their plant conversion process. The informative video was sent electronically to enterprises in the foam sector and posted on the website of the Ministry of the Environment (http://www.mma.gov.br/clima/protecao-da-camada-de-ozonio/difusao-de-informacao/videos-informativos and http://www.mma.gov.br/clima/protecao-da-camada-de-ozonio/acoes-brasileiras-para-protecao-da-camada-de-ozonio/programa-brasileiro-de-eliminacao-dos-hcfcs-HPMP/projeto-para-o-setor-de-manufatura-de-espumas-de-poliuretano) and on the UNDP website dedicated to the Brazilian HCFC Phase-Out Management Plan (www.protocolodemontreal.org.br).

30. Special mention should also be made of two important dissemination events in the rigid polyurethane foam sector:

a) Seminar on formulations of rigid polyurethane foams: organized by the MMA and UNDP with the support of the Sectoral Polyurethane Committee of the Brazilian Chemical Industry Association (ABIQUIM) in May 2017, the seminar aimed at offering the rigid foam sector the opportunity to increase the knowledge about the science of formulating these products. The event was attended by 50 people among formulation experts and entrepreneurs from the PU foam manufacturing sector. The recordings of all the lectures and roundtables held during the seminar are available on the UNDP website dedicated to the HCFC Phase-Out Management Plan (www.protocolodemontreal.org.br);

b) International Workshop on Environmentally Suitable Alternatives to the Foam Sector: held by the MMA and UNDP in April 2018, the workshop sought to stimulate the international exchange of information by presenting the results of the Colombian demonstration project for the use of HFO as a blowing agent in the manufacture of discontinuous panels. The event was attended by 35 participants among experts and entrepreneurs from the PU foam manufacturing sector. Workshop lecture and debates are available on the UNDP website dedicated to the HCFC Phase-Out Management Plan (www.protocolodemontreal.org.br).

31. In addition, 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.

32. In compliance with ExCom's request, Annex 1 presents the list of end users both validated and under validation included as beneficiaries of Stage 1 of the Brazilian HCFC Phase-Out Management Plan. It should be noted that 277 enterprises had the information validated, of which, 170 were converted for HCFC-free technologies, 64 are being converted and 43 are currently not included for different reasons (declined to participate, unwilling to sign commitment agreement but no longer operate with HCFC-141b, are potential ineligible, etc.). However, that due to the above-mentioned difficulties, and considering that there are three remaining system houses finalizing their conversion, the list presented in Annex 1 cannot be deemed a conclusive inventory of end users benefited by Stage 1 of the HPMP. Information on enterprises that need to be validated has not been included. The situation in specific end-users change over time and it is expected that more will be inclined to corporate once the end-date for using HCFC 141b is getting closer and the cost of low GWP alternatives getting more reasonable.

I.4.1.2. Activities in the RAC servicing sector

I.4.1.2.1. Implemented Activities

Table 7 - Project Activities implemented as of second half of August 2018, 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 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; • 25 technical visits to supermarkets carried out; • Scope of demonstrations identified; • Selection process published in close cooperation with the Brazilian

Project	ACTIVITIES Servicing Sector
	Association of Supermarkets (ABRAS); • Technical evaluation of applications carried out; • Five supermarkets selected and four cooperation agreements signed; • Identification, measurement and performance analysis equipment for refrigeration systems purchased; • Four 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; • Four 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 in order to correct identified problems published in cooperation with UNDP; • Technical and financial evaluation of proposals received within the scope of tenders 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 studies on the interventions carried out (ongoing) prepared; • Commercial consulting programme for end users aimed at enhancing the enterprise's decision-making process in favour of low GWP alternatives implemented; • 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

Project	ACTIVITIES Servicing Sector
	- ABNT provided; • The elaboration of the following standards was 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 2017); 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 adaptation of the system 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 URL www.ozoniohcfc.com.br; • Technical assistance provided to users; • App for use of the system on Android smartphones developed.
Dissemination and Awareness Campaign	• Project logo, visual identity and manual developed; • Folder and flyer on the Training and Capacity Building Programme prepared and distributed; • Technical material on the application of natural refrigerants in supermarkets prepared and published; • Content of project website developed; • Project website (www.boaspraticasrefrigeracao.com.br) published and continuously updated;

Project	ACTIVITIES Servicing Sector
	• Project fanpage on Facebook (https://www.facebook.com/camadadeozonioerefrigeracaoeclima?ref=bookmarks) developed and continuously updated; • Press officer contracted and activities and outcomes of Stage 1 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" translated and published; • Three best practice guides (Leak Control, Sealed System Design, Maintenance of Refrigeration Systems) prepared and published; • Materials and publications promoted 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.

33. 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). The states with the largest market share in terms of total annual revenues in each of the five regions of Brazil were identified according to "Ranking ABRAS 2012".

34. 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.

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

a) Provision of a sealed refrigeration system;
b) Reduction of flared mechanical connections in expansion valves, solenoid valves, filters, etc.;
c) Installation of thermoplastic pipes and industrial manufactured flares 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) Systems recharge 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.

36. The following groups of components and equipment have been or are being 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).

37. The main challenges faced during implementation of the intervention plans are described below.

38. 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 will be more costly and complex.

39. The focus of the project is the control of refrigerant leaks. The annual refrigerant consumption in RAC systems of the supermarkets evaluated is 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. There is usually no strategic planning for scheduled and preventive maintenance.

40. Delays in the delivery of purchased equipment and components (see also items 51 and 52) have demanded special attention from the project's technical team. Because of changes made to the original layout of the refrigeration system, the project needed to be re-evaluated and technical visits and additional data collection needed to be conducted.

41. 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.

1.4.2 Stage 2 of the HPMP

I.4.2.1 Activities in the PU Foam Manufacturing Sector

42. The actions informed below have been implemented since the last progress report with funds of the 1st and 2nd tranches received.

43. Individual projects:

a) Isar has completed its industrial conversion in a satisfactory manner, having migrated to Methyl Formate and Methylal. The conversion of this enterprise resulted in the phase-out of 4.97 ODP tonnes.
b) Ártico, Bulltrade, Furgão Ibiporã, Gelopar and Refrimate have finished developing the formulation with an alternative substance to HCFC-141b and have started the activities for the industrial conversion of their manufacturing plants with the definition of the plant conversion plan.
c) Niju is in the process of completing development of the formulation.
d) Tecpur, Therm Jet and Thermotelha are in the process of developing the formulation and starting activities for the industrial conversion of their manufacturing plants with the definition of the plant conversion plan.

44. Group projects:

a) System Houses Amino, Ariston and Ecoblaster have completed the conversion of their manufacturing plants dedicated to the production of rigid PU foams. The three system houses have opted for Methyl Formate as an alternative to HCFC-141b.

b) System House U-Tech has completed the conversion of its manufacturing plant regarding the HCFC-141b and HCFC-22 used in its production process. The enterprise has opted for Methyl Formate as alternative to HCFC-141b and has requested authorization for the temporary use of HFC-134a to replace HCFC-22, with the commitment to discontinue use, with its own resources, as soon as gaseous HFO is available on the market and polyol systems containing gaseous HFO have been developed and optimized. As informed in item 1.4.1.1 of this report, the enterprise has been performing formulation tests with the supplier's support to find solutions to correct the instability problem of the resulting product.
c) System House Flexível has completed development of the formulation, having opted for HFO as an alternative to HCFC-141b.
d) System House Univar (formerly Arinos) has advanced in the conversion process of its manufacturing plant. Currently, 40% of all formulated polyol systems produced are HCFC-141b-free.
e) System House Polyurethane is in the process of developing the formulation and starting activities for the industrial conversion of its manufacturing plant with the definition of the plant conversion plan.
f) System houses Amino, Ariston, Ecoblaster, Flexível, Purcom, Univar, and U-Tech are in the process of validating the list of beneficiary enterprises that will be converted under their group project.
g) A service contract with system house MCassab is in the final negotiation phase.

45. Table 9 shows detailed qualitative data on activities implemented within the scope of each industrial conversion project as of the second half of August 2018, under Stage 2 of the HPMP.

Table 9 – Industrial conversion activities implemented for the PU foam sector as of the second half of August 2018, with funds from the 1st and 2nd tranches approved under Stage 2 of the HPMP.

SECTOR	ENTERPRISE	STATUS OF IMPLEMENTATION	OUTCOMES/OUTPUTS (IMPLEMENTED ACTIVITIES)
Individual Projects (Rigid PU)	ARTICO	• Project in progress	• Enterprise eligibility validated; • Terms of Reference and Action Plan defined; • Service Contract for formulation development signed; • Formulation development plan completed; • Technology selected (Water base); • Plant conversion plan defined and under implementation.
	BULLTRADE	• Project in progress	• Enterprise eligibility validated; • Terms of Reference and Action Plan defined; • Service Contract for formulation development signed; • Formulation development plan completed; • Technology selected (HFO); • Plant conversion plan defined and under implementation.
	COLD AIR	• 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; • 2.81 ODP tons phased out; • Certificate of Completion in the preparation phase.
	FURGÃO IBIPORÃ	• Project in progress	• Eligibility of the enterprise validated; • Terms of Reference and Action Plan defined; • Service Contract for formulation development signed; • Formulation development plan completed; • Technology selected (HFO); • Plant conversion plan defined and under implementation.
	GELOPAR	• Project in progress	• Enterprise eligibility validated; • Terms of Reference and Action Plan defined; • Service Contract for formulation development signed; • Formulation development plan completed; • Technology selected (HFO); • Plant conversion plan is being defined .

	IBF	• 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; • 2.52 ODP tonnes phased out; • Certificate of Completion (COC) in the preparation phase.
	ISAR	• Project completed	• Enterprise eligibility validated; • Terms of Reference and Action Plan defined; • Service Contract for formulation development and plant conversion signed; • Formulation development plan under implementation. • Technology selected (Methyl Formate and Methylal); • Plant conversion plan completed; • Certificate of Completion (COC) in the preparation phase.
	NIJU	• Project in progress	• Enterprise eligibility validated; • Terms of Reference and Action Plan defined; • Service Contract for formulation development signed; • Formulation development plan in the final implementation phase; • Technology selected (HFO).
	REFRIMATE	• Project in progress	• Enterprise eligibility validated; • Terms of Reference and Action Plan defined; • Service Contract for formulation development signed; • Formulation development plan completed; • Technology selected (Water base); • Plant conversion plan defined and under implementation.
	SÃO RAFAEL	Project in progress	• Enterprise eligibility validated; • Work plan for enterprise conversion kick-off defined; • Estimated enterprise conversion kick-off date: 2018.
	TECPUR	• Project in progress	• Enterprise eligibility validated; • Work plan for enterprise conversion kick-off defined; • Service Contract for formulation development and plant conversion signed; • Formulation development plan and plant conversion plan defined and under implementation.

	TERM JET AND THERMOTELHA	• Project in progress	• Enterprise eligibility validated; • Work plan for enterprise conversion kick-off defined; • Service Contract for formulation development and plant conversion signed; • Formulation development plan and plant conversion plan defined and under implementation.
Group Projects – RIGID PU	AMINO	• System House conversion to rigid PU completed; • Validation of beneficiary enterprises in progress.	• Enterprise eligibility validated; • Service Contract for formulation development and plant conversion signed; • Formulation development plan completed; • Conversion Technology defined by the enterprise (Methyl Formate); • Plant conversion completed; • Information on end users in the validation phase; • Estimated end user conversion kick-off date: 2018.
	ARISTON	• System House conversion to rigid PU completed; • Validation of beneficiary enterprises in progress.	• Enterprise eligibility validated; • Service Contract for formulation development and plant conversion signed; • Formulation development plan completed; • Conversion Technology defined by the enterprise (Methyl Formate); • Plant conversion completed; • Information on end users in the validation phase; • Estimated end user conversion kick-off date: 2018.
	ECOBLASTER	• System House conversion to rigid PU completed; • Validation of beneficiary enterprises in progress.	• Enterprise eligibility validated; • Service Contract for formulation development and plant conversion signed; • Formulation development completed; • Conversion Technology defined by the enterprise (Methyl Formate); • Plant conversion completed; • Information on end users in the validation phase; • Estimated end user conversion kick-off date: 2018.
	FLEXÍVEL	• Development of formulation for application in rigid PU completed; • Validation of beneficiary enterprises in progress.	• Enterprise eligibility validated; • Service Contract for formulation development and end user validation signed; • Formulation development completed; • Conversion Technology defined by the enterprise (HFO); • Information on end users in the validation phase.
	MCASSAB	• In progress.	• Enterprise eligibility validated; • Terms of Reference and Action Plan for testing in the definition phase; • Five implementation meetings held; • New tests for defining the technology performed; • Service contract for System House conversion to Rigid Polyurethane (other applications) in the final negotiation phase.

	PURCOM	• System House conversion to rigid PU completed; • Validation of beneficiary enterprises in progress.	• Enterprise eligibility validated; • Terms of Reference and Action Plan for conversion defined; • Service Contract for enterprise conversion signed; • Conversion Technology defined (Methyl Formate); • System House conversion completed; • Term of Commitment signed; • Validation of end user list in progress; • Estimated end user conversion kick-off date: 2018.
	UNIVAR	• Conversion of 40% of the plant; • Project in progress.	• Enterprise eligibility not validated (not eligible); • Service Contract for end user validation signed; • Conversion Technology defined by the enterprise (Methylal); • Information on end users in the validation phase; • Estimated end user conversion kick-off date: 2018.
	UTECH	• System House conversion to rigid PU completed; • Temporary use of high GWP HFC; • Tests performed with negative results; • Formulation adjustment, high cost and limited availability of gaseous HFO on the market are making final conversion infeasible; • Validation of beneficiary enterprises in progress.	• Enterprise eligibility validated; • Service Contract for formulation development and plant conversion signed; • Formulation development completed; • Conversion Technology defined by the enterprise (Methyl Formate and HFO); • Plant conversion completed; • Temporary use of HFC-134a until gaseous HFO is available on the market and a gaseous HFO system is developed and optimized; • Information on end users in the validation phase.
	POLYURETHANE	• Project in progress.	• Enterprise eligibility validated; • Work plan for enterprise conversion kick-off defined; • Formulation development plan and plant conversion plan defined and under implementation.
	COMFIBRAS	• Project in progress.	• Enterprise eligibility validated; • Work plan for enterprise conversion kick-off defined; • Estimated enterprise conversion kick-of date: 2018.
	DOW	• Project in progress.	• Enterprise eligibility not validated (not eligible); • Work plan for end user conversion kick-off defined; • Estimated enterprise conversion kick-off date: 2018.

	BASF	• Project in progress.	• Enterprise eligibility not validated (not eligible); • Work plan for end user conversion kick-off defined; • Estimated enterprise conversion kick-off date: 2018.

I.4.2.2. Activities in the RAC servicing sector

Table 10 – Project activities implemented as of the second half of August 2018, with funds from the 1st and 2nd tranches approved for Stage 2 of the HPMP

Project	ACTIVITIES Servicing Sector
Training and Capacity Building (Training in HCFC-22 Containment)	• National and international consultants contracted; • Market research in the country's training capacity and potential regional implementation partners carried out; • Teaching material (presentations and best practice handbooks) for training refrigeration technicians updated and published; • Terms of reference and selection criteria for regional partner institutions prepared; • Tender carried out and 14 training institutions selected and contracted; • Technical visits to the selected regional training institutions conducted; • Tools and components for demonstration and practical training (educational kits) purchased and distributed to the selected regional training institutions; • Agenda, training materials and list of consumables for training courses prepared; • Six train-the-trainer courses held and 65 multipliers trained; • 1,238 technicians trained in best practices for split and window type air conditioners; • 737 technicians trained in best practices for commercial refrigeration [1]; • 3 monitoring visits to regional partner training institutions carried out.
Training and Capacity Building (Low GWP alternatives)	• National and international consultants contracted; • Best practices handbooks are in preparation phase.
Dissemination and Awareness Campaign	• Sectoral communication plan developed; • Operation of Project website (www.boaspraticasrefrigeracao.com.br); • Operation of Project fanpage on Facebook (https://www.facebook.com/camadadeozonioerefrigeracaoeclima?ref=bookmarks); • Press officer contracted and activities and results of Stage 2 of the

[1] Training was provided through partnerships established under Stage 1 of the HPMP.

Project	ACTIVITIES Servicing Sector
	HPMP disseminated; • Photos of implemented actions posted on Flickr: https://www.flickr.com/photos/147992141@N07/collections/72157690669896345/; • Interviews with participants in best practice training courses conducted and testimonies published and disseminated; • Meetings with national stakeholders in the servicing sector held; • Three best practice guides (Leak Control, Sealed System Design, Maintenance of Refrigeration Systems) printed and disseminated; • Poster on the "10 Golden Rules for Maintenance of RAC Systems" prepared, printed and disseminated; • Technical refrigerant rulers for rapid pressure and temperature conversion developed, produced and distributed; • Stickers/stamps to disseminate best practices in RAC systems designed and distributed; • Educational video to reduce leakages in the servicing sector produced (available in three versions: original with audio in Portuguese, one with English subtitles and one with Portuguese subtitles); • Project folder prepared (layout services contracted and ongoing); • Posters on capacity-building and training activities designed (layout services contracted and ongoing); • Card with specific refrigerant gravity elaborated and designed; • Video for end user awareness regarding contracting of adequate services in air conditioning systems (production contracted and ongoing); • Video for dissemination of best practices in the commercial refrigeration sector (production contracted and ongoing); • Participation in two workshops held by the RAC Systems Manufacturing Project/Presentation on activities in the servicing sector and safe use of flammable refrigerants; • Awareness Campaign on the Ozone Layer in Subways in Belo Horizonte supported; • 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; • Support for the review, discussion and development of technical standards for the servicing sector provided, with participation in monthly meetings of experts at the Brazilian Association of Technical

Project	ACTIVITIES Servicing Sector
	Standards (ABNT); • Standards supported by the Project (developed or under discussion): 1. Ammonia refrigeration systems (discussions are expected to continue until 2020, after conclusion of the review of standards ABNT NBR 16069 and ABNT NBR 13598); 2. Review of Standard ABNT NBR 16069 – "Security in refrigeration systems", in accordance with the latest version of international standard ISO 5149 (ongoing, completion estimated for 2019); 3. Review of Standard ABNT NBR 13598 – "Pressure Vessels for Refrigeration" (ongoing, this standard is likely to be incorporated into standard ABNT NBR 16069, which is currently under review); 4. Review of Standard ABNT NBR – 15833 – "Demanufacturing of Refrigerators". • NOTE: Technical standards are discussed within the Brazilian Committee for Refrigeration, Air Conditioning, Ventilation and Heating (CB-55) in specialized working groups. These working groups are composed of private sector experts and the role of the Brazilian government and GIZ is restricted to providing support in the preparation, discussion and review of technical standards that are essential for the adequate handling of refrigerants. The Government has no control over the preparation and review processes. Therefore, the above-mentioned time frames are estimated completion dates for each technical standard.

46. Table 11 below presents a summary of technicians trained in best practices in the commercial refrigeration sector under the Training and Capacity-Building Project for better HCFC-22 containment in the Commercial Refrigeration Sector.

Table 11 – Summary of Training Activities by region in the Commercial Refrigeration Sector

Application	Region	State	Target	No. of Technicians Trained	Partners
Best practices in HCFC-22 containment in commercial refrigeration systems	North	Rondônia	100	-	SENAI-RO
		Tocantins	130	182	SENAI-GO
	Northeast	Pernambuco / Rio Grande do Norte	170	-	SENAI-PE / SENAI-RN
		Bahia	158	187	IFBA
	Central-West	Distrito Federal	200	208	SENAI-GO
	Southeast	Rio de Janeiro	170	-	SENAI-RJ
		Minas Gerais	150	160	SENAI-MG
	South	Paraná	160	-	SENAI-PR
Total			1,238	737	

47. Table 12 below presents a summary of technicians trained in best practices in air conditioning systems under the Training and Capacity-Building Project for better HCFC-22 containment in the Air Conditioning Sector.

Table 12 – Summary of Training Activities by region in the Air Conditioning Sector

Application	Region	State	Target	No. of Technicians Trained	Partners
Best practices in HCFC-22 containment in air conditioning systems	North	Rondônia	250	-	SENAI-RO
		Amazonas	250	-	CESP
	Northeast	Pernambuco / Rio Grande do Norte	600	-	SENAI-PE / SENAI-RN
		Bahia	500	310	IFBA
		Maranhão	600	32	NETCOM
	Central-West	Distrito Federal	300	12	SENAI-DF
		Goiás	400	-	SENAI-GO
		Mato Grosso	500	-	SENAI-MT
	Southeast	Rio de Janeiro	700	27	SENAI-RJ
		Minas Gerais	800	179	SENAI-MG
		São Paulo	900	678	SENAI-SP
	South	Santa Catarina	400	-	SENAI-SC
		Paraná	400	-	SENAI-PR
		Rio Grande do Sul	400	-	SENAI-RS
Total			7,000	1,238	

I.4.2.3. Activities in the RAC manufacturing sector

a) Technical Assistance Project - Small and Medium-Sized Manufacturers of Commercial Refrigeration Equipment:

48. As mentioned in the previous report, in August 2017, official communications were sent to the 33 enterprises listed in the project, with the aim to confirm the information obtained during the project preparation process and re-establish the contacts. The enterprises listed in the RAC project were identified and contacted between 2014 and 2015. Contacts were made by email, phone calls and missions to the enterprises' facilities and some of them responded positively. It also emerged the need to hold workshops to share new information about the project. The process lasted until the second half of 2017, when the first workshop for small and medium-sized enterprises was held in São Paulo, SP.

49. For the purposes of the workshop the enterprises were divided in two groups: Group 1, enterprises from the Southeast and Northeast regions of Brazil; and Group 2 enterprises from the South. This strategy was adopted based on the number of enterprises in each group, their location and travel logistics. Group 1 was composed of 17 enterprises: 11 from the state of São Paulo (SP), two from the state of Espírito Santo (ES), three from the state of Pernambuco (PE), and one from the State of Ceará (CE). Group 2 was composed of 16 enterprises: eight from the State of Rio Grande do Sul (RS), seven from the state of Santa Catarina (SC) and one from the state of Paraná (PA). The workshop agenda was organized so as to allow small and medium-sized enterprises to re-establish contacts with the project management office and share technical information about alternative technologies in commercial refrigeration.

50. The workshop agenda included institutional and technical presentations related to alternative refrigerants, especially natural refrigerants. Because the enterprises expressed concern about the availability of components for equipment using alternative refrigerants, as observed also through contacts made before the workshop, representatives of suppliers of refrigeration equipment components were invited to the event.

51. This initial activity was called “Workshop on Alternative Refrigerants for Commercial Refrigeration Equipment”. The first workshop, for Group 1, was held on 27 February in the city of São Paulo and was attended by 7 beneficiary enterprises, 41% of the enterprises invited; the second workshop, for Group 2, was held on 28 June in the city of Porto Alegre and was attended by 13 beneficiary enterprises, 59% of enterprises invited. The Table 13 summarize the information for these two workshops.

Table 13 – Information on the Workshops held under the Technical Assistance Project

	Workshop 1	Workshop 2
Place	São Paulo - SP	Porto Alegre - RS
Date	27 February 2018	28 June 2018
No. of enterprises	7	13
Total No. of participants	40	68
Participating states	SP, ES, PE, CE	SP, RS, SC, PR

Note.: Records of all the lectures and debates that took place during the workshops are available on the MMA website (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-HPMP/projeto-para-o-setor-de-manufatura-de-equipamentos-de-refrigeracao-e-ar-condicionado)

52. The strategy to re-establish contacts with small and medium-sized enterprises in the RAC sector shall be pursued and enhanced over the next year, to clarify technical issues related to the management of flammable refrigerants.

53. A challenge to address in the RAC sector is the diversity of equipment produced by the enterprises. Most of them produce cold rooms, some produce vertical and horizontal food and beverage display refrigerators, others produce food display freezers, wine cellars, refrigerators, chillers, and monoblocs for cold rooms. In general, all enterprises are aware of both the need to replace HCFC-22 and the technological change required for adapting to alternative refrigerants. In this initial contact, it was noticed that, in addition to R-134a, the following refrigerants are also used: R-744, followed by R-290 and R-1234yf. Some of the barriers related to the use of alternative refrigerants include safety issues, the lack of knowledge about regulations, the need to redesign equipment, and the lack of knowledge about the efficiency of the systems. The enterprises also mention the need for further discussions about the cost of components that are compatible with alternative refrigerants, the cost of technological conversion, the lack of trained technicians to handle flammable refrigerants, and the lack of comparative data on equipment performance. The uncertainty regarding the commercial availability of certain refrigerants and compatible components is a relevant aspect pointed out by the enterprises. Due to the need for technical information, training and technology development, it was decided to start the activities by prioritizing the process of mobilizing and training the enterprises, thus allowing them to safely handle alternative refrigerants.

54. The diversity among the enterprises also includes technical aspects. There are enterprises that work on a "trial and error" basis, that is, they develop their products using the practical experience of their technicians. Obviously, in the case of flammable refrigerants this strategy is not feasible. Specialized technical assistance is therefore necessary to assist the enterprises in redesigning equipment to be adapted to alternative refrigerants, before the Project provides equipment and tools for their conversion. Other enterprises already have some experience with alternative refrigerants, including R-290, which facilitates the implementation and enables sharing experience, which has been happening through the workshops.

55. For small and medium-sized enterprises, the country's economic situation requires additional caution in the promotion of technological change. That is why activities related to the

purchase of equipment should be postponed to 2019/2020, with priority given to training and technical assistance activities, mainly through assistance in the redesign of equipment.

56. Given the aforementioned diversity among enterprises, two different strategies should be developed to meet the needs of each group. (1) For the more advanced enterprises with a greater potential to assimilate technology, a national consultant has been selected to work in partnership with the enterprise in the redesign of equipment. (2) For the group of enterprises that are less prepared to assimilate new technologies, or even to start technology development activities, the strategy will involve enhancing training activities, especially through workshops, and coordinating training activities under the RAC Project with training activities in the servicing sector, under the project implemented by GIZ. It should be noted that strategy 2 will comprise the 33 enterprises involved in the project.

57. Regarding the supply of equipment planned for 20 enterprises to be selected from among the 33 listed in the project, few of them have the capacity to receive equipment that allows them to safely handle flammable refrigerants. For safety reasons, the equipment should be supplied to enterprises that have the capacity to handle the technology and deliver the equipment gradually over the duration of the project. Thus, equipment for handling alternative refrigerants will be initially provided to enterprises that are already able to do so. As for the other enterprises, before receiving any equipment they should be trained in and sensitized to the new technologies available in the market.

58. As already mentioned, initial implementation activities included contacting the 33 enterprises listed. One of the enterprises, SPACINOX, a producer of commercial refrigerators for supermarkets, was not located and all contact attempts were unsuccessful. Therefore, we request the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol to amend the implementation strategy to replace this enterprise with a similar one, thus maintaining the scope of the project.

59. The new enterprise identified has expressed interest in both participating in the Project and implementing activities to replace HCFC-22 with R-290. This enterprise is JJ Instalações Comerciais, located in the State of Santa Catarina. The enterprise attended the workshop held in Porto Alegre in June 2018.

60. UNIDO has requested documents from JJ Instalações Comerciais and confirmed its eligibility according to the following information:

- Name of Enterprise: JJ Instalações Comerciais EIRELI
- Contact person: Gian Carlos Carraro
- Postal address, email address and telephone number: Av. Araucária, 1205 – Centro, Maravilha – SC; controladoria@jj.ind.br; +55 (49) 9 8828-6337

Eligibility Criteria – Project for HCFC-22 Phase-Out in the production of commercial refrigeration equipment in SMEs	**Status of enterprise JJ Instalações Comerciais**	**Observation**
Be a manufacturer of commercial	Yes	Produces refrigerated display cases

refrigeration equipment		(refrigerated display counters used by supermarkets, butcher shops, bakeries, convenience stores, etc.)
Established before 21 September 2007	Yes	Enterprise established on 6 May 2003
Individual HCFC-22 consumption below 10 ODS tons/year	Yes	Consumption in 2013 (base year for the HPMP Stage 2 strategy): 1.50 ODS tonnes
National owned enterprise	Yes	100% Brazilian. Enterprise fully owned by Mr Thiago Simon - there have been no changes in ownership in the last 5 years
Average R-22 charge per equipment	Reported	The enterprise reported that it has several types of products, and that the charge may vary significantly depending on the equipment model and modulation (size). However, the enterprise's engineering department has reported that the average R-22 charge per equipment is 900 g.


Figure 1 – Photos of enterprise JJ Instalações Comerciais, July 2018 (photo emailed by the enterprise representative on 9 July 2018).

b) Group Projects - Manufacture of Commercial Refrigeration Equipment

57. The initial implementation activity of this group was meant to mobilize the three participating enterprises by sending them mail in August 2017, followed by telephone calls, meetings at UNIDO's office in Brasilia, and a visit by the UNIDO team to the enterprise headquarters. All activities were carried out under MMA coordination. In this process, the project team was able to confirm the information collected during the project development phase and reiterate the importance of the project to assist the enterprise in migrating to an alternative refrigerant with low GWP and zero ODP, without the need to use intermediate refrigerants, that is, HFCs or HFC blends. The mobilization effort resulted in a positive feedback by the enterprises Indústria e Comércio Chopeiras Ribeirão Memo Ltda., hereinafter referred to as Chopeiras Memo, and Aquagel Refrigeração Ltda, hereinafter referred to as Aquagel. As for the Free Art Seral Enterprise, the several attempts to establish a contact were unsuccessful.

i. Indústria e Comércio CHOPEIRAS RIBEIRÃO MEMO Ltda.

58. The contact with Chopeiras Memo took place during a meeting held at UNIDO's office in Brasilia in October 2017, attended by two representatives of the enterprise and of the Ministry of the Environment. On the occasion the enterprise presented its product portfolio and specificities and expressed concerns such as higher prices for final products using alternative refrigerants, the low quality of the service sector and the lack of training for technicians in the use of alternative refrigerants. Like other enterprises, Chopeiras Memo mentioned the safety issue as a key factor to be worked out by its technicians before adopting a flammable refrigerant. The equipment (beer coolers) produced by Chopeiras Memo can be rented for use in private homes in a "delivery" format, and the enterprise's engineering team expressed apprehension with the use of a flammable refrigerant in beer coolers as it could entail risks during transportation of the equipment or in the customer's home.

59. These concerns of the enterprise should be addressed in the equipment redesigning process, together with other demands such as: impact on the factory floor (structural changes); changes in production logistics; need for special welding; lack of knowledge about safety standards; lack of employee training; concern about the logistics for technical assistance to equipment using R-290.

60. Chopeiras Memo has a team of specialized engineers who presented to UNIDO and MMA the design of a beer cooler that uses an alternative refrigerant. However, technical assistance is required for the project to continue.

61. The necessary technical assistance is scheduled to be provided throughout 2019. The aspect related to the commercial availability of suppliers of compressor and condenser was also mentioned by the enterprise. The enterprise expressed interest in receiving technical assistance to address safety issues in the use of flammable refrigerants.

ii. FREEART SERAL Brasil Metalúrgica Ltda.
Waiting response from the enterprise.

iii. AQUAGEL Refrigeração Ltda.

62. Following the mail contact with Aquagel in August 2017, the enterprise was invited to a meeting at UNIDO's office in Brasilia, with the presence of the Ministry of the Environment. At that meeting, the enterprise representative presented the work that had been done since the enterprise was first contacted by UNIDO during the preparation of the RAC project. The representative expressed concern about making technology changes in times of financial crisis but reiterated the enterprise's interest in participating in the project, having shown full knowledge of upcoming changes, including the Kigali Amendment on HFCs.

63. Aquagel plans to convert its line of beer coolers and "beverage dispensers" to equipment using R-290. The enterprise reported that it intends to start procedures for implementing the project in the second half of 2018, and that it has made internal progress in technical aspects, to meet its commitment to the RAC Project. Two missions to Aquagel have already been carried

out, and the project team stays in contact with the enterprise by providing it with news and trends in the beer coolers sector. Aquagel's position is understandable since this sector has been hardly affected by the economic crisis and caution in making decisions about new technologies is important, but its expectations of consolidating a conversion commitment are positive.

64. **Final consideration**: In this project, the biggest challenge is identifying a technology that is compatible with the country's needs. The beer coolers currently in use require a high HCFC-22 charge (from 1 kg to 7 kg.) and the beverage is served at temperatures around -2°C, which are lower than in European countries. Reaching this low temperature is a challenge and does not seem to be possible with the technology used in other countries in similar equipment using R-290. Therefore, carrying out the conversion of the enterprises requires first developing equipment that operates with an alternative refrigerant which, in addition to allowing for safe transportation, meets the technical specifications and needs of the Brazilian market (beverages served at low temperatures and high flows).

65. The technology development activity for this project will be tailored to the specificities of each enterprise, as there is great competition between them.

c) Individual Projects - Manufacture of Commercial Refrigeration Equipment for the Supermarket Sector:

66. Although the activities related to this sector had not been scheduled to start immediately, UNIDO and the MMA decided to start implementing activities with the supermarket sector because, in addition to the interest expressed by the two participating enterprises, Plotter Racks and Eletrofrio, they are leading companies in the country and consequently have a great capacity to influence the market, thus promoting new technologies. This decision has proven to be correct, since the activities are boasting positive and meaningful results.

67. Both enterprises were initially contacted to present the RAC Project and introduce the project team. Individual meetings were held at UNIDO's office in Brasilia in late September 2017 with the presence of MMA.

i. ELETROFRIO

68. Following the implementation team's first contact with Eletrofrio, a visit to the enterprise's facilities was held in October 2017, when the enterprise's senior management confirmed his interest in immediately starting the project activities. As a first activity, Eletrofrio expressed interest in strengthening contacts with suppliers of modular chiller components that use propane as a refrigerant. Thus, a technical assistance activity was organized with the help of the project's specialist engineer, which included visits to the manufacturers of equipment, components and tools. Appropriate security measures were also discussed and identified. The activity enabled making significant progress in the engineering design of the prototype and in the preparation of the work and investment plan for equipment purchase, commissioning and demonstration at end users.

69. Together with the MMA, UNIDO drafted the terms of reference (TOR) describing the activities to be carried out and listing the equipment to be purchased. After the contract was signed, Eletrofrio started the activities in May 2017, with an estimated completion period of 12 months, including the demonstration project. The enterprise is currently advancing rapidly in the development of a modular chiller prototype, having already presented the idea of the equipment at an important fair in the supermarket sector (APAS Show) held in São Paulo in April 2018.

70. The supermarket selection process for the demonstration project was carried out simultaneously with the implementation of the project in Eletrofrio's plant, since the modules should be designed according to the thermal capacity required by the selected supermarket and should consider the specifics of the supermarket machine room. The supermarket selection process resulted in the choice of Condor Super Center Ltda., located in the city of Curitiba, in Paraná state.

71. The project implementation team monitors the implementation of Eletrofrio's activities through both direct contact with the enterprise engineers responsible for the implementation and visits for collecting information and recording the project's progress.

ii. PLOTTER RACKS

72. The meeting with Plotter Racks was held in Brasilia in September 2017, with the participation of the MMA. The first visit to the enterprise's facilities was held in October 2017, when the implementation procedures were discussed with the enterprise's management team. Regarding technical aspects, the enterprise asked for access to more updated information on the subject and, thus, UNIDO has been informing the enterprise about technical events and has been conveying information on chiller technologies using alternative refrigerants.

73. Plotter Racks' project implementation started with providing technical assistance to the enterprise through an international consultant. The terms of reference were drawn up and the consultant was contracted in April 2018. The survey on modular chiller trends in Europe and in the United States using propane as a refrigerant helped the enterprise to both define the size and technical specification of chiller components by addressing safety aspects, which is the enterprise's main concern, and identify component suppliers and costs. The technical assistance requested by Plotter Racks is due to the recession the country has been experiencing, which leads to the need to identify and reduce the risks of investing in new technologies.

74. The contracted consultant provided information on applications and refrigeration and air conditioning equipment using propane, as well as comparative data for various refrigerants (HCFC-22, HFC-404A, HFC-134a, HFC-410A, and R-1234ze). Necessary interventions, safety requirements in the manufacturing area, orientation regarding manufacturing stages, and standards for refrigeration projects were also presented. The consultant visited the enterprise's headquarters in July 2018. To assist the enterprise in making decisions, topics under discussion include equipment capacity, pre-selection and availability of components (compressor, condenser and evaporator), module size and geometry, components compatible with flammable refrigerants, and safety requirements for the modules (type and number of sensors, exhaust system).

75. Plotter Racks is making rapid progress in the design of a modular chiller prototype, because it already has modular equipment in its portfolio that can be used as a starting point for an R-290 modular chiller.

76. In May 2018, Plotter Racks presented a work plan for the establishment of facilities that enable assessing the performance of the product to be developed under the project, as well as for the creation of a refrigerant charging area suitable for handling flammable refrigerants. Because its decision is in line with the objectives of the RAC Project, Terms of Reference and a contract were drawn up for the purpose of assisting the enterprise in the acquisition of refrigerant handling tools and safety measures. The contracting of Plotter Racks has been completed and the activity has been running since July 2018.

77. The contracting of Plotter Racks for the execution of the technical assistance services and implementation of the demonstration project in a supermarket, the final stage of project execution, is in an advanced stage at UNIDO. The expectation is that this activity will start in September 2018.

78. **Final Consideration**: As for the enterprises in the supermarket sector, both are involved and interested in the project and working towards its implementation.

d) Individual Projects - Manufacture of Air Conditioning Equipment

79. Activities related to conversion in the air conditioning sector should start in 2019. However, as mentioned in the previous report and pursuant to the procedure established to contact RAC project beneficiaries, in August 2017 official communications were sent to three air conditioner manufacturers - ELGIN S.A., GREE and CLIMAZON. Nonetheless, the contacts established have not yet resulted in formal commitments to start the project.

80. As initially noticed, the enterprises are uncertain about the regulations for the use of flammable refrigerants in air conditioning equipment. The issue is being discussed in a technical group of the ABNT, in which UNIDO participates. In addition, the representatives contacted by telephone showed little knowledge about technologies that use alternative refrigerants, especially natural ones. This lack of knowledge, coupled with uncertainties about the acceptability of a flammable product in the market, is a matter of concern for all enterprises.

81. Considering the situation, it is not appropriate to start field activities with the three air conditioner enterprises. Therefore, a plan of action, to start in 2019, with information and mobilization activities for technical assistance, is proposed according to Section II.2.2 of this report, to enable a gradual involvement of the air conditioning sector in the technology conversion process. The activities planned for 2019 are considered preliminary and aim to mobilize the sector for the discussions. They also include the exchange of knowledge between representatives of domestic enterprises and international stakeholders (experts and technicians) with experience in new technologies that use alternative refrigerants. Another aim is to strengthen relations between project beneficiary enterprises and enterprises established in other countries that have either carried out the conversion or are in more advanced conversion stages.

82. **Final consideration**: The work with enterprises in the air conditioning sector that should convert their production lines is the most challenging, especially due to the current demobilization of the enterprises, since the possibility of migrating to an alternative technology is not yet deemed urgent by the three enterprises. Therefore, the mobilization work should take most in 2019 and the funds earmarked for this project should be executed in 2020.

83. Factors that can be identified as the most challenging and that impacted the execution of project from the first tranche earmarked for the RAC Equipment Manufacturing Sector include:

- The lack of knowledge of how to handle alternative refrigerant technologies;
- The geographical distribution, variety, diversity and specificities of the equipment (in terms of installed refrigerant charge and type of system, for example) produced by small and medium-sized refrigeration enterprises that are beneficiaries of Stage 2 of the HPMP require a customized approach to project implementation activities;
- The belief by small and medium-sized commercial refrigeration enterprises that the use of ODS-free technologies will result in higher prices for the final product;
- The lack of knowledge about the availability on the domestic market of alternative refrigerants that enable conversion and allow for a final product price that is commercially more competitive;
- The scarcity/unavailability on the Brazilian market of components for refrigeration equipment suitable for the use of flammable refrigerants;
- The uncertainty of air conditioning enterprises about the acceptability of the final product with flammable refrigerant by consumers and the still ongoing discussion about the national regulation on the subject.

84. However, despite the challenges, the implementation of the RAC Project is in progress and Table 14 shows the activities carried out in each subproject as of the first half of August 2017.

Table 14 – Activities developed in the RAC Equipment Manufacturing Sector as of the second half of August 2018, with funds from the first tranche approved for Stage 2 of the HPMP

Sector	Type of Project	Outcomes/ Outputs (Implemented Activities)

COMMERCIAL REFRIGERATION	Technical assistance project - Small and medium-sized manufacturers of commercial refrigeration equipment	• Contact with the enterprises carried out. • National expert to assist beneficiary enterprises with greater potential for conversion to low GWP alternatives identified. • Terms of reference for contracting a national consultant and an assistant for a technical assistance project for redesigning equipment prepared; • National consultant and assistant to assist beneficiary enterprises in the conversion to low GWP alternatives contracted; • Visit to and meeting at the headquarters of 10 enterprises held; • Two workshops entitled "*Workshop on alternative refrigerants for commercial refrigeration equipment*" held. • Development of programme content for technical and informative workshops aimed at meeting the demands of enterprises in greater need of and demand for technical training in handling flammable refrigerants.
	Group Projects - Manufacture of commercial refrigeration equipment	• AQUAGEL REFRIGERAÇÃO: • Three meetings held; • Two visits to enterprise headquarters undertaken.
		• CHOPEIRAS RIBEIRÃO MEMO • Three meetings held; • One visit to enterprise headquarters undertaken.

	Individual Projects - Manufacture of commercial refrigeration equipment for the supermarket sector	ELETROFRIO: • Enterprise eligibility validated; • Conversion technology defined (propane); • Term of commitment for Project implementation signed; • Terms of Reference for equipment purchase prepared; • Terms of Reference for services prepared, with Action Plan defined; • Service Contract signed; • Contract for equipment purchase signed; Expression of interest from the supermarket published and finalized: the supermarket Condor Super Center Ltda. was selected.
		PLOTTER RACKS: • Enterprise eligibility validated; • Conversion technology defined (propane); • Terms of reference for contracting the international consultant prepared; • International consultant contracted; • Terms of reference for purchase of refrigerant handling tools and safety measures prepared; • Term of Reference for technical assistance and demonstration project prepared.
AIR CONDITIONING	Individual projects - Manufacture of air conditioning equipment	• Not started.

I.4.3. Lessons learned and key challenges

Foam Sector

Lessons learned

a) 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;

b) The execution of service contracts signed between UNDP and HPMP beneficiary enterprises requires continuous monitoring by UNDP at the enterprise level;

c) The dissemination of information through different communication media is of great importance to raise awareness among micro and small enterprises benefiting from the project.

Key challenges

85. As informed in previous progress reports, one of the main challenge faced in the implementation of activities in the foam sector is related to the economic crisis experienced by the country, which has slowed down the production process of enterprises in all sectors and consequently affected the conversion process of some HPMP beneficiary enterprises. As a strategy to overcome this difficulty, the dissemination of information has been enhanced since 2016 with the creation of new publicity pieces to help raise awareness among enterprises. Furthermore, UNDP is working on a simplified contracting modality to provide more flexibility to system house in the project implementation.

86. Furthermore, the limited availability of HFOs at commercial scale at a reasonable cost is representing a major barrier for companies that has selected this technology for their reconversion process. Monitoring meetings was held with the three HFO's suppliers on July 2018. The companies have confirmed the high costs of the substances, from USD 13.00 to USD 20.00 per kg.

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 is much more

complex. The cooperation established during Stage I serves as the basis for enhancing best practice training activities during Stage 2 of the HPMP;

d) 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 leak containment are expected to continue to be part of the partner institutions' programmes, including after completion of the Project.

Key challenges

Interinstitutional arrangements

87. 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.

88. 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 document 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

89. Based on the training experience gained during implementation of the PNC, 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 enhancement of activities for Stage 2 in Brazil.

90. However, the regional participation of 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 enter into individual contracts.

Technical

91. 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.

92. Finding the proper components for a demonstration unit to work as a model for supermarket refrigeration systems was more difficult than expected in terms of pressure, temperature, settings and performance of the system. It was also difficult to find suppliers willing to offer products that met the specifications required.

93. 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 are not always available in the national market. Selecting alternative components and contacting potential national suppliers is being 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.

94. 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 contract 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 have not been able to meet the agreed delivery schedules, and the last delivery is expected to occur only in September of this year.

95. The contracting of additional technical consultants led to significant progress throughout this year. Therefore, all actions are expected to be completed by the second half of 2019.

96. 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 1 of the HPMP was met on 31 August 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*

97. 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.

98. 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.

99. 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.

100. 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 2 of the HPMP.

Manufacture of RAC equipment

Lessons learned

a) Need for customized technological solutions, because many enterprises compete with each other, hindering the establishment of cooperation networks between small and medium-sized enterprises;

b) The main mechanism used for project implementation is the contracting of enterprises. In the supermarket sector this stage has already been completed and it was observed a need for a close coordination with the enterprise for defining the Terms of Reference and the Action Plan;

c) The commercial refrigeration and air conditioning manufacture sector is being addressed for the first time under the HPMP; thus, the strategy for raising awareness in this sector and promoting its adhesion to the HPMP is being developed in the course of project implementation;

d) It was found that most project beneficiary enterprises, especially small and medium-sized enterprises, are totally unprepared to handle inflammable refrigerants. Therefore, there is no possibility of purchasing equipment for some enterprises without prior training activities are carried out.

Key challenges

101. The main challenge faced in implementing the activities is related to the enterprises' concern in promote substantial technological changes in refrigeration equipment which require additional investments in the manufacturing area in times of economic crisis. Enterprises are very cautious and worried about any additional costs that may be necessary.

102. In addition, the conversion of beneficiary enterprises must be preceded by the development of equipment prototypes with a very particular technology to meet the needs of the country's market, especially in regard with beer cooler equipment, which requires a temperature and flow that are unusual in other countries.

103. The variety of equipment in the enterprises listed in the project requires specific action to some of them and, in order to solve this problem, groups of enterprises are being set up based on equipment with similar characteristics, so that they can receive customized technical assistance simultaneously.

104. The Concerns about market availability of components have been repeatedly mentioned by the enterprises – therefore the invitation for component suppliers to attend the debates in the technical workshops, which will allow them to identify the expected demand for these types of equipment in the country.

105. It was observed that the enterprises are uncertain about how to deal with flammable refrigerants. Therefore, an aspect that will be urgently addressed is the training in the safe use of flammable refrigerants in the manufacture, installation, handling, and maintenance of RAC equipment. In this context, the work to be carried out in the Servicing Sector under Stage 2 of the HPMP will be essential to assist in the safe handling of flammable refrigerants.

106. Regarding the existence of alternative technology using low GWP refrigerants, investment in technical assistance is required for the development of commercially feasible prototypes. This aspect should be further discussed in the second half of 2018, as the focus of this first implementation stage is to clearly identify the work scenario within the beneficiary enterprises of the RAC Project.

I.4.4. Other environmental impacts, including on the climate system

107. As mentioned earlier, HCFC consumption in 2017 was below the baseline, which was the average consumption in 2009/2010, 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.4.5. Implementation and Monitoring

108. 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. 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 fulfil its obligations under the Montreal Protocol.

109. 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.

110. The MMA, through its National Ozone Unit (NOU) is also responsible for the general coordination of activities implemented under the HPMP. It tracks projects and plays a lead role in coordinating interactions with different stakeholders (implementing agencies, private sector,

associations, etc.), especially through the GT-HCFC working group and the Executive Inter-Ministerial Committee for Ozone Layer Protection (PROZON), of which it is both the coordinator and agency responsible for the executive secretariat. The former allows for articulations with the private sector and associations, and the latter with other line ministries whose mandates share any level of intercession with ODS control and phase-out, both aimed at increasing the understanding of actions and activities planned in the HPMP and at strengthening relations for a better development of HCFC phasing-out efforts.

111. 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.

112. The UNDP (PMU/UNDP) Project Monitoring Unit has one project manager, one senior national technical advisor, one international technical advisor, one technical advisor, and one programme assistant. The PMU provides permanent assistance to the 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 recommendation 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 1 of the HMPH, 40 service contracts have been signed with HPMP beneficiary enterprises, of which 33 have expired. As regards Stage 2, 24 service contracts have been signed with beneficiary enterprises, of which two had expired by August 2018.
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.

113. The Project Management Unit (UGP in Portuguese) located at UNIDO Brazil, is composed of a project manager, a national specialist and an administrative assistant, who continuously assist the Ministry of the Environment and beneficiary enterprises of the HPMP -

Stage 2 in the implementation of the Project for the RAC Equipment Manufacturing Sector through the following technical, administrative and operational activities:

a) International and national technical assistance services to the Government and eligible enterprises;
b) Management in the implementation of investment projects in the RAC equipment manufacturing sector;
c) 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 UNIDO) to report on the implementation of the activities related to the approved tranches;
f) Preparation of terms of commitment;
g) Preparation of Terms of Reference;
h) Technical analysis of products presented;
i) Administration of payment for analysed products approved by senior international and national advisors;
j) Monitoring of the schedules agreed upon in the signed contracts.

I.5. Consolidated Financial Report

I.5.1. Stage 1 of the HPMP

114. Table 15 shows consolidated financial data for Stage 1 of the HPMP as of the second half of August 2018. As shown, UNDP disbursements in the foam manufacturing sector, regulatory actions and implementation and monitoring activities total USD 11,489,845.83, while outstanding financial obligations (hard commitments) account for USD 3,140,970.59 of the total amount received for conversion projects. Combined, disbursements and commitments amount to USD 14,630,846.42, or the equivalent of 95.46% of the total amount of the five tranches received.

115. In the RAC servicing sector, disbursements for the activities implemented by GIZ account for USD 3,956,710.00 of the tranches received for that sector and total commitments worth USD 134,199.00. Combined, disbursements and commitments in the RAC servicing sector account for 100.00% of the three tranches received.

116. As reported in paragraphs 25 to 29 of this report, several factors have delayed the implementation of industrial conversion projects in the PU foam sector, although advances have been made since the progress report presented to the 80th ExCom meeting. As a strategy to reverse this scenario, the information dissemination campaign was intensified, as reported in paragraphs 30 to 32 of this report.

117. In addition, progress has been observed in the implementation of Demonstration Projects for better HCFC-22 containment, with the completion of the process for the purchase of the components required for the implementation of intervention plans for two supermarkets located in the North and Southeast region, and for contracting a specialized consultant to assist in the implementation of Demonstration Projects. In addition, the process for the purchase of components for the supermarket located in the Northeast region of Brazil is in the final phase.

118. Section III of this progress report presents the updated work plan for execution of remaining funds up to 2019.

Table 15– HPMP Financial Report as of the second half of August 2018 – Stage 1.

Component	Activities	Tranches	Disbursements (D)	Disbursement %	Commitments (C)	Total (D+C)	Implementation %	Balance
		(USD)						
PU manufacturing	Industrial Conversion	**15,326,957.00**	10,569,875.83	**74,97%**	3,140,970.59	**14,630,846.42**	**95.46%**	**696,110.58**
Regulatory Actions	Improvement of the HCFC control system		120,000.00		0.00			
Implementation & Monitoring	Implementation		800,000.00		0.00			
UNDP Subtotal			**11,489,875.83**		**3,140,970.59**			
RAC Servicing	Training and capacity building	**4,090,909.00**	2,059,733.00	**96.72%**	0	**4,090,909.00**	**100.00%**	**0**
	Technical assistance and demonstration projects		757,748.00		118,457.00			
	Online documentation system		209,723.00		0			
	Awareness campaigns		637,585.00		1,627.00			
	Management, monitoring and evaluation		291,921.00		14,115.00			
GIZ Subtotal			**3,956,710.00**		**134,199.00**			
Total		**19,417,866.00**	**15,446,585.83**	**79.55%**	**3,275,169.59**	**18.721.755.42**	**96.42%**	**696,110.58**

119. 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 16 provides the time series of the financial disbursement levels for conversion projects under the HPMP for each tranche received as of the second half of August 2018.

Table 16 – Time series of financial disbursements for conversion projects as of the second half of August 2018 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	3,307,353	3,400,000	2,256,675	3,000,000	2,249,277	3,000,000	2,571,269	1,470,700	1,105,302	15,326,957	11,489,876
Subtotal (%)	74%		66%		75%		86%		75%		75%	
GERMANY	1,209,091	1,209,091	2,472,727	2,472,727	0	0	0	0	409,091	274,892	4,090,909	3,956,710
Subtotal (%)	100%		100%		0%		0%		67%		97%	
TOTAL	**5,665,348**	**4,516,444**	**5,872,727**	**4,729,402**	**3,000,000**	**2,249,277**	**3,000,000**	**2,571,269**	**1,879,791**	**1,380,194**	**19,417,866**	**15,446,586**
TOTAL (%)	**80%**		**81%**		**75%**		**86%**		**73%**		**80%**	

1.5.2. Stage 2 of the HPMP

120. Table 17 shows consolidated financial data for Stage 2 of the HPMP as of the second half of August 2018. As shown, UNDP disbursements in the foam manufacturing sector, regulatory actions and implementation and monitoring activities total USD 2,923,568.56, while outstanding financial obligations (hard commitments) account for USD 2,259,520.25 of the total amount received for conversion projects. Combined, disbursements and commitments amount to USD 5,195,634.82, or the equivalent of 90.83% of the total amount of the tranches received.

121. UNDP/Italy disbursements in the foam manufacturing sector total USD 110,793.00, while outstanding financial obligations (hard commitments) account for USD 139,207.00. Combined, disbursements and commitments amount to USD 250,000, or the equivalent of 100% of the total amount of the tranche received.

122. UNIDO disbursements in the RAC equipment manufacturing sector and implementation and monitoring activities total USD 411,130.73, while outstanding financial obligations (hard commitments) account for USD 823,306.20 of the total amount received. Combined, disbursements and commitments amount to USD 1,234,436.93, or the equivalent of 63,30% of the total amount of the tranche received.

123. In order to ensure full implementation of the remaining funds of the first UNIDO tranche as well as of the second tranche to be approved in 2018, we request the Executive Committee of the Multilateral Fund for Implementation of the Montreal Protocol to amend the implementation strategy, according to the work plan submitted for execution of the remaining funds until August 2020.

124. In the RAC servicing sector, disbursements for the activities implemented by GIZ account for USD 1,359,719.00 of the two tranches received for that sector and total commitments of USD 626,645.00. Combined, disbursements and commitments in the RAC servicing sector account for 100.00 % of the total amount of the tranches received.

125. Annex 2 provides detailed information on funds approved for activities in the RAC servicing sector.

Table 17 – HPMP Financial Report as of the second half of August 2018 – Stage 2.

Component	Activities	Tranches	Disbursements (D)	Disbursement %	Commitments (C)	Total (D +C)	Implementation %	Balance
		(USD)						
PU Manufacturing	Industrial Conversion	**5,706,604.00**	2,162,241.11	**51.23%**	1,745,835.00	**5,195,634.82**	**90.83%**	**523,516.01**
Regulatory Actions	Improvement of the HCFC control system		33,892.70		12,409.20			
RAC Servicing	Purchase of components and equipment		331,391.02		268,608.98			
Implementation & Monitoring	Implementation		396,043.73		232,667.07			
UNDP Subtotal			**2,923,568.56**		**2,259,520.25**			
PU Manufacturing	Industrial Conversion	**250,000.00**	110,793.00	**44.32%**	139,207.00	**250,00.00**	**100%**	**0.00**
Italy Subtotal			**110,793.00**		**139,207.00**			
RAC Manufacturing	Subproject 1 (Technical Assistance)	**1,950,275.00**	56,410.02	**21,08%**	15,661.63	**1,234,436.93**	**63,30%**	**715,838.07**
	Subproject 2		0.00		0.00			
	Subproject 3		164,346.39		732,084.00			
	Project local management		190,374.32		75,560.57			
UNIDO Subtotal			**411,130.73**		**823,306.20**			
RAC Servicing	Training and capacity building (HCFC-22 containment)	**1,986,364.00**	1,182,475.00	**68.45%**	361,751.00	**1,986,364.00**	**100%**	**0.00**
	Training and capacity building (low GWP alternatives)		15,000.00		145,000.00			
	Awareness campaigns		131,720.00		98,174.00			
	Management, monitoring and evaluation		30,524.00		21,720.00			
GIZ Subtotal			**1,359,719.00**		**626,645.00**			
Total		**9,893,243.00**	**4,805,211.29**	**48.57%**	**3,848,678.45**	**8,650,500.02**	**87,47%**	**1,239,353.26**

126. 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 18 provides the time series of the financial disbursement levels for conversion projects under the HPMP for each tranche received as of the second half of August 2018.

Table 18 – Time series of financial disbursements for conversion projects as of the second half of August 2018 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	3,078,900	2,273,398	2,627,704	650,170							5,706,604	2,923,568
Subtotal (%)	74%		25%								51%	
ITALY	250,000	110,793									250,000	105,0000
Subtotal (%)	44%										42%	
GERMANY	1,299,386	947,521	686,978	412,198							1,986,364	1,359,719
Subtotal (%)	73%		60%								68%	
UNIDO	1,950,275	411,130.73									1,950,275	411,130.73
Subtotal (%)	21,08%										21,08%	
TOTAL	**6,578,561**	**3,742,843**	**3,314,682**	**1,062,368**							**9,893,243**	**4,805,212**
TOTAL (%)	**57%**		**32%**								**49%**	

SECTION II.

HCFC CONSUMPTION VERIFICATION REPORT

SECTION III.

ACTION PLAN

III.1 STAGE 1 of the HPMP

III.1.1 PU Foam Manufacturing Sector

Component	Subsector	Action Plan	2017	2018	2019	Remaining Funds (USD)
Investment Projects	Group Projects (ISF/FMF and Rigid PU)	Complete implementation of the industrial conversion of system houses				3,377,137.17
		Polisystem				
		MCassab				
		Rodza (Ecopur)				
		Complete implementation of the industrial conversion of end users				
		Amino				
		Arinos				
		MCassab				
		Polisystem				
		Polyurethane				
		Purcom				
		Rodza (Ecopur)				
	Individual Projects	Complete implementation of the industrial conversion of enterprises listed as individual subprojects				459,944.00
		Panisol				
		Espumatec				
TOTAL						**3,837,081.17**

III.1.2. RAC Servicing Sector

Agency	Project	Action Plan 2018/2019	Remaining and committed funds (US$)
GIZ	Technical Assistance and Demonstration Projects	• Completion of interventions to correct problems identified in the selected supermarkets; • Preparation and publication of case studies.	118,457.00
	Dissemination and Awareness Campaign	• Regional dissemination of the activities and results of Stage 1 of the HPMP with publication of articles in regional sectoral journals and on the Project website and fanpage.	1,627.00
	Management, Monitoring and Evaluation	• Management and monitoring; • Data processing; • Sampling; • Quality control; • Reports.	14,115.00
		Total	**134,199.00**

III.2 STAGE 2 of the HPMP

III.2.1 PU Foam Manufacturing Sector

Action Plan - 2nd Tranche (Update): As a result of the amendment to the Agreement between the Brazilian Government and the Multilateral Fund for the Implementation of the Montreal Protocol for the Reduction in Consumption of HCFCs, in accordance with Stage 2 of the Brazilian HCFC Phase-Out Management Plan (Decision 80/64), and the change in the amount of the previously established tranches, the Action Plan for the 2nd tranche presented in the previous progress report had to be adjusted as follows:

Component	Subsector	Action Plan – 2nd Tranche	2nd Tranche Funds (USD)
Investment Projects	Group Projects (Rigid PU)	– Carry out the industrial conversion of one system house.	2,177,704
	Individual Projects	– Carry out the industrial conversion of six individual projects.	
Regulatory Action	n/a	– HCFC consumption management activities; – Preparation of regulatory instruments for HCFC management.	60,000
PIMU	n/a	– Continuous implementation and monitoring of activities.	390,000
		TOTAL	**2,627,704**

Action Plan – 3rd Tranche: The proposed Action Plan for implementation of the 3rd tranche is presented below:

Component	Subsector	Action Plan – 3rd Tranche	3rd Tranche Funds (USD)
Investment Projects	Group Projects (Rigid PU)	– Carry out the industrial conversion of system houses not yet converted; – Start the conversion of end users under a group project – all technologies.	6,557,221
	Individual Projects	– Carry out the industrial conversion of one individual project.	221,175
Regulatory Action	n/a	– HCFC consumption management activities; – Preparation of regulatory instruments for HCFC management.	0.00
PIMU	n/a	– Continuous implementation and monitoring of activities.	390,000
		TOTAL	**7,168,396**

III.2.2. RAC Manufacturing Sector

Action Plan – Funds remaining from the 1st Tranche: Due to the situation encountered and described in this report, the funds remaining from the first tranche that had been originally earmarked for small and medium-sized enterprise projects were used in their majority in the project with manufacturers of supermarket equipment (Eletrofrio and Plotter Racks). The Plan of Action for remaining funds will be implemented as follows:

Sector	Type of project	Action Plan – 2018/2020	Remaining and committed Funds from the 1st Tranche of HPMP-Stage II (USD)
Commercial Refrigeration	Individual Project	• For the ELETROFRIO enterprise: o Execution of the service contract, including the Demonstration Project at the selected supermarket o Execution of the contract for equipment purchase • For the PLOTTER RACKS enterprise: o Execution of the contract for equipment purchase (partial) o Drafting/signature of contracts for conversion services (partial)	135,653.61
	Group Project	• Technical assistance activities (visits, participation in events, information) • Preparation of TOR for product modification at the enterprise, with the contracting of National / International Consultant • Project implementation (manufacturing/equipment) at the enterprise	412,500.00
	Technical Assistance	• Planning, organization and implementation of WORKSHOPS to disseminate information on different aspects of the use of low GWP alternative refrigerants (for all project enterprises) • Contracting of national consultant - Sustainable Beer Keg Project • Product modification project- (preparation of terms of reference, contracting and implementation); • Contracting of consultant and implementation of the project for product modification: redesign of equipment using CO_2 technology • Beginning of the selection process of enterprises prepared to receive equipment and purchase of part of the equipment	905,364.98
Air Conditioning	Individual Project	-	0.00

Local Project Management	**UGP**	• Operation of the management and monitoring unit • Implementation, follow-up, recording and continuous monitoring of activities • Preparation of reports • Maintenance of the Project Team • Support in the review, discussion and development of technical standards for the refrigeration and air conditioning sector, with participation in monthly meetings of experts at the Brazilian Association of Technical Standards - ABNT	85,625.68
		Partial Total	1,539,144.27

Action Plan – 3rd Tranche: The proposed Action Plan for implementation of the 3rd tranche is presented below:

Sector	Type of project	Action Plan – 2018/2020	Funds from the 3rd Tranche of HPMP- Stage II (USD)
Commercial Refrigeration	**Individual Project**	• For the ELETROFRIO enterprise: • Execution of the service contract, including the Demonstration Project in the selected supermarket (conclusion) • Execution of the contract for equipment purchase (conclusion) • Preparation of Technical Bulletin • Workshop on the demonstration component of the project • For the PLOTTER RACKS enterprise: • Execution of the contract for equipment purchase • (conclusion) • Drafting/signature of contracts for conversion services • Implementation of the Demonstration Project at the selected supermarket • Preparation of Technical Bulletin • Workshop on the demonstration component of the project	640,000.00
	Group Project	• Technical assistance activities (visits, participation in events, information); • Preparation of TOR for product modification at one enterprise, with the contracting of National/International Consultant.	222,832.00

	Technical Assistance	• Planning, organization and implementation of WORKSHOPS to disseminate information on different aspects of the use of natural refrigerants (for all project enterprises) • Contracting of national consultant for product modification - **(**preparation of terms of reference, contracting, implementation) • Contracting of consultant and implementation of the product modification project: commercial refrigeration equipment, refrigeration chambers and other commercial refrigeration equipment identified in project beneficiary enterprises; • Equipment purchase (conclusion in 2020).	558,225.00
Air Conditioning	**Individual Project**	• Awareness, dissemination and information activities on the use of alternative air-conditioning refrigerants; • Technical assistance for product developing/changing; • Development of TOR to study needs of assembly line modifications and development of equipment projects; • Exchange of information with companies using low GWP and zero ODP alternative refrigerants.	950,000.00
Local Project Management	**UGP**	• Operation of the management and monitoring unit; • Implementation, follow-up, recording and continuous monitoring of activities; • Preparation of reports; • Maintenance of the Project Team. • Support in the review, discussion and development of technical standards for the refrigeration and air conditioning sector, with participation in monthly meetings of experts at the Brazilian Association of Technical Standards - ABNT.	276,000.00
		Partial Total	2.647.057,00

The General Total for implementation until disbursement of the next tranche for the RAC Sector Project is USD4,186,201.27, corresponding to USD 1,539,144.27 from remaining funds of the 1st tranche, and USD 2.647.057,00 from the 3rd Tranche.

The projects related to the air conditioning sector will include, until 2020, information activities and mobilization for technical assistance to the redesign and to the development of equipment and activities for the dissemination of technologies, justifying the request of USD 950,000 for execution until 2021. The beginning of implementation of conversion projects in this sector has been moved to 2021, with funds to be requested in 2020.

With reference to the ExCom decision 77/58(b), requesting the Secretariat to adjust the cost of Stage-II of the HCFC phase-out management plan for Brazil on the basis of the technical information contained in document UNEP/OzL.Pro/ExCom/77/69, UNIDO requests to postpone the submission of the assessment report to the 85th ExCom meeting (2020). As described in the present report (ITEM I.4.2.3), it was not yet possible to obtain the commitment of the air conditioning sector due to technical and marketing issue specificity of the sector hence it will be addressed in the course of 2019. It must be considered that the calculation of the incremental cost in the manufacturing of heat exchanges will be possible only once the counterpart companies will define the technical specification of equipment to be used for the conversion.

The 3rd tranche for the RAC Project set forth in the Revised Agreement between Brazil and ExCom (Decision 80/64) is USD 3,420,039.00. However, due to the need to postpone activities for the air conditioning sector, as explained in the report, (ITEM I.4.2.3), UNIDO proposes a new adjustment in the tranche schedule, and requests the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol to transfer to the 2020's tranche the remaining amount of the tranche that UNIDO would be requesting this year, according to the disbursement schedule below:

Year of tranche request	Original Amount of Tranche (approved at the 80th EXCOM Meeting in November 2017)	Adjusted Tranche Amount
2015	1,950,275.00	1,950,275.00
2018	3,420,039.00	2,647,057.00*
2019	0.00	0.00
2020	2,846,383.00	3,619,365.00*
2021	2,000,000.00	2,000,000.00
2022	1,000,000.00	1,000,000.00
	RAC Project Total	11,216,697.00

* Highlighted tranches in which changes are being requested.

III.2.3. RAC Servicing Sector

Agency	Project	Action Plan 2018/2019	Remaining Funds and 3rd Tranche Funds (USD)
GIZ	Training and Capacity Building (HCFC-22 containment)	• Training of 5 trainers; • Training of 501 technicians in best commercial refrigeration practices; • Training of 3,200 technicians in best practices for air conditioning systems (window and split type); • Follow-up and monitoring visits.	2,004,757.00
	Training and Capacity Building (low GWP alternatives)	• Preparation of best practices handbook (CO2 and HC in commercial refrigeration systems); • Tender process and contracting of partner technical training institutions; • Tender process and purchase of demonstration units and toolkits (commercial refrigeration).	500,000.00
	Dissemination and Awareness Campaign	• Development of information materials, technical publications and videos; • Operation and maintenance of website and fanpage; • Regional dissemination of activities and results of Stage 2 of the HPMP, with publication of articles in regional sectoral journals and on the Project website and fanpage; • Participation in sectoral events and fairs; • Networking activities with other stakeholders; • Meeting with national stakeholders in the servicing sector at national and regional level.	197,525.00
	Management, Monitoring and Evaluation	• Management and monitoring; • Data processing; • Sampling; • Quality control; • Support in the review, discussion and design of technical standards for the servicing sector, with participation in monthly meetings of experts at the Brazilian Association of Technical Standards (ABNT); • Reports.	288,000.00
		Total	**2,990,282.00**

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

Amendments have been made to the Agreement regarding Stage 1 of the HPMP, pursuant to Document UNEP/OzL.Pro/ExCom/75/85, Decision 75/53, paragraph 212.

Amendment has been made to the Agreement regarding Stage 2 of the HPMP, pursuant to Document UNEP/OzL.Pro/ExCom/80/59, Decision 80/64, paragraph 195.

ANNEX 1 – LIST OF END USERS VALIDATED AND UNDER VALIDATION INCLUDED AS BENEFICIARIES OF STAGE 1 OF THE BRAZILIAN HCFC PHASE-OUT MANAGEMENT PLAN

ANNEX 2 - PROGRESS REPORT IN TABLE FORMAT FOR ACTIVITIES IN THE RAC SERVICING SECTOR

Annex 2.1 RAC Servicing Sector – Stage 1 of the HPMP

Agency	Project/component	Activities completed and description of impact.	Remaining activities to be implemented next year	Total Budget for 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. 4,800 technicians trained in best commercial refrigeration practices. 100 technicians trained in best practices for split air conditioning systems. Eight monitoring visits to vocational training institution carried out. Evaluation and final report on training activities completed. 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		0.00	

		learned how to use new tools and practices that help them in applying best practices in their daily activities. They have also stated having learned how to use new tools and practices hitherto unknown to them that help them in applying best practices in their daily activities.			
GIZ	Technical Assistance and Demonstration Projects	25 technical visits to supermarkets carried out. Five supermarkets selected and 4 cooperation agreements formalized. Identification, measurement and performance analysis equipment for refrigeration systems purchased. Four technical diagnoses made to identify problems that cause leakages and efficiency loss in refrigeration systems prepared for the supermarkets selected in the North, Northeast, Southeast and South regions of Brazil. Four intervention plans to correct identified problems prepared. Technical specifications developed for the procurement and purchase of equipment and components to be installed in the selected supermarkets to correct identified problems. Tender for the purchase of equipment and components to be implemented in the supermarkets to correct the problems identified published in cooperation with UNDP. Technical and financial evaluation of the proposals received in the context of the tender process for the purchase of equipment and components to be implemented in the supermarkets to correct problems	Conclusion of interventions to correct problems identified in the selected supermarkets; Preparation and publication of case studies.	118,457.00	

		identified carried out and suppliers contracted in cooperation with UNDP. Refrigerant consumption monitoring system installed in the selected supermarkets. 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. Preparation of case studies on the interventions conducted (in progress). Commercial consulting programme for end users aimed at promoting the company's decision-making process in favour of low GWP alternatives to HCFCs implemented. 19 end users assisted under the Commercial Consulting Programme. Summary report on the 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 refrigerant containment practices 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 necessary adaptations after the testing phase. Three system introduction meetings held with supermarkets and representatives of the following		0.00	

		supermarket associations: ABRAS, APAS and AGAS. System presented in three seminars for supermarkets. System published in the domain www.ozoniohcfc.com.br. Technical assistance to users. Development of the mobile app for use of the system on Android smartphones. **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 substance through registration and monitoring of the relation between the amounts of refrigerants recovered and recharged; - supports the management and collection of maintenance and repair data.			
GIZ	Dissemination 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).	Regional dissemination of the activities and results of Stage 2 of the HPMP, with articles published in regional sectoral journals and posted on the Project website and fanpage.	1,627.00	

		Maintenance of the Project fanpage on Facebook (https://www.facebook.com/camadadeozonioerefrigeracaoeclima?ref=bookmarks). Regional dissemination with publication of articles in regional sectoral journals. Ten meetings held with national stakeholders in the servicing sector. Participation and presentation of the Project in 22 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. Eight coordination meetings held. **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 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.	Continuity of administration activities; operation of the management and monitoring unit; data processing; quality control; reports.	14,115.00	
		Total		134,199.00	

Annex 2.2 RAC Servicing Sector – Stage 2 of the HPMP

Agency	Project/component	Activities completed and description of impact	Remaining activities to be implemented next year	Total Budget for next implementation period	Note
GIZ	Training and capacity building (HCFC-22 containment)	Contracting of national and international consultants. Market research on the country's training capacity and potential regional implementation partners. Teaching material (presentations and best practices handbook) for training refrigeration technicians updated and published. Terms of reference and selection criteria for regional partner training institutions prepared. Tender carried out and 14 training institutions selected and contracted. Technical visits to the selected regional training institutions carried out. Tools and components for demonstration and practical training (educational kits) purchased and delivered to the	Training of 5 trainers. Training of 501 technicians in best commercial refrigeration practices. Training of 3,200 technicians in best practices for air conditioning systems (window and split type). Follow-up and monitoring visits.	2,004,757.00	

		selected training institutions. Agenda, training materials and consumables list for training courses prepared. Six train-the-trainer courses delivered and 65 multipliers trained. 1238 technicians trained in best practices for air conditioning systems (window and split type). 737 technicians trained in best commercial refrigeration practices; • 3 monitoring visits to regional partner training institutions carried out **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 servicing. They have also confirmed having learned how to use new tools and practices that help them in applying best practices in their daily activities.			
GIZ	Training and capacity building (low GWP alternatives)	National and international consultants contracted. Preparation of best practice handbook (in progress).	Preparation of best practices handbook (CO_2 and HC in commercial refrigeration systems). Tender process and contracting of partner trainings institutions. Tender process and purchase of demonstration units and toolkits (commercial refrigeration).	500,000.00	
GIZ	Dissemination and Awareness Campaign	Sectoral communication plan developed. Operation of the project website (www.boaspraticasrefrigeracao.com.br); Operation of the Project fanpage on Facebook (https://www.facebook.com/camadadeozonioerefrigeracaoeclima?ref=bookmarks). Press officer contracted and regional dissemination of the activities and results of Stage 2 of the HPMP carried out.	Development of information material, technical publications and videos. Operation and maintenance of website and fanpage. Regional dissemination of the activities and results of Stage 2 of the HPMP, with articles published in regional sectoral journals and posted on the Project website and fanpage. Participation in sectoral events and fairs. Networking activities with other stakeholders.	197,525.00	

		Photos of actions developed posted on Flickr: https://www.flickr.com/photos/147992141@N07/collections/72157690669896345/; Interviews with participants in best practice training courses conducted and testimonies published and disseminated. Three meetings with national stakeholders from the servicing sector held. Three best practice guides (Leak Control, Sealed System Design, Maintenance of Refrigeration Systems) printed (200 copies each). Poster on the "10 Golden Rules for Maintenance of RAC Systems" prepared and disseminated and 200 copies printed. 10,000 technical refrigerant rulers for rapid pressure and temperature conversion developed and produced. Design and dissemination of stickers/stamps to disseminate best practices in RAC systems. 12,000 stickers printed. Educational video to reduce leaks in the servicing sector produced (3 versions available: original in Portuguese and two versions with English and Portuguese subtitles). Project folder prepared (layout services contracted and ongoing). Posters on capacity-building and training activities designed (layout services contracted and ongoing). Card with specific refrigerant gravity elaborated and designed . Video for end user awareness regarding contracting of adequate services in air conditioning systems (production contracted and ongoing). Video for dissemination of best practices in the commercial refrigeration sector (production contracted and ongoing).	Meeting with national stakeholders from the sector at national and regional level.		

		Participation in two workshops held by the RAC Systems Manufacturing Project/Presentation on activities in the servicing sector and safe use of flammable refrigerants. Awareness Campaign on the Ozone Layer in Subways in Belo Horizonte supported. Three coordination meetings held. **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 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. The materials are being used and disseminated by industry associations and 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. Support in the review and discussion of 4 technical standards for the servicing sector with participation in monthly meetings of experts at the Brazilian Association of Technical Standards (ABNT).	Operation of the management and monitoring unit. Data processing. Sampling. Quality control. Support in the review and discussion of technical standards for the servicing sector with participation in monthly meetings of experts at the Brazilian Association of Technical Standards (ABNT). Reports.	288,000.00	
		Total		**2,990,282.00**	
