

**BRAZIL**  
**BRAZILIAN HCFC PHASE-OUT MANAGEMENT PLAN (HPMP)**  
**STAGE II**  
**PROGRESS REPORT 2018/2020**

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prepared by

THE MINISTRY OF THE ENVIRONMENT

with the support of the

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the UNITED NATIONS INDUSTRIAL DEVELOPMENT PROGRAMME

(UNIDO)

and the DEUTSCHE GESELLSCHAFT FÜR INTERNATIONALE

ZUSAMMENARBEIT (GIZ) GMBH

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*August, 2020*

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<b>PROJECT COVER</b>
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<b>COUNTRY</b>	Brazil
<b>LEADING IMPLEMENTATION AGENCY</b>	UNDP
<b>COOPERATING AGENCY</b>	GIZ
<b>COOPERATING AGENCY</b>	UNIDO

<b>SUBMISSION OF THE COMPLETE DOCUMENTATION</b>		
<b>Document</b>	<b>Yes/No</b>	<b>Comments</b>
<b>Progress Report of the Previous Tranche</b>		
<b>Stage II</b>	Yes	Approved by the 75th Excom Meeting
<b>Financial Report (disbursements &gt;20% of the previously approved tranche)</b>	Yes	
<b>Verification Report (if applicable)</b>	Yes	
<b>Action Plan</b>	Yes	Stage II
<b>Pluriannual Tables (online)</b>	Yes	
<b>Official Endorsement Letter</b>	Yes	
<b>Revised Agreement (if applicable)</b>	Yes	Stage II – Amended by Decision 80/64, paragraph a (ii)

<b>RATIFICATION OF THE AMENDMENTS TO THE MONTREAL PROTOCOL</b>			
<b>Copenhagen</b>	June/25/1997	<b>Beijing</b>	June/30/2004
<b>Comments:</b>			

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

<b>SUBMITTED ODS CONSUMPTION REPORTS</b>			
<b>Reports</b>	<b>Yes/No</b>	<b>Year</b>	<b>Comments</b>
<b>Country Programme</b>	Yes	2019	
<b>Data from Article 7 (most recent report)</b>	Yes	2019	
<b>ODS data for the tranche year</b>	Yes	2019	
<b>Explain any discrepancies</b>			

<b>HPMP DOCUMENT - STAGES I AND II</b>			
<b>Phase-Out Commitment (%)</b>	10	<b>Commitment year</b>	2015
<b>Phase-Out Commitment (%)</b>	35	<b>Commitment year</b>	2020
<b>Phase-Out Commitment (%)</b>	45	<b>Commitment year</b>	2021
<b>Servicing only</b>	No	<b>Manufacturing only</b>	No
		<b>Servicing/Manufact.</b>	Yes

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**SECTION I**  
**PROGRESS REPORT**

**I.1. Introduction**

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

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

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

4. Implementation of Stages I and II of the HPMP and compliance with the legislation in force, coupled with the partial and independent conversion of multinational enterprises operating in the Brazilian household refrigeration sector enabled the country to achieve the consumption of 838.85 ODP tonnes in 2019, totaling a reduction of 36.80% in relation to the baseline.

5. Stage I of the HPMP was concluded in December 2019 and the final progress report was submitted and approved during the Intersectional Meeting held in the 85th ExCom Meeting.

6. Table 1 below presents the updated disbursement schedule reflecting the changes made by the MLF upon approval of the 2nd tranche and refers to Stage II of the HPMP.

**Table 1 – Tranches and ODS consumption, 2015 – 2023, Stage II of the HPMP.**

DESCRIPTION	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
	CONSUMPTION (tons ODP)									
ODS Reduction Schedule	1,194.6	1,194.6	1,194.6	1,194.6	1,194.6	862.74	862.74	862.74	862.74	<i>n/a</i>
Maximum allowed consumption	1,194.6	1,194.6	1,194.6	1,194.6	1,194.6	862.74	730.02	730.02	730.02	<i>n/a</i>
Consumption phase-out accomplished	1,025.81	875.29	837.25	826.26	838.85					<i>n/a</i>
TRANCHES IN USD										
Lead Implementation Agency (IA) (UNDP) Funding	3,078,900	0	2,627,704	7,168,396	0	3,895,000	0	0	0	16,770,000
Support Costs for Lead IA (UNDP)	215,523	0	183,939	501,788	0	272,650	0	0	0	1,173,900
Cooperating Agency (UNIDO) Funding	1,950,275	0	0	2,647,057*	0	3,619,365*	2,000,000	1,000,000	0	11,216,697
Support Costs for Cooperating Agency (UNIDO)	136,519	0	0	185,294*	0	253,356*	140,000	70,000	0	785,169
Cooperating Agency (GIZ) Funding	1,299,386	0	686,978	2,363,637	0	1,004,545	1,500,000	0	872,727	7,727,273
Support Costs for Cooperating Agency (GIZ)	144,614	0	76,457	263,059	0	111,800	166,941	0	97,129	860,000
Cooperating Agency (Italy) Funding	250,000	0	0	0	0	0	0	0	0	250,000
Support Costs for Cooperating Agency (Italy)	32,500	0	0	0	0	0	0	0	0	32,500
<b>Total Funding Agreed</b>	<b>7,107,717</b>	<b>0</b>	<b>3,575,078</b>	<b>13,129,131*</b>	<b>0</b>	<b>9,156,716*</b>	<b>3,806,941</b>	<b>1,070,000</b>	<b>969,856</b>	<b>38,815,539</b>
Approved tranche to be funded by Lead IA (UNDP)	3,078,900	0	2,627,704	7,168,396						12,875,000
Support Costs for Lead IA (UNDP)	215,523	0	183,939	501,788						901,250

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

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

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

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

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

### I.2.2. Legislation / Regulations on ODSs

#### I.2.2.1. HCFC Legal Framework

8. Table 2 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 2 – Regulatory Acts on HCFC Phase out in Brazil.**

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

Source: MMA

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

10. As for flammable alternatives, the Brazilian government, along with UNDP, UNIDO and GIZ, has been promoting awareness campaigns about the safe handling of alternatives with a low negative impact on the global climate system and which have some degree of flammability. In the case of technological conversion projects, in the polyurethane foams sector, the adoption of national and international parameters of industrial safety, demonstrated by a safety certificate issued by a qualified enterprise, is a *sine qua non* condition for the approval of technological conversion and for the disbursement of funds to HPMP beneficiary enterprises that opt for flammable alternatives. A similar positioning is also valid for the refrigeration and air conditioning sector (RAC), whose development standards for equipment and the management of flammable refrigerants follow strict standards and guidelines of national and international safety, and of protection to workers, the environment and the end consumer. All projects receive the approval of the Fire Department, which is responsible for issuing the document which attests that during their inspection the building had the appropriate safety conditions for the use of flammable alternatives.

11. In order to support the enterprises in terms of the required safety parameters for those which opted for flammable technological options, a Guide named "Use of Flammable Blowing Agents in the Preparation of Completely Formulated Polyols and of Foams for the Polyurethane Production Chain" was developed, which is in the final stage of the publishing process for electronic publication.

12. Moreover, the proposal for the Technical Standard for the safe use of flammable blowing agents in the production chain of polyurethane foams is in the stage of internal consultation *vis-à-*

vis the relevant institutions. It is worth pointing out that the government has been supporting the Brazilian Association of Technical Standards (ABNT) in the development and debate of specific technical standards which may ensure, at the national sphere, the standardization of the handling, installation and maintenance of equipment that use flammable substances which are alternative to HCFCs. Among the initiatives, we highlight the Brazilian Association of Technical Standards (ABNT) Standard NBR 16069 on “Safety of Refrigeration Systems” based in the last version of the international standard ISO 5149, and the development of a technical standard on terminology of refrigerants.

### **I.3. HCFC Consumption and Production**

13. Brazil does not produce HCFCs. Therefore, the national consumption is based on imports and exports. Table 3 provides data on HCFC consumption in the country from 2007 to 2019.

**Table 3 – HCFC Consumption, Brazil, 2007 – 2019.**

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
HCFC-22	ODP t.	562.98	582.95	753.10	831.01	627.48	936.10	784.10	787.64	701.67	610.60	552.78	485.69	565.24
	ODS t.	10,235.99	10,599.10	13,692.67	15,109.34	11,408.80	17,020.04	14,256.44	14,320.78	12,757.62	11,101.86	10,050.47	8,830.72	10,277.15
HCFC-141b	ODP t.	573.85	432.61	649.31	393.76	408.13	443.06	400.56	371.03	314.94	260.90	284.56	338.38	272.70
	ODS t.	5,216.82	3,932.84	5,902.85	3,579.62	3,710.27	4,027.82	3,641.42	3,373.04	2,863.05	2,371.80	2,586.90	3,076.18	2,479.09
HCFC-142b	ODP t.	2.14	1.47	4.37	6.84	4.46	0.78	0.97	3.51	3.96	2.32	-1.33	1.43	0.02
	ODS t.	32.98	22.69	67.23	105.28	68.69	12.02	14.88	54.06	60.96	35.74	-20.50	22.02	0.35
HCFC-123	ODP t.	0.93	0.41	0.20	0.40	0.89	3.42	0.00	0.06	0.00	-0.06	0.30	0.18	0.29
	ODS t.	46.70	20.57	9.99	19.84	44.31	170.79	0.00	3.00	0.00	-2.87	14.89	8.99	14.92
HCFC-124	ODP t.	11.45	3.66	8.49	6.97	5.43	4.51	3.62	2.49	5.24	1.52	0.95	0.58	0.59
	ODS t.	520.29	166.54	385.72	316.90	246.94	204.83	164.59	113.20	238.12	69.22	42.98	26.21	26.69
HCFC-225	ODP t.	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	ODS t.	0.20	0.10	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	ODP t.	1,151.37	1,021.12	1,415.47	1,238.98	1,046.40	1,387.87	1,189.25	1,164.74	1,025.81	875.29	837.25	826.26	838.85
	ODS t.	16,052.97	14,741.84	20,058.51	19,130.98	15,479.01	21,435.50	18,077.33	17,864.08	15,919.75	13,575.75	12,674.74	11,964.12	12,798.20

Source: MMA – 2007 through 2019

14. HCFC consumption in Brazil totaled 838.85 ODP tonnes in 2019, 36.80% lower than the established baseline (1,327.30 ODP tonnes), thus reflecting the country's phase-out efforts to meet the commitments agreed under the Montreal Protocol through implementation of Stages I and II of the HPMP and fulfillment of the legislation in force, as well as the partial and independent conversion of multinational household refrigeration enterprises operating in Brazil.

15. IBAMA IN 04, from February 14, 2018, establishes that:

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

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

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

18. Table 4 provides data on HCFC imports and exports in Brazil by sector in 2019. The information is in line with that presented in the Country Programme Report.

**Table 4 – HCFCs Imports and Exports in metric tonnes, by sector in Brazil, in 2019.**

Substance	Import (ODS t.)					Export (ODS t.)
	Foam	Solvent	RAC Manufacturing	RAC Servicing	Total	
HCFC-22	0.0	0.0	1,541.57	8,735.57	10,277.15	0.00
HCFC-141b	2,356.72	124.04	0.0	0.0	2,480.75	1.65
HCFC-142b	0.35	0.0	0.0	0.0	0.35	0.00
HCFC-123	0.0	0.0	0.0	14.92	14.92	0.21
HCFC-124	0.0	0.0	0.0	26.69	26.69	0.00
<b>TOTAL</b>	<b>2,357.07</b>	<b>124.04</b>	<b>1,541.57</b>	<b>8,788.05</b>	<b>12,799.86</b>	<b>1.86</b>

19. In 2019, 1.65 metric tonnes of HCFC-141b were exported to be used as a polyurethane blowing agent and 0.21 metric tonnes of HCFC-123 were exported to replace the substance used in air conditioning equipment.

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

## **I.4. HCFC Phase-out Activities**

### I.4.1 Activities in the Manufacturing Sector of PU Foams

21. The measures reported below have been implemented since the last progress report with the funds received from the 1st, 2nd, and 3rd tranches:

#### 22. Individual Projects:

- a) The enterprises Ártico, Furgões Ibiporã, Gelopar and Niju concluded their industrial conversion in a satisfactory way. The enterprise Ártico has migrated to the water-based technology and the other enterprises have migrated to the HFO technology. The conversion of these enterprises, added to the conversion of the previously listed enterprises Cold Air, IBF and Isar, resulted in phasing out the consumption of 28.42 ODP tonnes.
- b) The enterprise São Rafael is currently developing the formulation with an alternative substance to HCFC-141b.
- c) The enterprises Bulltrade, Refrimate, Therm Jet and Thermotelha are carrying out activities to promote the industrial conversion of their manufacturing plants.
- d) The enterprise Tecpur, concluded the development of formulation, based on different technologies. However, the technology to be used for its conversion was not informed, yet.

#### 23. Group Projects:

- a) The system houses Flexível, MCassab and Polyurethane concluded the conversion of the manufacturing plants dedicated to producing PU rigid foams, and these system houses have chosen to use HFO, and HFO and Methyl Formate as alternatives to HCFC-141b, respectively.
- b) The system house U-Tech had completed the conversion of its industrial complex in relation to HCFC-141b and to HCFC-22 used in its production process. The enterprise chose to use Methyl Formate as an alternative to HCFC-141b and requested authorization to temporarily use HFC-134a to replace HCFC-22, with the commitment to phase out the use of this alternative as soon as the gaseous HFO becomes commercially available and the HFO-based polyol systems are developed and optimized, using for that purpose the financial resources of the system house. As reported in the Progress Report submitted for analysis during the 85th ExCom Meeting, the enterprise is still using HFC-134a as a temporary replacement of **HCFC-22** in the production of the Froth system. The gaseous HFOs samples importing process, which was previously reported, was completed at a final FOB cost of USD 22.00/kg. New tests were performed and, in April and May of 2020, Honeywell worked on the improvement of the formulation which had been developed at the plant with the blowing agent Solstice GBA. This work was carried out at Honeywell's Laboratory in the United States, and U-Tech is currently waiting for the report with the final technical data of the material for the analysis and final decision of the enterprise. Another meeting was held in May 2020 with Honeywell's representative in Brazil to discuss commercial and financial details in order to provide the enterprise with the required subsidies for

decision-making, considering the impact on the end product costs, and, consequently, on the financial feasibility. **(CONFIDENTIAL INFORMATION, PLEASE DO NOT DISCLOSE)**

- c) System house Univar is in the conversion phase of its manufacturing plant with its own resources. Currently, 60% of the formulated polyol systems are produced free from HCFC-141b. The enterprise informed that, due to the drop in demand resulting from restrictions imposed by the COVID-19 pandemic, the phasing out of the supply of formulated polyol containing HCFC-141b will take place in up to 12 months after the import ban enforcement in Brazil on January 1, 2020.
- d) Currently, the system houses Amino, Ariston, Ecoblaster, Flexível, MCassab, Polyurethane, Purcom, Univar are in the stage of validating their data and/or conversion of end users under the scope of the long-term agreement established between UNDP and the system houses. A total number of 73 (seventy-three) end users converted until July 2020, among which 6 (six) end users were converted by Amino, 3 (three) end users were converted by Ecoblaster, 3 (three) end users were converted by Flexível, 2 (two) end users were converted by MCassab, 24 (twenty-four) end users were converted by Polyurethane, 26 (twenty-six) end users were converted by Purcom, and 9 (nine) end users were converted by Univar, which resulted in the phasing out of the consumption of 27.48 ODP tonnes of HCFC-141b.

24. Table 5 provides detailed qualitative data on activities implemented in each industrial conversion project until the first half of July 2020, under Stage II of the HPMP.

**Table 5 – Industrial conversion activities implemented in the PU foam sector until the first half of July 2020, with funds from the 1st, 2nd, and 3rd tranches approved under Stage II of the HPMP.**

<b>MODALITY</b>	<b>ENTERPRISE</b>	<b>IMPLEMENTATION STATUS</b>	<b>OUTCOMES / OUTPUTS (IMPLEMENTED ACTIVITIES)</b>
<b>Individual Projects (PUR)</b>	<b>ARTICO</b>	<ul style="list-style-type: none"> <li>• Project completed.</li> </ul>	<ul style="list-style-type: none"> <li>• Enterprise Eligibility Validated;</li> <li>• Terms of Reference and Action Plan defined;</li> <li>• Service Contract signed;</li> <li>• Formulation Development Plan completed;</li> <li>• Selected Technology: Water-based;</li> <li>• Plant conversion plan implemented;</li> <li>• Term of Commitment signed;</li> <li>• Project completed;</li> <li>• 2.62 ODP tonnes phased-out;</li> <li>• COC is being prepared.</li> </ul>
	<b>BULLTRADE</b>	<ul style="list-style-type: none"> <li>• Project in progress.</li> </ul>	<ul style="list-style-type: none"> <li>• Enterprise Eligibility Validated;</li> <li>• Terms of Reference and Action Plan defined;</li> <li>• Service Contract signed;</li> <li>• Formulation Development Plan completed;</li> <li>• Selected Technology: HFO;</li> <li>• Plant conversion plan defined and under execution.</li> </ul>
	<b>COLD AIR</b>	<ul style="list-style-type: none"> <li>• Project completed.</li> </ul>	<ul style="list-style-type: none"> <li>• Enterprise Eligibility Validated;</li> <li>• Terms of Reference and Action Plan defined;</li> <li>• Service Contract signed;</li> <li>• Formulation Development Plan completed;</li> <li>• Selected Technology: Methyl Formate;</li> <li>• Plant conversion plan implemented;</li> <li>• Term of Commitment signed;</li> <li>• Safety Certificate issued;</li> <li>• Project completed;</li> <li>• 2.81 ODP tonnes phased-out;</li> <li>• COC is being prepared.</li> </ul>
	<b>FURGÃO IBIPORÁ</b>	<ul style="list-style-type: none"> <li>• Project completed.</li> </ul>	<ul style="list-style-type: none"> <li>• Enterprise Eligibility Validated;</li> <li>• Terms of Reference and Action Plan defined;</li> <li>• Service Contract signed;</li> <li>• Formulation Development Plan completed;</li> <li>• Selected Technology: HFO;</li> <li>• Plant conversion plan implemented;</li> <li>• Term of Commitment signed;</li> <li>• Project completed;</li> <li>• 5.28 ODP tonnes phased-out;</li> <li>• COC is being prepared.</li> </ul>

GELOPAR	<ul style="list-style-type: none"> <li>• Project completed.</li> </ul>	<ul style="list-style-type: none"> <li>• Enterprise Eligibility Validated;</li> <li>• Terms of Reference and Action Plan defined;</li> <li>• Service Contract signed;</li> <li>• Formulation Development Plan completed;</li> <li>• Selected Technology: HFO;</li> <li>• Plant conversion plan implemented;</li> <li>• Term of Commitment signed;</li> <li>• Project completed;</li> <li>• 7.13 ODP tonnes phased-out;</li> <li>• COC is being prepared.</li> </ul>
IBF	<ul style="list-style-type: none"> <li>• Project completed.</li> </ul>	<ul style="list-style-type: none"> <li>• Enterprise Eligibility Validated;</li> <li>• Terms of Reference and Action Plan defined;</li> <li>• Service Contract signed;</li> <li>• Formulation Development Plan completed;</li> <li>• Selected Technology: Methyl Formate;</li> <li>• Safety Certificate issued;</li> <li>• Plant conversion plan implemented;</li> <li>• Term of Commitment signed;</li> <li>• Safety Certificate issued;</li> <li>• Project completed;</li> <li>• 2.52 ODP tonnes phased-out;</li> <li>• COC is being prepared.</li> </ul>
ISAR	<ul style="list-style-type: none"> <li>• Project completed.</li> </ul>	<ul style="list-style-type: none"> <li>• Enterprise Eligibility Validated;</li> <li>• Terms of Reference and Action Plan defined;</li> <li>• Service Contract signed;</li> <li>• Formulation Development Plan completed;</li> <li>• Selected Technology: Methyl Formate and Methylal;</li> <li>• Safety Certificate issued;</li> <li>• Plant conversion plan implemented;</li> <li>• Term of Commitment signed;</li> <li>• Safety Certificate issued;</li> <li>• Project completed;</li> <li>• 4.97 ODP tonnes phased-out;</li> <li>• COC is being prepared.</li> </ul>
NIJU	<ul style="list-style-type: none"> <li>• Project completed.</li> </ul>	<ul style="list-style-type: none"> <li>• Enterprise Eligibility Validated;</li> <li>• Terms of Reference and Action Plan defined;</li> <li>• Service Contract signed;</li> <li>• Formulation Development Plan completed;</li> <li>• Selected Technology: HFO;</li> <li>• Plant conversion plan implemented;</li> <li>• Term of Commitment signed;</li> <li>• Project completed;</li> <li>• 3.09 ODP tonnes phased-out;</li> <li>• COC is being prepared.</li> </ul>



	REFRIMATE	<ul style="list-style-type: none"> <li>• Project in progress.</li> </ul>	<ul style="list-style-type: none"> <li>• Enterprise Eligibility Validated;</li> <li>• Terms of Reference and Action Plan defined;</li> <li>• Service Contract signed;</li> <li>• Formulation Development Plan completed;</li> <li>• Selected Technology: HFO;</li> <li>• Plant conversion plan defined and under execution.</li> </ul>
	SÃO RAFAEL	<ul style="list-style-type: none"> <li>• Project in progress.</li> </ul>	<ul style="list-style-type: none"> <li>• Enterprise Eligibility Validated;</li> <li>• Terms of Reference and Action Plan defined;</li> <li>• Service Contract signed;</li> <li>• Formulation development plan under execution.</li> </ul>
	TECPUR	<ul style="list-style-type: none"> <li>• Project in progress.</li> </ul>	<ul style="list-style-type: none"> <li>• Enterprise Eligibility Validated;</li> <li>• Terms of Reference and Action Plan defined;</li> <li>• Service Contract signed;</li> <li>• Formulation Development Plan completed;</li> <li>• Selected Technology: to be informed</li> </ul>
	TERM JET AND THERMOTELHA	<ul style="list-style-type: none"> <li>• Project in progress.</li> </ul>	<ul style="list-style-type: none"> <li>• Enterprise Eligibility Validated;</li> <li>• Terms of Reference and Action Plan defined;</li> <li>• Service Contract signed;</li> <li>• Formulation Development Plan completed;</li> <li>• Selected Technology: HFO;</li> <li>• Plant conversion plan defined and under execution.</li> </ul>
Safety Certificate - Group Projects - PUR	AMINO	<ul style="list-style-type: none"> <li>• System House Conversion to PUR completed;</li> <li>• Group project in progress.</li> </ul>	<ul style="list-style-type: none"> <li>• Enterprise Eligibility Validated;</li> <li>• Service Contract signed;</li> <li>• Formulation Development completed;</li> <li>• Selected Technology: Methylal;</li> <li>• Safety Certificate issued;</li> <li>• Plant conversion completed;</li> <li>• Long-term agreement signed;</li> <li>• 6 end users converted;</li> <li>• Consumption of 1.20 ODP tonnes phased-out.</li> </ul>
	ARISTON	<ul style="list-style-type: none"> <li>• System House Conversion to PUR completed;</li> <li>• Group project in progress.</li> </ul>	<ul style="list-style-type: none"> <li>• Enterprise Eligibility Validated;</li> <li>• Service Contract signed;</li> <li>• Formulation Development completed;</li> <li>• Selected Technology: Methyl Formate and Methylal;</li> <li>• Safety Certificate issued;</li> <li>• Plant conversion completed;</li> <li>• Long-term agreement signed.</li> </ul>
	ECOBLASTER	<ul style="list-style-type: none"> <li>• System House Conversion to PUR completed;</li> <li>• Group project in progress.</li> </ul>	<ul style="list-style-type: none"> <li>• Enterprise Eligibility Validated;</li> <li>• Service Contract signed;</li> <li>• Formulation Development completed;</li> <li>• Selected Technology: Methyl Formate;</li> <li>• Safety Certificate issued;</li> <li>• Plant conversion completed;</li> <li>• Long-term agreement signed;</li> <li>• 3 end users converted;</li> <li>• Consumption of 0.59 ODP tonnes phased-out.</li> </ul>

FLEXÍVEL	<ul style="list-style-type: none"> <li>• Formulation development for PUR applications completed;</li> <li>• Group project in progress.</li> </ul>	<ul style="list-style-type: none"> <li>• Enterprise Eligibility Validated;</li> <li>• Service Contract signed;</li> <li>• Formulation Development completed;</li> <li>• Selected Technology: HFO;</li> <li>• Long-term agreement signed;</li> <li>• 3 end users converted;</li> <li>• Consumption of 1.74 ODP tonnes phased-out.</li> </ul>
MCASSAB	<ul style="list-style-type: none"> <li>• Formulation development for PUR applications completed;</li> <li>• Group project in progress.</li> </ul>	<ul style="list-style-type: none"> <li>• Enterprise Eligibility Validated;</li> <li>• Service Contract signed;</li> <li>• Formulation Development completed;</li> <li>• Selected Technology: HFO;</li> <li>• Long-term agreement signed;</li> <li>• 2 end users converted;</li> <li>• Consumption of 1.43 ODP tonnes phased-out.</li> </ul>
PURCOM	<ul style="list-style-type: none"> <li>• System House Conversion to PUR completed;</li> <li>• Group project in progress.</li> </ul>	<ul style="list-style-type: none"> <li>• Enterprise Eligibility Validated;</li> <li>• Service Contract signed;</li> <li>• Formulation Development completed;</li> <li>• Selected Technology: Methyl Formate;</li> <li>• Safety Certificate issued;</li> <li>• Plant conversion completed;</li> <li>• Long-term agreement signed;</li> <li>• 26 end users converted;</li> <li>• Consumption of 6.75 ODP tonnes phased-out.</li> </ul>
UNIVAR	<ul style="list-style-type: none"> <li>• Conversion of 50% of the plant;</li> <li>• Group project in progress.</li> </ul>	<ul style="list-style-type: none"> <li>• Eligibility of the enterprise invalidated (non-eligible enterprise);</li> <li>• Service Contract for the validation of end users signed;</li> <li>• Selected Technology: Methylal, HFO, and water-based;</li> <li>• Long-term agreement signed;</li> <li>• 9 end users converted;</li> <li>• Consumption of 10.61 ODP tonnes phased-out.</li> </ul>
UTECH	<ul style="list-style-type: none"> <li>• System House Conversion to PUR completed;</li> <li>• Temporary use of High-GWP HFC;</li> <li>• Tests performed with negative results;</li> <li>• Formulation adjustments, high cost and limited availability of gas HFO in the market, rendering the final conversion unfeasible;</li> <li>• Validation of the beneficiary enterprises in progress;</li> </ul>	<ul style="list-style-type: none"> <li>• Enterprise Eligibility Validated;</li> <li>• Service Contract signed;</li> <li>• Formulation Development completed;</li> <li>• Conversion technology defined by the enterprise (Methyl Formate and HFO);</li> <li>• Plant conversion completed;</li> <li>• Temporary use of HFC-134-a until gas HFO is commercially available, together with its developed and optimized system;</li> <li>• Information on end users in the validation stage.</li> </ul>

POLYURETHANE	<ul style="list-style-type: none"> <li>• System Conversion to PUR completed;</li> <li>• Group project in progress.</li> </ul>	<ul style="list-style-type: none"> <li>• Enterprise Eligibility Validated;</li> <li>• Service Contract signed;</li> <li>• Formulation Development completed;</li> <li>• Selected Technology: Methyl Formate;</li> <li>• Safety Certificate issued;</li> <li>• Plant conversion completed;</li> <li>• Long-term agreement signed;</li> <li>• 24 end users converted;</li> <li>• Consumption of 5.16 ODP tonnes phased-out.</li> </ul>
COMFIBRAS	<ul style="list-style-type: none"> <li>• Project in progress.</li> </ul>	<ul style="list-style-type: none"> <li>• Enterprise Eligibility Validated;</li> <li>• Work Plan to start conversion of the enterprises in negotiation;</li> <li>• Expected start date for the enterprise conversion: 2021.</li> </ul>
DOW	<ul style="list-style-type: none"> <li>• Project in progress.</li> </ul>	<ul style="list-style-type: none"> <li>• Eligibility of the enterprise invalidated (non-eligible enterprise);</li> <li>• Work Plan to start conversion of end users in negotiation;</li> <li>• Expected start date for the end user conversion: 2020.</li> </ul>
BASF	<ul style="list-style-type: none"> <li>• Project in progress.</li> </ul>	<ul style="list-style-type: none"> <li>• Eligibility of the enterprise invalidated (non-eligible enterprise);</li> <li>• Work Plan to start conversion of end users in negotiation;</li> <li>• Expected start date for the end user conversion: 2020.</li> </ul>

25. Notwithstanding the advances made since the last progress report, the implementation of the industrial conversion projects at end users, especially in small and medium-sized enterprises, has been quite a challenging task. The economic recovery signs, which had been witnessed in the end of 2019 in the country, were stifled by the worsening of the crisis faced by Brazil as a result of the COVID-19 pandemic, especially as of March 2020.

26. Currently, most enterprises are partially operational, experiencing high impacts on their commercial activities. Considering that the industrial conversion of end user enterprises is strongly dependent on field visits to validate information and provide technical assistance, the system houses are unable to carry on with such activities, since there is also the effective likelihood to contribute with the virus dissemination.

27. Moreover, with reduced economic activity in the country, and consequently, in the foam sector, many enterprises still hold a significant stock of HCFC-141b, acquired before January 1, 2020, when the importation ban of the substance for the foam sector was enforced.

28. Finally, three factors which have been driving a significant part of the foam sector to migrate to low-cost technologies and high global warming potential, such as HFC blends were identified:

- a) availability in the national market at competitive prices compared to HFO and water-based technologies

- b) the strong marketing strategy, implemented in the past by international system houses and chemical suppliers, associating these products to ecological technologies,
- c) the belief that HFCs will still be used for a long time until the country defines its schedule for phasing down the use of these substances.

29. Several virtual meetings between MMA, UNDP, the International Consultant and the System Houses have been organized with the purpose of assessing the economic impact in the sector and defining an emergency strategy to help the industry to carry on safely with the conversion process during the pandemic period.

30. The project continues to use publicity pieces to sensitize the foam sector about the urgency of their conversion:

- 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](http://www.mma.gov.br/ozonio)) and on UNDP website dedicated to the Brazilian HCFC Phase-Out Management Plan ([www.protocolodemontreal.org.br](http://www.protocolodemontreal.org.br));
- b) Informative videos - In addition to presenting information on the international efforts to phase out HCFCs and the substance phase out schedule for the foam sector in Brazil, the videos provide information on how enterprises may have access to funds from the HPMP to support them in the conversion process of their manufacturing plants. The videos also show testimonial reports from the representatives of converted enterprises, emphasizing the results achieved. The informative videos were sent electronically to enterprises from the foam sector and posted on the website of the Ministry of the Environment (<http://www.mma.gov.br/clima/protecao-da-camada-de-ozonio/difusao-de-informacao/videos-informativos> e <http://www.mma.gov.br/clima/protecao-da-camada-de-ozonio/acoes-brasileiras-para-protecao-da-camada-de-ozonio/programa-brasileiro-de-eliminacao-dos-hcfc-pbh/projeto-para-o-setor-de-manufatura-de-espumas-de-poliuretano>) and on UNDP website dedicated to the Brazilian HCFC Phase-Out Management Plan ([www.protocolodemontreal.org.br](http://www.protocolodemontreal.org.br));

I.4.2 Activities in the RAC Servicing Sector**Table 6 – Project activities implemented until the first half of July 2020, with funds from the 1st, 2nd, and 3rd tranches approved under Stage II of the HPMP.**

<b>Project</b>	<b>ACTIVITIES Servicing Sector</b>
Training and Capacity Building (Training for HCFC-22 Containment)	<ul style="list-style-type: none"> <li>• National and international consultants contracted;</li> <li>• Market research on the country’s training capacity and potential regional implementation partners conducted;</li> <li>• Educational material (presentations and handbooks on best practices) for training of refrigeration technicians updated and published;</li> <li>• Terms of Reference and selection criteria for regional partner institutions prepared;</li> <li>• Tender carried out and fourteen training institutions selected and contracted;</li> <li>• Technical visits to the selected regional training institutions carried out;</li> <li>• Tools and components for demonstrations and practical training purposes (educational kits) were purchased and delivered to the selected regional training institutions;</li> <li>• Agenda, training materials and list of consumables for training courses prepared;</li> <li>• Nine “Train the Trainers” workshop were held and 93 multipliers were trained;</li> <li>• 3.894 technicians trained in best practices for split and window type air conditioning systems;<sup>1</sup></li> <li>• 857 technicians trained in best commercial refrigeration practices;<sup>1</sup></li> <li>• 17 monitoring visits carried out.</li> </ul>
Training and Capacity Building (Low-GWP Alternatives)	<ul style="list-style-type: none"> <li>• National and international consultants contracted;</li> <li>• Training handbooks and presentations on the safe use of CO<sub>2</sub> and propane under development;</li> <li>• Market research for technology, potential suppliers and potential implementation partners performed;</li> <li>• Terms of Reference for the selection of two technical training institutions for the training project for the safe use of CO<sub>2</sub> and propane in commercial refrigeration systems performed;</li> <li>• The tender process for the selection of technical schools for the training project for the safe use of CO<sub>2</sub> and propane in commercial refrigeration systems was published and two schools were selected (contracting in progress);<sup>2</sup></li> <li>• The technical specifications for the acquisition of two mini-supermarkets, which will be installed in the two training institutions</li> </ul>

<sup>1</sup> Due to the COVID-19 pandemic, the partner technical training institutions have suspended all training activities for an undetermined period of time since April 2020.

<sup>2</sup> The tender process was delayed due to the COVID-19 pandemic, which made on-site technical visits to potential partner schools impossible.

Project	ACTIVITIES Servicing Sector
	<p>selected for the training of refrigeration technicians and mechanics on the safe design, installation, operation and maintenance of commercial refrigeration systems operating with natural refrigerants, namely CO<sub>2</sub> and propane, were prepared (tender publication planned for September<sup>3</sup>).</p>
Outreach and Awareness Campaign	<ul style="list-style-type: none"> <li>• Sectoral communication plan elaborated;</li> <li>• Updating and operation of the project website (<a href="http://www.boaspraticasrefrigeracao.com.br">www.boaspraticasrefrigeracao.com.br</a>);</li> <li>• Operation of the Project fanpage on Facebook (<a href="https://www.facebook.com/camadadeozonioerefrigeracaoeclima?ref=bookmarks">https://www.facebook.com/camadadeozonioerefrigeracaoeclima?ref=bookmarks</a>);</li> <li>• Communication consulting hired, and activities and results of HPMP Stage II disseminated;</li> <li>• Photos of the activities implemented published on Flickr: <a href="https://www.flickr.com/photos/147992141@N07/collections/72157690669896345/">https://www.flickr.com/photos/147992141@N07/collections/72157690669896345/</a>;</li> <li>• Interviews with participants of the best practice training course performed, and testimonials published and disseminated;</li> <li>• Meetings with national stakeholders in the servicing sector held;</li> <li>• Three best practice handbooks (Leak Control, Sealed System Design, Planned Preventive Maintenance) printed and disseminated;</li> <li>• Poster on the “10 Golden Rules for the Maintenance of RAC Systems” prepared, printed and disseminated;</li> <li>• Technical rules for the quick conversion of pressure and temperature developed, produced and distributed;</li> <li>• Stickers/seals for dissemination of best practices for RAC systems developed and distributed;</li> <li>• Educational video for leak reduction in the servicing sector produced (three versions are available: original video with Portuguese audio, video with English subtitles, and video with Portuguese subtitles);</li> <li>• Project folder developed, printed and distributed;</li> <li>• Posters on the training and capacity building activities developed, printed and distributed;</li> <li>• Card listing the specific gravity of refrigerants developed, produced and distributed</li> <li>• Video for awareness raising of end users towards contracting the appropriate services for air conditioning systems produced (three versions are available: original video with Portuguese audio, video with English subtitles, and video with Portuguese subtitles);</li> </ul>

<sup>3</sup> The publication of the tender process for the acquisition of two mini-supermarkets depended on the selection of the two partner training institutions, as the particular information on the installation facility had to be part of the technical specifications.

<b>Project</b>	<b>ACTIVITIES Servicing Sector</b>
	<ul style="list-style-type: none"> <li>• Video for dissemination of best practices in the commercial refrigeration sector produced (three versions are available: original video with Portuguese audio, video with English subtitles, and video with Portuguese subtitles);</li> <li>• Two videos of the series “Capacity Building in Focus”, whose purpose is depicting the life and work of refrigeration professionals who disseminate best practices and new technologies in the sector for the protection of the environment, were produced (Trainers Jossineide Oliveira e Silva and Willian Ramon Grassiotti);</li> <li>• Five videos of the series “Best Practices in Minutes” were produced (it is a series of educational videos bringing together technology and audiovisual communication to convey knowledge to technicians of the refrigeration and air conditioning sector throughout Brazil, promoting best practices to enhance environment protection);</li> <li>• Participation in trade shows, events, seminars, etc., of the sector and partners (e.g., workshops and seminars held by the Project for the RAC Manufacturing Sector, FEBRAVA, AVAC-R Sector Women’s Meeting);</li> <li>• Support to the Awareness Campaign for ozone layer protection conducted in the metro stations of the city of Belo Horizonte;</li> <li>• Technical assistance provided to users of the online logbook “Pro-Ozonio”, and improvement of the app developed under HPMP Stage I continued;</li> <li>• Coordination meetings held.</li> </ul>
Management, Monitoring and Evaluation	<ul style="list-style-type: none"> <li>• Agreement with the Brazilian government signed;</li> <li>• Administration carried out;</li> <li>• Data processing carried out;</li> <li>• Quality control performed;</li> <li>• Reports prepared;</li> <li>• Support in the review, discussion and development of technical standards for the servicing sector, with participation in monthly meetings of experts at the Brazilian Association of Technical Standards - ABNT;</li> <li>• Technical standards supported by the project developed or under discussion: <ol style="list-style-type: none"> <li>1. Review of the ABNT NBR 16069 Standard - Safety in refrigeration systems (concluded in 2018);</li> <li>2. Review of the ABNT NBR 13598 Standard - Pressure vessels for refrigeration systems (concluded in 2018);</li> <li>3. Review of the ABNT NBR – 15833 Standard - Reverse Manufacturing - Refrigeration equipment (concluded in 2018);</li> <li>4. Translation of the International Standard ISO 5149:2014 – Refrigeration Systems and Heat Pumps - Safety and environmental</li> </ol> </li> </ul>

<b>Project</b>	<b>ACTIVITIES Servicing Sector</b>
	<p>requirements – Parts 1 to 4 (Parts 1 and 3 published in April 2020, Parts 2 and 4 will be published shortly after public consultation).</p> <ul style="list-style-type: none"><li>• NOTE: The technical standards are discussed in specialized work groups under the Brazilian Committee of Refrigeration, Air Conditioning, Ventilation and Heating (CB-55) from the Brazilian Association of Technical Standards (ABNT). These work groups are composed of experts from the private sector. The participation of the Brazilian government and GIZ is limited to the support for preparation, discussion and review of the technical standards which are essential to the appropriate handling of refrigerants. The Brazilian government has no control over the development and the review processes.</li></ul>

31. Table 7 below presents a summary of the technicians trained in best practices for commercial refrigeration under the Training and Capacity Building Project for better HCFC-22 containment in the Commercial Refrigeration Sector.



**Table 7 – Summary of Training Activities per region in the Commercial Refrigeration Sector.**

Application	Region	State	Target	N° Technicians Trained	Partners
Best Practices in HCFC-22 containment in commercial refrigeration systems	North	Rondônia	100	47	Senai-RO
		Tocantins	130	182	Senai-GO
	Northeast	Pernambuco / Rio Grande do Norte	170	45	Senai-RN in partnership with Senai-PE
		Bahia	158	187	IFBA
	Central-West	Federal District	200	208	Senai-GO
	Southeast	Rio de Janeiro	170	28	Senai-RJ
		Minas Gerais	150	160	Senai-MG
	South	Paraná	160	-	Senai-PR
Total			1,238	857	

32. Table 8 below presents a summary of the 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 8 – Summary of Training Activities per region in the Air Conditioning Sector.**

Application	Region	State	Target	N° Technicians Trained	Partners
Best Practices in HCFC-22 containment in air conditioning systems	North	Rondônia	250	183	Senai-RO
		Amazonas	250	74	CESP
	Northeast	Pernambuco / Rio Grande do Norte	600	158	Senai-RN in partnership with Senai-PE
		Bahia	500	500	IFBA
		Maranhão	600	600	Netcom
	Central-West	Federal District	300	93	Senai-DF
		Goiás	400	159	Senai-GO
		Mato Grosso	500	149	Senai-MT
	Southeast	Rio de Janeiro	700	179	Senai-RJ
		Minas Gerais	800	474	Senai-MG
		São Paulo	900	900	Senai-SP
	South	Santa Catarina	400	97	Senai-SC
		Paraná	400	167	Senai-PR
Rio Grande do Sul		400	161	Senai-RS	
Total			7,000	3,894	

### I.4.3. Activities in the RAC Manufacturing Sector

33. The actions reported below were implemented as from the last progress report with resources from the 1st and 2nd tranches from UNIDO (which is equivalent to the 1st and 3rd tranches from the HPMP respectively), under Stage II of the HPMP:

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

34. As mentioned in the previous report, the 33 project enterprises were mobilized to implement the project by means of e-mail correspondence, phone calls, and missions/visits to their facilities. In 2018, two workshops were organized to convey information on the project, as reported in the document submitted to the 82nd ExCom, and some enterprises showed interest in starting the project implementation, whereas other enterprises did not respond.

35. As informed in the previous Progress Report, in order to start the project implementation the enterprises were assessed in terms of their capability to handle flammable refrigerants. This criterion was - and still is - required, due to the large gaps found in the technical and logistic structure amongst the beneficiary enterprises.

36. Therefore, the strategy to prioritize specialized technical capacity building efforts to support the enterprises in redesigning their equipment and to train them to handle alternative flammable refrigerants still continues, instead of simply making the funds available for the purchase of equipment and tools. To this end, capacity building and information dissemination events were scheduled for the year of 2020, which were nevertheless canceled due to the COVID-19 pandemic.

37. In 2018 and 2019, UNIDO requested the replacement of some enterprises by others, which also met the criteria of the RAC project and of the MLF. Table 9 shows the substitutions performed:

**Table 9 – Replacement of manufacturing enterprises of commercial refrigeration equipment in the technical assistance project for SMEs.**

<b>Enterprise Excluded</b>	<b>Reason for Exclusion</b>	<b>Enterprise Included</b>	<b>ExCom Decision approving the request</b>
<b>Spacinox</b>	Enterprise concluded activities	JJ Refrigeração	Decision 82/62
<b>CMR Refrigeração</b>	Enterprise not interested in the project	REFRIAC	Decision 84/33
<b>Fermara</b>	Enterprise not interested in the project	AUDEN	Decision 84/33
<b>Polifrio</b>	Enterprise concluded activities.	INGECOLD	Decision 84/33

38. In addition to two (2) “Workshops on Alternative Refrigerant Fluids for Commercial Refrigeration Equipment” carried out in 2018, we highlight three other important events on technical assistance, focusing on each one of the alternative refrigerants available - Propane, CO<sub>2</sub> and HFOs, in the first semester of 2019.

39. The workshop content was developed by the UNIDO Expert Engineer, Edgard Soares, and two consultants of the Federal University of Uberlândia, Professor Enio Bandarra and the Doctoral

Student David Marcucci. These consultants were responsible for preparing and reviewing the Technical Newsletters and for presenting their respective contents.

40. The workshop agenda included technical presentations for training purposes and dissemination of information about alternative refrigerants for HCFC-22 replacement. In addition to the beneficiary enterprises, representatives of the sector associations, experts, technicians and suppliers of components and refrigerants were also invited. An example to be highlighted was the presentation during the workshop by the São Paulo Fire Department on Propane.

41. Although the technical workshops were done within the scope of SMEs, all beneficiary enterprises were invited and almost all participated.

42. For each one of these workshops, a technical newsletter was published, focusing on the refrigerant of interest. These newsletters were directed to technicians, engineers and experts from the refrigeration sector. They are available on the Ministry of the Environment website: <https://mma.gov.br/publicacoes/clima/category/110-protacao-da-camada-de-ozonio>.

43. All presentations and debates carried out during the three workshops are available on the Ministry of the Environment website: <https://mma.gov.br/clima/protacao-da-camada-de-ozonio/acoes-brasileiras-para-protacao-da-camada-de-ozonio/programa-brasileiro-de-eliminacao-dos-hcfc-pbh/projeto-para-o-setor-de-manufatura-de-equipamentos-de-refrigeracao-e-ar-condicionado>.

44. The participation in the three workshops is presented in Table 10, and the greater interest by the enterprises for the refrigerants Propane and HFO may be observed.

**Table 10 – Workshops held in 2019, under the scope of the Technical Assistance Project.**

	<b>Workshop - Propane</b>	<b>Workshop – CO2</b>	<b>Workshop – HFO</b>
<b>Venue</b>	São Paulo - SP	São Paulo - SP	São Paulo – SP
<b>Date</b>	March 14, 2019	April 25, 2019	June 13, 2019
<b>No. of beneficiary enterprises</b>	20	13	18
<b>Total no. of Participants</b>	49	43	48

45. Currently, five beneficiary enterprises in the sector of commercial refrigeration started their projects and are following the implementation schedule approved in the respective Terms of Reference. They are: JJ INSTALAÇÕES COMERCIAIS, REFRIMATE, CHOPEIRAS CCITTI, KLIMA REFRIGERAÇÃO LTDA e KITFRIGOR.

46. Except for Kitfrigor, that opted for an HFO system, the other enterprises are converting their equipment for the R-290 system. The activities developed, as well as the project implementation status until July 2020, are presented in Table 12.

47. An activity that deserves to be highlighted that was performed by the SME group was the development of a prototype for a draft beer cooler equipment using HC-290. The challenge was proposed to the researchers of Federal University of Uberlândia and consisted of developing a piece

of equipment with beverage temperature and flow rates specifically customized to the requirements of the Brazilian market.

48. Similar equipment manufactured abroad do not meet the desired characteristics, which are high flow rate, low temperature (less than 0°C) and short time to obtain the beverage in the desired temperature. The equipment developed offers a safety system that allows for the equipment rental. Chopeira Ccitti was the site selected for the hired consultant and his assistant to develop the prototype.

49. One of the conditions imposed by UNIDO was that *Chopeira Ccitti* employees actively participated in the prototype development and were trained on the product development techniques and manufacturing processes.

50. The main features of the developed equipment are efficiency, safety and lower production cost, when compared to the technologies available for the same segment. The prototype, in Figure 1, was presented during the Propane Workshop in March 2019. The developed innovative aspects of the technology has been used and optimized by other enterprises.



**Figure 1 – Draft beer cooler equipment developed under the RAC Project, March 2019.**

51. The JJ enterprise has virtually concluded the project. The COD (Certificate of Destruction) and COC (Certificate of Completion) are pending and would have been signed in April 2020 in the opening of the converted line, but due to the COVID-19 pandemic, this activity was canceled. Figure 2 shows JJ production line.



**Figure 2 – Production line of the Enterprise JJ Instalações Comerciais, March 2020.**

52. MECALOR enterprise is in advanced stage of writing the Term of Reference and should start execution by September 2020. The enterprise intends to develop a chiller, as refrigeration equipment.

53. INGEcold and REFRIAC are in the phase of preparing the Terms of Reference. This activity was delayed due to the reduced shifts in the enterprises in the first semester of 2020.

54. The challenge posed by different types of commercial refrigeration equipment produced by beneficiary enterprises still remains. Also related to that, as previously report, there is the need to pay greater attention to the implementation of technological changes in Small and Medium-sized Enterprises because of the economic situation of the country. This aspect justifies the fact that the equipment acquisition activities were started only in 2019, as training and technical assistance activities were prioritized.

55. Barriers to the use of alternative refrigerants were identified, especially regarding safety matters, lack of knowledge of applicable regulation and system efficiency and need of equipment redesign. The cost of components compatible with alternative refrigerants has also been mentioned as an obstacle to start the project implementation, associated to the lack of technicians trained to handle flammable refrigerants. Another aspect worth mentioning is the uncertainty in the availability and cost of some alternative refrigerants.

56. The SMEs conversion depends strongly on field visits to validate information and provide technical assistance. These activities were impacted by the quarantine adopted in the country due to the COVID-19 crisis. Virtually all enterprises in this SME group had to shut down their activities or impose blanket vacations on the employees, and, as a consequence, they interrupted their activities. Other enterprises kept on working, but with slowed-down production or maintenance activities only.

57. The strategy to reconnect SMEs with the RAC Project will be kept and improved along the upcoming years, addressing the development/redesign of equipment and answering to technical questions related to flammable refrigerant management. As the project foresees, the goal is to allow

20 commercial refrigeration enterprises to have the opportunity to develop innovative equipment, fully phasing out the use of R-22.

58. We highlight the growing need of coordination between RAC Project training activities and service training activities within the scope of the GIZ Project, for handling flammable fluids.

b) Group Projects - Manufacturing of Commercial Refrigeration Equipment

59. After the mobilization and awareness campaign to communicate to enterprises the opportunity offered by the RAC Project, the phase of preparing the Terms of Reference to initiate activities was started at *AQUAGEL REFRIGERAÇÃO LTDA* and *INDÚSTRIA E COMÉRCIO CHOPEIRAS RIBEIRÃO MEMO LTDA*.

60. There were several visits to clarify and discuss technical aspects of the project. The contact between enterprise technicians and experts was promoted, especially during the project events.

61. Ribeirão Memo manufactures draft beer refrigeration equipment and started their project immediately after learning about the prototype developed for *Chopeira CCITTI*, previously described. The enterprise hired external consultants to convert a 70 L/h beer cooler, charged with 4.5 Kg of R-22, to the R-290 refrigerant.

62. The results obtained were relevant, with the same flow rate as the original equipment. The refrigeration system was redesigned and the refrigerant charge was reduced to 150g of R-290. The electrical components were replaced by components compatible with flammable refrigerants and the energy consumption was reduced from 1.7kW/h to 0.72kW/h. The equipment manufacturing line was converted to operate safely with the R-290 fluid. Charging and discharging machines were installed, together with fixed leak detectors, a pneumatic sealing tool in the process pipe, an exhaustion system and a detection and alarm system containing fixed sensors and a siren, all fully compatible with the R-290 fluid. The loading area was fenced off, grounded and painted with anti-static paint. Currently, the enterprise is negotiating with consumers to start producing beer coolers and it expects to sell converted products to Brazil and export to South America and Africa.

63. Aquagel had their Terms of Reference approved towards the end of 2018, but only started project execution in the first semester of 2019. The project is under development and aims at converting beverage coolers and refrigerated displays, both manufactured by the enterprise, using R-290 as refrigerant. Aquagel completed the charging line conversion in May 2020. A charging machine and a discharging line were installed, together with a leak detector, a pneumatic sealing tool in the process pipe, an exhaustion system and a detection and alarm system containing fixed sensors and a siren, all fully compatible with the R-290 fluid. The charging area was marked, grounded and an anti-static mat was installed. The enterprise started converting three lines: the beer pre-cooling line; the refrigerated display line; and the juice dispenser line. The prototypes were manufactured and are being tested in the enterprise laboratory.

64. Regarding the Free Art Seral enterprise, as reported in the 84th ExCom, UNIDO has been hearing companies of the commercial refrigeration sector. Although several enterprises showed

interest in participating, the volume of R-22 that they use is still very low. In general, it is less than 10 tons/year, which does not characterize them as medium-sized enterprises.

65. In June 2020, a representative of a relatively large national enterprise has informally expressed interest in participating in the project and communicated they would be discussing internally with their business area before formalizing this interest. Therefore, ExCom is being asked to keep this project open until we may confirm this enterprise's actual interest in becoming a beneficiary enterprise. If the enterprise meets the criteria, all correct formal procedures will be applied to request ExCom's approval and the consequent Free Art Seral removal of the project.

66. The technological development of this project has been executed in a personalized way, that is, according the specificities of each enterprise, considering that there is fierce competition between them. The expectation is that they conclude their projects in the first semester of 2021. In both enterprises, a minor delay in execution was identified, caused by the COVID-19 pandemic, which has severely hit the State of São Paulo, where both enterprises are located.

67. The developed activities and the implementation status of the projects until July 2020 are presented in Table 12.

68. Figure 3 shows Memo and Aquagel production lines, respectively.



**Figure 3 – Production line of enterprises Chopeiras MEMO (a) and AQUAGEL Refrigeração (b), March 2020.**

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

69. As reported in the 82th ExCom, activities connected to individual projects were prioritized and started in the end of 2017.

70. ELETROFRIO Project, the first one to be started, is in the final stage of information dissemination to transfer the technical know-how that was acquired. Several dissemination activities

were performed, both for other enterprises of the refrigeration sector and for the supermarket sector. The project was presented in different national and international trade fairs and events in 2019.

71. The prototype of the Propane Modular Chiller was successfully concluded and installed in a unit of Supermarket Condor in the city of Curitiba, in the State of Paraná. The choice for the supermarket was based on a selection process after an invitation with Expression of Interest was published.

72. Eletrofrio manufacturing plant is ready to operate with flammable fluids. The charging line equipment were acquired, tested and certified by competent institutions, including the Fire Department.

73. Eletrofrio submitted all the documentation related to the acquisition and installation of the equipment and safety system items. According to project requirements, the enterprise submitted the documentation attesting the prototype assembly; the equipment performance report; the installation, operation and maintenance manual; as well as the documentation containing data of the demonstration project with the selected supermarket; design of the machine room; and proof of the manufactured modular chillers.

74. The six modular chillers installed in the supermarket are showing promising results and they are very much appreciated by the supermarket sector. As informed in Eletrofrio's documents, three modules meet the demand of the supermarket for the area of chilled products, two modules meet the demand of frozen products, and one module is the spare unit. It is worth highlighting that in 2019 the project was laureated with the International Award "Lower-GWP Refrigeration and Air-Conditioning Innovation Award" for its contribution to reducing the adverse impacts of refrigeration technologies on the ozone layer. The Award was granted by the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE), headquartered in Atlanta (USA), and by the United Nations Environment Programme (UNEP)<sup>4</sup>.

75. As for the chillers which were developed, a reduction in the number of technical problems was observed so far, resulting in a low demand for technical assistance. As for energy efficiency, initial data demonstrate improvements of approximately 3%, as compared to similar systems which use R-134a. The comparison between systems using R-290 and R-134a was possible because the project contemplated new stores, with the same construction method, similar refrigeration systems<sup>5</sup>, located in the same city.

76. Figure 4 shows the propane filling line at Eletrofrio, inaugurated in April 2019, and the chillers installed at the machine room of supermarket Condor in Curitiba city.

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<sup>4</sup> <https://nacoesunidas.org/projeto-brasileiro-de-refrigeracao-sustentavel-recebe-premio-internacional/> e <https://nacoesunidas.org/projeto-brasileiro-de-refrigeracao-recebe-certificados-de-premio-internacional/>

<sup>5</sup> Parallel compressor rack with R-134a at medium temperature and subcritical CO<sub>2</sub> cascade system at low temperature *versus* R-290 at medium temperature and subcritical CO<sub>2</sub> cascade system at low temperature)





(a)



(b)

**Figure 4 – Propane filling line at Eletrofrío(a), and chillers installed at the machine room of supermarket Condor in Curitiba city(b).**

77. A video to disseminate the activities developed with Eletrofrío was prepared. The video in Portuguese is available on the website: <https://www.youtube.com/watch?v=Fiee26fF-FA&feature=youtu.be> (in Portuguese) and <https://youtu.be/E2TdMRb295c> (in English).

78. The enterprise PLOTTER RACKS started the implementation of the project in August 2018, proposing to develop a modular chiller, install a laboratory for tests and a charging line for propane. Plotter Racks requested the technical advice of an international consultant to support it in developing the solution and the project.

79. The enterprise presented its report in the first two months of 2020, containing information on the charging area and the laboratory, since these have been concluded, and on the prototype which was assembled and tested. The enterprise acquired all pieces of equipment which are part of the package for the handling of refrigerants, and of the safety measures related to the charging area.

80. A mid-sized supermarket, from the Network Bahamas, was selected through a Request for Expression of Interest, to participate in the demonstration project. The chillers that were developed were installed in a new store from the network in the city of Juiz de Fora, in the State of Minas Gerais. The start up of the equipment was on March 19, 2020.

81. In April 2020 the demonstration stage of the project started, when the experience and knowledge gained by Plotter Racks was shared with the technicians from the commercial refrigeration and supermarket sectors. However, due to the COVID-19 pandemic, preventing travels in the country, no further activities were carried out on site. In spite of the current status, the project has disseminated positive news, as per the article published by the Arab Brazilian Chamber of Commerce, which may be seen in the link: <https://anba.com.br/en/company-developed-sustainable-refrigeration-technology/>.

82. Figure 5 shows the filling line at Plotter Racks and the chillers installed in the supermarket Bahamas in March of 2020. Three modular chillers were installed and another module with the pumps and the electrical control panels, which enable remote monitoring by Plotter Racks.

83. The development of a technical newsletter of the individual projects for the supermarket sector, as well as the organization of the Conclusion Workshop, for the dissemination of project information and analysis of the results for the commercial refrigeration and supermarket sectors, will be made after the completion of Plotter Racks project, since these activities, as defined by the Project, involve both enterprises. Considering travel and meeting difficulties, it is likely that the Workshop will only take place in the first semester of 2021.



**Figure 5 – Filling Line of the Enterprise Plotter Racks (a) and chillers installed by the enterprise at supermarket Bahamas, in Juiz de Fora city (b).**

84. The activities developed, as well as the implementation status of the enterprise projects under this Plan are displayed in Table 12 with information until July 2020.

85. A publicity video of Plotter Racks project was produced, and it is available in Portuguese: <https://www.youtube.com/watch?v=Kl67hZZ3klA&feature=youtu.be> and in English: [https://www.youtube.com/watch?v=nyiRrIysTUE&feature=emb\\_title](https://www.youtube.com/watch?v=nyiRrIysTUE&feature=emb_title)

#### d) Individual Projects - Manufacturing of Air Conditioning Equipment

86. The implementation of the project for the air conditioning sector is in the discussion stage with the three beneficiary enterprises - ELGIN S.A., GREE and CLIMAZON. Several mobilization activities were performed by these enterprises and all of them have received UNIDO team in their plants.

87. In 2018, UNIDO reported to the ExCom that the effective implementation of the conversion should take place during the year of 2020. In August 2019, during the 84th ExCom Meeting, UNIDO introduced information related to Decision 82/62 about the implementation status of this project. On such occasion, the first international event, which took place in March 2019, was highlighted, and the organization of the second event was announced, to be held by the end of 2019. Moreover, the enterprises' concerns with the following topics were underlined: acceptance of equipment with flammable refrigerants in the Brazilian market; difficult product traceability in the post-sale stage; possibility of problems arising from poor installation and maintenance; and the need to establish training and capacity building programs to handle the new equipment.

88. Early in 2020, UNIDO submitted information related to Decision 84/33 to the 85th ExCom Meeting, reporting about the second meeting of the air conditioning sector, held in November 2019, focused on the use of R-290 in the air conditioning equipment. This second meeting contributed to raising the sector awareness about the use of R-290, the existing opportunities and the status of the global discussions on the topic.

89. The development of a market study for the sector was also reported. The company which will carry out the study has already been selected and it started working in June 2020. This market study should especially address the acceptance of the market in regard to equipment with flammable fluids; assess the consumer perception; identify existing safety standards; verify costs and availability of components, bottlenecks, and other items.

90. As such, UNIDO, in cooperation with the MMA, has been performing activities which enable the gradual engagement of the enterprises participating in the project. The activities organized in 2019 prioritized the exchange of knowledge between the representatives of national enterprises and international stakeholders (international experts and technicians), who have experience with new technologies using alternative refrigerants .

91. Still under the scope of promoting the engagement of the enterprises in the discussion, it is worth noting the publication of the document named "Report containing Information on Low-GWP Technologies/Equipment for Residential Air Conditioning Systems", developed by the Consultant Roberto Peixoto. This publication synthesizes the content of the Reports of UNEP-TEAP and other involved institutions in the implementation of alternatives to high-GWP HCFCs and HFCs. It is available at: <https://www.mma.gov.br/publicacoes/clima/category/110-protacao-da-camada-de-ozonio>.

92. As mentioned above, it is worth noting the 2 (two) international events as relevant milestones of the project, with the presence of national and international experts, as presented in Table 11.

**Table 11 – Meetings of the Air Conditioning Sector held in 2019, under the scope of the Individual Projects for the Manufacturing of Air Conditioning Equipment.**

Event	Objective	Venue/ Date	No. of Participants
I Technology Meeting for the Air Conditioning Sector - Perspectives for the Use of Alternative Refrigerants in Residential Air Conditioning Equipment	Training course on the use of zero-ODP, low-GWP alternative refrigerants for AC systems	São Paulo - SP March 28	60
II Technology Meeting for the Air Conditioning Sector - Perspectives for the Use of Alternative Refrigerants in Residential Air Conditioning Equipment (Split and Window) - Experience and Perspectives of the use of R-290 (propane) as refrigerant in Residential Air Conditioning Equipment	Training course on the use of R-290 (propane) for AC systems, introducing filed experience, case studies, R&D, safety and TEAP documentation. Report of enterprises which use propane.	Brasília- DF November 28	36

93. The work has been challenging, since the possibility of migrating to a flammable technological alternative is not yet seen as urgent by the three enterprises. The expectation of starting with activities in 2020 was thwarted by the global sanitary pandemic, which led the enterprises to interrupt discussions that could lead to new investments.

94. In 2021, the activities listed in the previously described Action Plans should be implemented, especially those related to the development of Terms of Reference, when the enterprises have the opportunity to reflect upon activities related to the scope of the work, as well as discuss the alternatives of refrigerants allowed by the project.

95. In spite of the absence of formal commitments to start the project implementation, and of the complex scenario of the pandemic, the enterprise Climazon expressed its interest in discussing technical aspects of the project, as described in the previous paragraph, towards developing equipment that would use the R-32 refrigerant. Therefore, two virtual meetings were held with the enterprise's technical experts, on April 1 and May 28, 2020. In these meetings, the technical questions of the enterprise's engineers were addressed, as well as the implementation methods and the project costs, depending on the refrigerant to be adopted. During the May 28 conference, the responsible engineer for the plant provided information on the budgetary reductions enforced by the enterprise in this moment of global crisis, stating that it was not possible to materialize commitments at this moment. However, he also stated that the proposition is including the project in the 2021 enterprise business plan, which should be discussed in the next September and October 2020.

96. In July 2020, Elgin S.A. expressed interest in starting the conversion of two air conditioning equipment manufacturing lines as soon as possible. The alternative selected by the company is R-32 instead of R-290, as initially planned. Considering that R-32 is listed in the project document as an eligible alternative, we consider that no further discussions are needed with regard to the technology choice. However, considering that the investment cost for conversion to R-32 is lower than R-290,

the project budget has been recalculated. In addition to this, Elgin S.A. requested the replacement of the window type line for a split floor/wall type line.

97. In this regard, UNIDO requests the ExCom to revise the value of the project and authorize Elgin to convert to a split floor/wall system instead of window system. Thus, the total budget of the ELGIN project is USD 2,436,957.10, instead of USD 4,040,031.10, including the contingency and the support costs, as the table below:

**Tabela 12 – Requested change for ELGIN S.A. project.**

Description	Approved at the 75th Meeting		Revised budget requeste	
	Cost per unit (US\$)	Total Cost (US\$)	Cost per unit (US\$)	Total Cost (US\$)
Technical assistance for modification of the product	50,000.00	50,000.00	50,000.00	50,000.00
Technical assistance for factory layout	50,000.00	50,000.00	50,000.00	50,000.00
Modifications of the heat exchanger production line:	1,500,000.00	1,500,000.00	138,000.00	138,000.00
Refrigerant handling package:	155,000.00	310,000.00	155,000.00	310,000.00
Safety measures for the split line:	200,000.00	200,000.00	200,000.00	200,000.00
Safety measures for the <del>*window</del> / split floor/wall type line:	75,000.00	75,000.00	75,000.00	75,000.00
Assembly line modifications	25,000.00	50,000.00	25,000.00	50,000.00
Refrigerant Tanks and pipes	75,000.00	75,000.00	75,000.00	75,000.00
Modifications in the performance testing area for the split type	5,000.00	100,000.00	5,000.00	100,000.00
Modifications in the performance testing area for the split type	1,000.00	4,000.00	1,000.00	4,000.00
TÜV certification	50,000.00	50,000.00	50,000.00	50,000.00
Contingencies - 10%		246,400.00		110,200.00
ICC (US\$)		<b>2,710,400.00</b>		<b>1,212,200.00</b>
ICC (US\$)		2,710,400.00		1,212,200.00
IOC (US\$)		1,065,330.00		1,065,330.00
Subtotal		<b>3,775,730.00</b>		<b>2,277,530.00</b>
Agency support costs (7%)		264,301.10		159,427.10
Total		<b>4,040,031.10</b>		<b>2,436,957.10</b>

\* Replacement of the window line, from the original Project, by the Split floor ceiling line

98. As a result of the changes requested for the Elgin S.A. project, the total value of the RAC Project decreases from USD 11,216,697.00 to USD 9,718,528.00. The supporting cost for the Agency, UNIDO, is now USD 680,296.96.

99. Regarding the others beneficiary enterprises, the efforts will continue to start the planned activities, focusing on the use of lower GWP and zero-ODP refrigerants, which are more suitable for the enterprises. Apart from the difficulties that the enterprises are facing as a result of the global crisis, the MLF resources are an essential element to leverage their business using an innovative and sustainable alternative. The activities developed, as well as the implementation status of the enterprise projects under this Plan are displayed in Table 13 with information until July 2020.

100. Some factors are deemed as the most challenging ones, having impacted the implementation of the first and second tranches of the RAC Manufacturing Project. Some of these factors are:

- Lack of knowledge on the technology handling with the use of alternative flammable refrigerants;
- The geographical distribution, the variety, diversity and specificity of equipment produced by small and mid-sized refrigeration enterprises (in terms of installed inventory of refrigerant and type of system, for instance), demanding a personalized approach for the implementation of project activities;
- Lack of knowledge on the availability of alternative refrigerants in the national market, enabling the conversion and a final product price that is commercially more competitive;
- Granting of licenses and permits to the enterprises, so that they may work with flammable refrigerants, which may sometimes affect the expected implementation schedule;
- Scarcity/unavailability in the Brazilian market of refrigeration equipment components, which are suitable for flammable refrigerants, thereby demanding importation of items that influence the cost of equipment development;
- Time required for the importation of components;
- Insecurity of air conditioning enterprises in regards to the acceptability of the final product by consumers, the handling of refrigerants at the plant, the technical services, and the national regulation.

101. Nevertheless, in spite of the challenges, the implementation of the RAC Project is in course and yielding concrete results with a positive repercussion in the country. Table 13 consolidates the activities performed in each subproject, until the first half of July 2020.

**Table 13 – Activities developed in the Manufacturing RAC Sector until the first half of July 2020, with funds from the 1st and 2nd tranches from UNIDO, approved under Stage II of the HPMP.**

PROJECT	ENTERPRISE	IMPLEMENTATION STATUS	OUTCOMES / OUTPUTS (IMPLEMENTED ACTIVITIES)
Technical Assistance Project - Small and Medium-Sized Manufacturers of Commercial Refrigeration Equipment	All Enterprises	<ul style="list-style-type: none"> <li>Activities implemented in the projects</li> </ul>	<ul style="list-style-type: none"> <li>Contracting of a researcher to develop the technology for beverage refrigeration equipment using R-290;</li> <li>Two workshops, named “<i>Workshop on alternative refrigerants for commercial refrigeration equipment</i>”, were held;</li> <li>Three technical workshops addressing propane (R-290), CO<sub>2</sub> and HFO, held in 2019;</li> <li>Start of the implementation of projects, with redesigning of commercial refrigeration equipment in five beneficiary enterprises, with four using R-290 and one using HFO;</li> <li>Terms of Reference for beneficiary enterprises developed;</li> <li>Technical assistance and constant contact with the enterprises performed;</li> <li>Proposal and organization of technical-informative workshops, oriented to meeting the demand of the enterprises for technical training on handling of flammable refrigerants, performed;</li> </ul>
	JJ Instalações Comerciais	<ul style="list-style-type: none"> <li>Project in the final stage of completion</li> </ul>	<ul style="list-style-type: none"> <li>Presentation of project data on the redesign of equipment, layout of the charging area, documentation of the Fire Department for the handling of flammable refrigerants, detailed information of the acquisition and installation of the equipment from the refrigerant handling and safety measures package, data on power consumption and refrigerant charge in the redesigned equipment. Pending item: official documentation;</li> <li>Plant conversion plan implemented;</li> <li>Term of Commitment for the destruction of R-22 charged equipment signed;</li> <li>Selected Technology: R-290;</li> <li>1.50 ODP tonnes phased-out;</li> <li>COC under development.</li> </ul>
	Refrimate	<ul style="list-style-type: none"> <li>Project in progress</li> </ul>	<ul style="list-style-type: none"> <li>Term of Reference defined;</li> <li>Service Contract signed;</li> <li>Presentation of technical information on the equipment converted, layout of the charging area and evidence of acquisition of equipment from the refrigerant handling and safety measures package. The delivery of the data on power consumption and refrigerant charge of converted equipment is still pending, in addition to the evidence of conversion completion of the charging area for the operation with R-290;</li> <li>Selected Technology: R-290.</li> </ul>

PROJECT	ENTERPRISE	IMPLEMENTATION STATUS	OUTCOMES / OUTPUTS (IMPLEMENTED ACTIVITIES)
	Chopeiras CCITTI	<ul style="list-style-type: none"> <li>Project in progress</li> </ul>	<ul style="list-style-type: none"> <li>Term of Reference defined;</li> <li>Service Contract signed;</li> <li>Initial Development Stage of Equipment Conversion Design;</li> <li>Selected Technology: R-290.</li> </ul>
	KLIMA Refrigeração Ltda	<ul style="list-style-type: none"> <li>Project in progress</li> </ul>	<ul style="list-style-type: none"> <li>Term of Reference defined;</li> <li>Service Contract signed;</li> <li>Layout of the charging area to start the acquisition and installation process of equipment defined;</li> <li>In the stage of quoting the components for the charging area, development of design, and assessment of converted equipment;</li> <li>Selected Technology: R-290.</li> </ul>
	Kitfrigor	<ul style="list-style-type: none"> <li>Project in progress</li> </ul>	<ul style="list-style-type: none"> <li>Term of Reference defined;</li> <li>Service Contract signed;</li> <li>Initial Development Stage of Equipment Conversion Design;</li> <li>Acquisition of components for the charging area;</li> <li>Selected Technology: HFO.</li> </ul>
Group Projects - Manufacturing of commercial refrigeration equipment	Aqualgel	<ul style="list-style-type: none"> <li>Project in progress</li> </ul>	<ul style="list-style-type: none"> <li>Three meetings held;</li> <li>Four visits to the headquarters of the enterprise made;</li> <li>Service Contract signed;</li> <li>Equipment conversion projects under the implementation stage;</li> <li>Acquisition of components and equipment for the charging area;</li> <li>Term of Commitment to destroy/ dispose the machines used for HCFC-22 charging, in progress;</li> <li>Production line converted;</li> <li>Enterprise was closed due to the COVID-19 pandemic, and partially returned to its activities in early June 2020;</li> <li>Selected Technology: R-290.</li> </ul>



PROJECT	ENTERPRISE	IMPLEMENTATION STATUS	OUTCOMES / OUTPUTS (IMPLEMENTED ACTIVITIES)
	Memo	<ul style="list-style-type: none"> <li>Project in progress</li> </ul>	<ul style="list-style-type: none"> <li>Six meetings held;</li> <li>Three visits to the headquarters of the enterprise made;</li> <li>Plant conversion plan implemented; Line converted;</li> <li>Term of Commitment for the destruction of R-22 charged equipment signed;</li> <li>Acquisition of equipment concluded;</li> <li>Prototype of the equipment converted and concluded;</li> <li>Pending delivery of evidence documentation of the production of new equipment in order to receive the IOC (Incremental Operational Cost) ;</li> <li>The plant is operating with a reduced team, rotating shifts;</li> <li>Selected Technology: R-290;</li> <li>22.47 ODP tonnes phased-out;</li> <li>COC (Certificate of Completion) under development.</li> </ul>
	Free Art Seral	<ul style="list-style-type: none"> <li>Not started</li> </ul>	<ul style="list-style-type: none"> <li>Waiting for formal notification from another enterprise which may replace it.</li> </ul>
Group Projects - Manufacturing of commercial refrigeration equipment for the supermarket sector	Eletrofrio	<ul style="list-style-type: none"> <li>Project completed</li> </ul>	<ul style="list-style-type: none"> <li>Enterprise Eligibility Validated;</li> <li>Conversion technology defined (propane);</li> <li>Term of Commitment for Project Implementation signed;</li> <li>Term of Reference for the the acquisition of equipment developed;</li> <li>Term of Reference for service execution developed, with a defined Target Plan;</li> <li>Service Contract signed;</li> <li>Contract for the acquisition of equipment signed;</li> <li>Notification of interest from the supermarket published; Supermarket Condor Super Center Ltda selected;</li> <li>Propane filling line finalized;</li> <li>Six units of the modular chiller developed and installed in the machine room of the Supermarket Condor, in the city of Curitiba, in the State of Paraná;</li> <li>Term of Commitment for the destruction of R-22 charged equipment signed;</li> <li>COC under development;</li> <li>Selected Technology: R-290.</li> </ul>

PROJECT	ENTERPRISE	IMPLEMENTATION STATUS	OUTCOMES / OUTPUTS (IMPLEMENTED ACTIVITIES)
	Plotter Racks	<ul style="list-style-type: none"> <li>• Project in progress</li> </ul>	<ul style="list-style-type: none"> <li>• Enterprise Eligibility Validated;</li> <li>• Conversion technology defined (propane);</li> <li>• International consultant contracted;</li> <li>• Term of Reference for the acquisition of handling tools of refrigerant fluids and safety measures prepared;</li> <li>• Term of Reference for technical assistance and demonstration project prepared;</li> <li>• Equipment acquired;</li> <li>• Manufacturing line converted;</li> <li>• Three units of the modular chiller and one unit with control electrical panels and pumps developed, installed and in operation in the machine room of Supermarket Bahamas, in the city of Juiz de Fora, State of Minas Gerais;</li> <li>• The chillers are in operation in the Supermarket Bahamas</li> <li>• Selected Technology: R-290.</li> </ul>
Individual Projects - Manufacturing of Air Conditioning Equipment	ELGIN	<ul style="list-style-type: none"> <li>• Not started</li> </ul>	<ul style="list-style-type: none"> <li>• Technical visits made to the plants of the three enterprises;</li> <li>• Presence-based and conference meetings held with representatives of the three enterprises;</li> <li>• Organization of two international events, one on general alternative fluids and another one on R-290;</li> </ul>
	GREE	<ul style="list-style-type: none"> <li>• Not started</li> </ul>	<ul style="list-style-type: none"> <li>• Publication of the summary of the UNEP/TEAP report on HCFC and High-GWP HFC alternatives for the residential air conditioning sector;</li> <li>• Proposition of a work plan for the development of an equipment prototype, submitted to the three enterprises;</li> </ul>
	CLIMAZON	<ul style="list-style-type: none"> <li>• Not started</li> </ul>	<ul style="list-style-type: none"> <li>• Tendering process and contracting of the company which will carry out the market study for the sector;</li> <li>• Market study on the technical-economic feasibility analysis for the use of R-290 and R-32 in residential air conditioning equipment, in progress;</li> <li>• Terms for the inclusion of project in the 2021 Plan of two enterprises, in progress.</li> </ul>

## **I.5 Lessons learned and main challenges**

### **Foam Sector**

#### *Lessons Learned*

- a) The consent of the enterprises in regard to the technologies to be implemented in the investment projects should always be given, before submitting them to be approved by the MLF Executive Committee.
- b) The Projects have to be targeted at meeting the demands of sectors and of the country;
- c) The process of contracting foam enterprises for the conversion of their plants, which is the key mechanism used for the implementation of projects in this sector, requires close cooperation with enterprises to define the Terms of Reference and Action Plans for conversion;
- d) With the purpose of enhancing the application of this instrument, since July 2019, Long Term Agreements are being signed between UNDP and the System Houses, in order to make the contract implementation and the end users' conversion more agile, considering the frequent switching of suppliers (System Houses), a characteristic of the PU foam production sector.
- e) The execution of service contracts signed between UNDP and HPMP beneficiary enterprises requires continuous monitoring by UNDP at the enterprise level. Along these lines, it is of utmost importance to consider the conversion execution schedules defined by the enterprises, so as to prevent mismatches;
- f) The implementation of group projects requires constant and programmed in situ monitoring, in addition to a focal point representative allocated at the System House and exclusively dedicated to executing the conversion of end users;
- g) Training sessions on the group project implementation must be given to the system house teams assigned to the project as soon as the servicing contracts are signed;
- h) The dissemination of information through different communication media is of great importance to raise awareness among micro and small enterprises benefiting from the project. In this context, the experience of enterprises which finalized their industrial conversion projects should be used and announced to the other enterprises (e.g. by awarding the enterprises which completed their conversions with a commemorative plaque, by producing videos which demonstrate the progress accomplished by the project, etc.);
- i) The technological conversions should only take place if there are economically-feasible alternatives available;
- j) It is important to promote campaigns on the safe management of alternatives with a certain grade of flammability, in addition to seeking to establish rules and regulations for the safe use of flammable blowing agents in the polyurethane foam production sector.
- k) The policies and the legal framework are elements which drive the market;
- l) An efficient control of imports is needed;

- m) External cooperation efforts supports the learning of new technologies;
- n) The strengthening of teams is an indispensable tool for the technological conversion process;
- o) The interest and commitment of the country is required for the execution of projects;
- p) The specificities of each country must be respected, as well as the competences of each institution;
- q) The institutional strengthening projects are fundamental for maintaining the government's governance throughout the process.

### *Main challenges*

102. Currently, the main challenge is finding mechanisms to safely carry on with the implementation of investment projects in view of the COVID-19 pandemic. The industrial conversion of the end user enterprises is highly dependent on field visits to validate information and provide technical assistance. The conversion activities of end users were strongly affected by the current scenario.

103. Another important challenge to overcome is related to low-cost technologies and high global warming potential, such as HFC blends. Three factors which have been driving a significant part of the foam sector to migrate to this option: a) availability in the national market at competitive prices compared to HFO and water-based technologies b) the strong marketing strategy, implemented in the past, associating these products to ecological technologies, c) the belief that HFCs will still be used for a long time until the country defines its schedule for phasing down the use of these substances.

## **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 may 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 sector are very different from those in the domestic one, 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 expanding best practice training activities during Stage II 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 technical educational partner institutions' programmes, with activities beyond the completion of the Project;

- e) In order to monitor and evaluate the content learned by the technicians during the capacity-building programs, a continuous follow-up strategy based on interviews with the participants and monitoring visits during the courses is fundamental;
- f) During the training sessions, it is important to provide information on the currently available technological alternatives;
- g) The policies and the legal framework are elements which drive the market;
- h) An efficient control of imports is needed;
- i) External cooperation efforts support the learning of new technologies;
- j) It is important to create specific communication strategies adapted to each sub-sector, since the target audience varies and requires different information and methods to draw their attention. The use of short videos in the communication strategy is an essential tool to disseminate content to the servicing sector;
- k) The definition and establishment of strategic partnerships for the awareness campaign is required in order to harmonize the content of the materials developed, increase the capillarity of information and identify the needs of the sector;
  - l) The interest and commitment of the country is required for the execution of projects;
- m) The particularities of each country, including cultural and environmental issues, must always be respected;
- n) Institutional strengthening projects are fundamental for maintaining the government's governance throughout the entire process;
- o) The competences of each institution must be respected;
- p) Actions must be discussed with all stakeholders (including the professional training institutions, the industry, associations, among others) to ensure a positive participation and support to activities.

### *Main challenges*

#### *Regional Training Approach*

104. Based on the training experience gained during the implementation of the NPP, a regional training approach has been chosen to meet the specific needs of each of the five regions of Brazil, as well as to improve the enhancement of activities for Stage II in Brazil.

105. However, the participation of regional training institutions in the tender and contracting process complicated the process. Most regional partners had no experience with this type of contract and needed previous authorization from national agencies to participate in tenders and enter into individual contracts.

#### *COVID-19 Pandemic*

106. Since 70% of the activities of the best practice training courses for better HCFC containment are practical exercises, finding alternative methods to continue with the courses in a safe and efficient way has been a major challenge. The theoretical lessons could be transferred to online platforms with no harm to their technical content. However, one should bear in mind that not all technicians from the target audience have access to internet. The alternatives for the practical lessons are even more

complicated, since they demand the presence of students. Therefore, the training courses have been suspended for an undetermined time period since April 2020.

### I.5.1 Alternative Technologies

107. 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.

108. Technical information was also compiled on alternative technologies available on the market such as CO<sub>2</sub>, HC, NH<sub>3</sub>. Particularly for CO<sub>2</sub>, a growing number of installations were observed, as well as an increased interest by the commercial refrigeration sector in adopting this technology.

109. 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.

110. Capacity building (training in best practices) and promotion of alternative technologies for the refrigeration and air conditioning industry are part of the strategy of Stage II of the HPMP. The capacity building and training program for refrigeration technicians and mechanics in the safe design, installation, operation and maintenance of commercial refrigeration systems using the natural refrigerants CO<sub>2</sub> and propane is currently under development, with an expected start date in the first half of 2021.

### RAC Equipment Manufacturing Sector

#### *Lessons Learned*

- a) There is a need for personalized technological solutions, since many enterprises are competitors, being difficult to create cooperation networks among the small and mid-sized enterprises;
- b) The main mechanism used for project implementation is the contracting of enterprises. In the supermarket sector, this stage has been fulfilled and the need for a close cooperation with the enterprise to define the Terms of Reference and the Action Plan has been noted;
- c) The lack of preparation to handle flammable refrigerants is still observed in most beneficiary enterprises of the project, especially in the small enterprises. For this reason, equipment may not be acquired for some enterprises without organizing capacity building activities prior to that;
- d) The redesign of equipment and the development of new technologies, especially for the SMEs, depend on the availability of economically feasible components.
- e) The capacity building events organized under the scope of the technical assistance project are fundamental to engage the small entrepreneurs in the discussions on new technologies. These events have empowered the small enterprises and improved their self-esteem;

- f) The business plans of enterprises from the air conditioning sector, which are part of company holdings with representation overseas, count on business strategies which are relatively independent, meaning that the activities geared towards technology development in a foreign branch are not necessarily replicated in Brazil.

### *Main challenges*

111. The main challenge faced in the implementation of activities is related to the concern of the enterprises in failing to promote substantial technological changes in the refrigeration equipment, which require additional investment in the manufacturing area, during a period of economic crisis. The enterprises are extremely cautious and concerned with any additional costs they need to incur into.

112. This challenge was further worsened with the social and economic situation triggered by the COVID-19 pandemic. As such, the project implementation mechanisms should be impacted, and it is hoped they are reversed in the forthcoming year. Moreover, as mentioned, some enterprises depend on a closer technical support, which has been widely hindered by the restrictions on traffic in the country.

113. The concern in regards to the availability of components in the market has been repeatedly mentioned by the enterprises. For this reason, vendors of components have been invited to participate in the debates during technical workshops, enabling them to learn about the expected demand for these items in the country.

114. Promote the concrete engagement of enterprises of the air conditioning sector in the discussions on alternative technologies which use low-GWP, zero ODP refrigerants, and generate meaningful and useful information for the market study of the sector, so that it may be used by the enterprises.

### I.5.2. Other environmental impacts, including impacts on the climate system

115. As mentioned earlier, HCFC consumption in 2020 was below the established consumption limit, thus contributing to reducing negative impacts on the climate system. In addition, the conversion projects implemented under HPMP aim only at low GWP alternatives.

### I.5.3 Implementation and Monitoring

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

117. 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.

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

119. 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.

120. The UNDP (PMU/UNDP) Project Monitoring Unit has one project manager, one technical advisor, and two programme assistants. 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 recommendations to the local UNDP office regarding the drafting of service contracts agreed upon with enterprises (review of terms of reference and commitment, schedule and selection process);
- g) Drafting, execution and monitoring of service contracts for signature by eligible enterprises listed in the project document (preparation, drafting, printing, posting, tracking, and signature by the enterprise and the Resident Representative) – Since the beginning of implementation of Stage II of the HMPH, 34 service contracts have been signed with HPMP beneficiary enterprises, of which 22 have been completed up to July 2020;
- h) Preparation of the Terms of Commitment;
- i) Technical analysis of products presented;
- j) Administration of payment for analysed products, approved by international and national technical 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.

121. The Project Management Unit operating under 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 II in the implementation of the



Project for the RAC Manufacturing 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 RAC manufacturing 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 UNIDO) to report on the implementation of activities related to approved tranches;
- f) Preparation of the Terms of Commitment;
- g) Preparation of the Terms of Reference;
- h) Technical analysis of products presented;
- i) Administration of payment for analysed products, approved by senior international and national technical advisors;
- j) Monitoring of schedules agreed upon in signed contracts;
- k) Management of the execution of the financial, technical and administrative activities related to the implementation of the Project.

## **I.6. Consolidated Financial Report**

### I.6.1. Stage II of the HPMP

122. Table 14 shows the consolidated financial data for Stage II of the HPMP until the first half of July 2020. As shown, UNDP disbursements in the foam manufacturing sector, regulatory actions, acquisition of components of RAC equipment, and implementation and monitoring activities total USD 7,326,742.38, while outstanding financial obligations (hard commitments) account for USD 5,396,104.18 of the total amount received for projects. Combined, disbursements and commitments amount to USD 12,722,846.56, or the equivalent of 98.82% of the total amount of the tranches received.

123. As shown, disbursements made by the UNDP/Italy in the foam manufacturing sector, amount to USD 250,000.00, or the equivalent to 100% of the total amount received.

124. As shown, UNIDO disbursements in the RAC Manufacturing Sector, implementation and monitoring activities total USD 1,942,726.60, while outstanding financial obligations (hard commitments) account for 495,011.75 of the total amount received. Combined, disbursements and commitments amount to USD 2,437,738.35, or the equivalent of 53.03% of the total amount of the tranches received.

125. Aiming at ensuring the complete implementation of the remaining resources from the first and second tranches of UNIDO, an amendment in the implementation strategy is requested to the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol, according to the detailed information provided under Item III.1.2 from Section III.

126. In the RAC servicing sector, disbursements for the activities implemented by GIZ amount to USD 2,702,812 of the three tranches received for the sector, and total commitments amount to USD 1,647,189. Combined, disbursements and commitments in the RAC servicing sector amount to 100.00 % of the total amount of the tranches received.

127. Annex 2 presents detailed information on the approved resources for the activities in the RAC Servicing Sector.

**Table 14– Financial Report of the HPMP until the first half of July 2020 – Stage II.**

Component	Activities	Tranches	Disbursements (D)	% disbursement	Commitments (C)	Total (D +C)	% Implementation	Balance
<b>PU Manufacturing</b>	Industrial Conversion	<b>12,875,000.00</b>	6,011,680.34	<b>56.91z%</b>	5,124,302.47	<b>12,722,846.56</b>	<b>98.82%</b>	<b>152,153.44</b>
<b>Regulatory Actions</b>	Improvement of the HCFC control system		55,228.85		4,771.15			
<b>RAC Servicing</b>	Acquisition of components and equipment		564,969.44		35,030.56			
<b>Implementation and Monitoring</b>	Implementation		694,863.75		232,000.00			
<b>UNDP Sub-total</b>			<b>7,326,742.38</b>		<b>5,396,104.18</b>			
<b>PU Manufacturing</b>	Industrial Conversion	<b>250,000.00</b>	250,000.00	<b>100%</b>	0.00	<b>250,000.00</b>	<b>100%</b>	<b>250,000.00</b>
<b>Italy Sub-total</b>			250,000.00		0.00			
<b>RAC Manufacturing</b>	Subproject 1 (Technical Assistance)	<b>4,597,332.00</b>	360,827.50	<b>42.26%</b>	129,440.60	<b>2,437,738.35</b>	<b>53.03%</b>	<b>2,159,593.65</b>
	Subproject 2		215,479.04		193,041.91			
	Subproject 3		855,965.88		62,638.28			
	Local Project Management		416,294.94		48,154.64			
	AC Sector		94,159.30		61,736.32			
<b>UNIDO Sub-total</b>		<b>1,942,726.66</b>	<b>495,011.75</b>					
<b>RAC Servicing</b>	Training and Capacity Building (HCFC-22 Containment)	<b>4,350,001.00</b>	2,317,095.00	<b>62.13%</b>	1,418,338.00	<b>4,350,001.00</b>	<b>100%</b>	<b>0.00</b>
	Training and Capacity Building (Low-GWP Alternatives)		68,256.00		91,744.00			
	Outreach and Awareness Campaigns		248,274.00		110,364.00			
	Management, monitoring and evaluation		69,187.00		26,743.00			
<b>GIZ Sub-total</b>		<b>2,702,812.00</b>	<b>1,647,189.00</b>					
<b>Total</b>		<b>22,072,333.00</b>	<b>12,222,281.04</b>	<b>55.37%</b>	<b>7,538,304.93</b>	<b>19,760,585.97</b>	<b>89.53%</b>	<b>2,311,747.03</b>

128. In compliance with item 5(c) of the Agreement between the Government of the Federative Republic of Brazil and the Executive Committee of the Multilateral Fund for the reduction in consumption of Hydrochlorofluocarbons - HCFCs, Table 15 provides the time series of the financial disbursement levels under the HPMP for each tranche received until the first half of July 2020.

**Table 15 – Time series of financial disbursements for conversion projects until the first half of July 2020 by tranche received (2015-2023).**

Tranches	First tranche 2015		Second tranche 2017		Third tranche 2018		Fourth tranche 2020		Fifth tranche 2021		TOTAL	
	A	D	A	D	A	D	A	D	A	D	A	D
UNDP	3,078,900	3,038,798	2,627,704	1,950,042	7,168,396	2,337,902					12,875,000	7,326,742
Subtotal (%)	99%		74%		33%						57%	
ITALY	250,000	250,000									250,000	250,000
Subtotal (%)	100%										100%	
GERMANY	1,299,386	1,299,386	686,978	686,978	2,363,637	716,448					4,350,001	2,702,812
Subtotal (%)	100%		100%		30%						62%	
UNIDO	1,950,275	1,152,306			2,647,057	790,420					4,597,332	<b>1,942,727</b>
Subtotal (%)	59.08%				29.86%						42.26%	
<b>TOTAL</b>	<b>6,578,561</b>	<b>5,740,490</b>	<b>3,314,682</b>	<b>2,637,020</b>	<b>12,179,090</b>	<b>3,844,770</b>					<b>22,072,333</b>	<b>12,222,280</b>
<b>OVERALL TOTAL(%)</b>	<b>87%</b>		<b>80%</b>		<b>32%</b>						<b>55%</b>	

A– Approved  
D – Disbursed

**SECTION II.**  
**HCFC CONSUMPTION VERIFICATION REPORT**

**Attached to this Report**

## **SECTION III.**

### **ACTION PLAN**

#### **III.1 Stage II of the HPMP**

##### III.1.1 Manufacturing Sector of PU Foams

129. With the enforcement of the importation ban of HCFC-141b for the foam sector, a sharp movement in the sector towards implementing the industrial conversion process was expected before the stocks of HCFC-141b imported before the ban came to an end.

130. This scenario was highly impacted by the worsening of the sanitary crisis unleashed by the pandemic in the country. As a result, the sector has been facing a drastic reduction of commercial activities, and consequently, a new financial crisis.

131. Therefore, a strong deceleration in the conversion process of end users has been observed since March 2020.

132. Currently, the project relies on USD 5,124,302 as the committed amount to convert end users by means of the Long Term Agreements signed with eight System Houses, namely Amino, Ariston, Ecoblaster, Flexível, MCassab, Polyurethane, Purcom and Univar. UNDP, in cooperation with MMA, is in contact with the abovementioned enterprises with the goal of defining an emergency strategy which will enable the safe continuity of activities.

133. However, in view of the current scenario, the reality upon us is that the project activities will still be strongly impacted until the end of 2020, with a foreseeable recovery starting in 2021.

134. For the very reasons listed above, UNDP requests the amendment of the schedule of the last planned tranche, shifting from 2020 to 2021, to the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol.

**III.1.2. RAC Manufacturing Sector**

135. UNIDO received funds originated from the 1st and 3rd tranches of Stage II of the HPMP. In the report submitted for assessment in the 82nd ExCom Meeting in November 2018, the working plans for the refrigeration and air conditioner sector were presented for these resources, which have not been changed and will continue to be implemented with the remaining funds of these tranches.

136. Currently, the total amount of resources to be used in the implementation until disbursement of the next tranche earmarked for the RAC Sector Project is USD 2,654,605.40, corresponding to USD 797,968.52 from remaining funds of the 1st tranche, and USD 1,856,636.88 from the remaining funds of the 3rd tranche.

137. According to the Revised Agreement between Brazil and the ExCom (Decision 82/62), the fund tranche earmarked for the RAC Project in 2020 is USD 3,619,365.00. This amount is allocated to projects in the air conditioning sector.

138. Based on the scenario reported below, UNIDO is requesting ExCom to adjust the tranches, to meet the mentioned on item I.4.3 (d).

139. Until 2019, for the projects in the air conditioning sector, the activities which were implemented were related to information gathering, mobilization of technical support for the redesign and development of equipment, and activities for technology dissemination. In 2020, the disbursement/commitment, until now, has been allocated for the development of a market study. The current scenario of disbursements refers to the positive feedback from Elgin S.A. and Climazon, the first one, in a effective way. Therefore, there is the perspective of materializing a project with Elgin S.A., in 2021.

140. On a realistic approach, and subject to the approval by the ExCom of the alteration of the Elgin project, as requested in item I.4.3. (d), UNIDO requests to the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol to keep up with the tranche schedule, adjusted to the new value of the RAC Project, according to Table 16 below.

**Table 16 – Tranche schedule of the RAC Project - UNIDO**

Year of tranche request	Original tranche amount Approved in the 80th ExCom Meeting, in November 2017	Tranche amount Approved in the 82nd ExCom Meeting, in November 2018	Tranches adjusted to the revised value of the RAC Project
2015	1,950,275.00	1,950,275.00	1,950,275.00
2018	3,420,039.00	2,647,057.00	2,647,057.00

2019	0.00	0.00	0.00
2020	2,846,383.00	3,619,365.00	2,121,196.70
2021	2,000,000.00	2,000,000.00	2,000,000.00
2022	1,000,000.00	1,000,000.00	1,000,000.00
2023	0.00	0.00	0.00
Total amount for the RAC Project		11,216,697.00	9,718,528.70

141. Action Plan: The proposed Action Plan for the implementation of the remaining resources from the 3rd tranche of the Brazilian HPMP-Stage II, to the air conditioner sector, and the 4th tranche, is presented below:

**Tabela 17 – Actin Plan for Air conditioner projetcts.**

Sector	Type of project	Action Plan –2021/2022	Remaining resources from the 3rd tranche of HPMP - Stage II (US\$)	Resources from the 4th tranche of HPMP - stage II (US\$)
Air Conditioning	Individual Project	<ul style="list-style-type: none"> <li>• Activities for awareness, dissemination and information on the use of alternative refrigerants for the air conditioning sector;</li> <li>• Market study implementation;</li> <li>• Technical assistance activities for product redesign / modification;</li> <li>• TOR elaboration to study the needs for changes in the assembly lines and development of equipment projects;</li> <li>• Beginning of the execution of the assembly line conversion project in one company</li> </ul>	855,840.70	2,121,196.70
<b>Total Parcial</b>			2,977,037.40	



### III.1.3. RAC Servicing Sector

142. The Action Plan for the implementation of the 4th tranche is presented below. It is worth highlighting that the fourth tranche will be essential to enable the start of training activities for the safe use of CO<sub>2</sub> and HC in commercial refrigeration systems, including the acquisition of demonstration units and tool kits, considering that 86% of the remaining funds are committed to other contracts signed with the partner technical training institutions responsible for the training of 8,238 technicians in best practices to promote better HCFC-22 containment in commercial refrigeration and air conditioning systems, according to the commitments of the Project for the Servicing Sector presented in Table 14.

**Tabela 18 – Action plan for RAC Servicing Sector.**

Agency	Project	Action Plan 4th Tranche	4th Tranche Funds (USD)
GIZ	Training and Capacity Building (HCFC-22 Containment)	<ul style="list-style-type: none"> <li>N/A</li> </ul>	00.00
	Training and Capacity Building (Low-GWP Alternatives)	<ul style="list-style-type: none"> <li>Continuation of the development of teaching materials for training on the safe use of CO<sub>2</sub> and HC in commercial refrigeration systems (best practice handbooks, course agenda, evaluations, presentations, etc);</li> <li>Acquisition of demonstration units and tool kits (commercial refrigeration);</li> <li>Conduction of two Train the Trainer workshops for the training of multipliers for the training course on the safe use of CO<sub>2</sub> and HC in commercial refrigeration systems;</li> <li>Training of 300 refrigeration technicians on the safe use of CO<sub>2</sub> and HC in commercial refrigeration systems;</li> <li>Follow up and monitoring visits.</li> </ul>	700,000.00
	Outreach and Awareness Campaign	<ul style="list-style-type: none"> <li>Development of informative materials, technical publications and videos;</li> <li>Operation and maintenance of the website and fan page;</li> <li>Regional outreach of the activities and results of HPMP Stage II, with publications of articles in regional sector magazines, on the website and on the fan page of the Project;</li> <li>Participation in trade shows and events of the sector;</li> <li>Networking activities with other stakeholders;</li> </ul>	112,475.00

Agency	Project	Action Plan 4th Tranche	4th Tranche Funds (USD)
		<ul style="list-style-type: none"> <li>• Meeting with national stakeholders of the servicing sector at national and regional level;</li> </ul>	
	<p>Management, Monitoring and Evaluation</p>	<ul style="list-style-type: none"> <li>• Management and Monitoring;</li> <li>• Data processing;</li> <li>• Sampling.</li> <li>• Quality control;</li> <li>• Support in the review, discussion and development of technical standards for the servicing sector, with participation in monthly meetings of experts at the Brazilian Association of Technical Standards - ABNT.</li> <li>• Reports.</li> </ul>	<p>192,070.00</p>
<i>Total</i>			<b>1,004,545.00</b>

**SECTION IV.**

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

An amendment to the Agreement, regarding Stage II of the HPMP was made, pursuant to Document UNEP/OzL.Pro/ExCom/80/59, Annex XXI, Decision 80/64.

**ANNEX 1 – TABLE SHOWING THE PROGRESS REPORT OF THE ACTIVITIES OF THE RAC SERVICING SECTOR**

Agency	Project/component	Activities completed and description of the impact	Remaining activities to be implemented in the following year	Total budget for the next implementation period	Note
GIZ	Training and Capacity Building (HCFC-22 Containment)	<p>Contracting of national and international consultants;                      Market research on the country's training capacity and potential regional implementation partners;                      Educational material (presentations and handbooks on best practices) for training refrigeration technicians updated and published;                      Terms of Reference and selection criteria for regional partner institutions prepared;                      Tender carried out and fourteen training institutions selected and contracted;                      Technical visits to the selected regional training institutions carried out;                      Tools and components for demonstrations and practical training purposes (educational kits) were purchased and delivered to the selected regional training institutions;                      Agenda, training materials and list of consumables for training courses prepared;                      Nine "Train the Trainer" workshops conducted and 93 multipliers trained;                      3,894 technicians trained in best practices for split and window type air conditioning systems;</p>	<p>Training of 381 technicians in best practices for commercial refrigeration;                      Training of 2,000 technicians in best practices for split and window type air conditioning systems;                      Follow up and monitoring visits.</p>	1,418,338.00	

		<p>857 technicians trained in best commercial refrigeration practices; 17 monitoring visits carried out.</p> <p><b>Impact:</b> Trained and evaluated technicians confirmed having increased their knowledge of ozone depletion and the importance of leak containment and use of best practices during services. They also confirmed having learned how to use new tools and practices that help them in applying best practices in their daily activities.</p>			
GIZ	Training and Capacity Building (Low-GWP Alternatives)	<p>National and international consultants contracted; Training handbooks and presentations on the safe use of CO<sub>2</sub> and propane under development; Market research for technology, potential suppliers and potential implementation partners performed; Terms of Reference for the selection of two technical training institutions for the training project for the safe use of CO<sub>2</sub> and propane in commercial refrigeration systems performed; The tender process for the selection of technical schools for the training project for the safe use of CO<sub>2</sub> and propane in commercial refrigeration systems was published and two schools were selected (contracting in progress); The technical specifications for the acquisition of two mini-supermarkets, which will be installed in the two training institutions selected for the training of refrigeration technicians and mechanics on the safe design, installation, operation and maintenance of commercial refrigeration systems operating with natural refrigerants, namely CO<sub>2</sub> and propane, were prepared (tender publication planned for September).</p>	<p>Continuation of the development of teaching materials for training on the safe use of CO<sub>2</sub> and HC in commercial refrigeration systems (best practice handbooks, course agenda, evaluations, presentations, etc); Acquisition of demonstration units and tool kits (commercial refrigeration); Conduction of two Train the Trainer workshops for the training of multipliers for the training course on the safe use of CO<sub>2</sub> and HC in commercial refrigeration systems; Training of 300 refrigeration technicians on the safe use of CO<sub>2</sub> and HC in commercial refrigeration systems; Follow up and monitoring visits.</p>	791,744.00	
GIZ	Outreach and Awareness Campaign	<p>Sectoral communication plan elaborated; Operation of the project website (www.boaspraticasrefrigeracao.com.br);</p>	<p>Development of informative materials, technical publications and videos; Operation and maintenance of the website and fan page;</p>		

		<p>Operation of the Project fan page on Facebook (<a href="https://www.facebook.com/camadadeozonioerefrigeracaoelima?ref=bookmarks">https://www.facebook.com/camadadeozonioerefrigeracaoelima?ref=bookmarks</a>).</p> <p>Communication consulting contracted and regional dissemination of activities and outcomes of HPMP Stage II;</p> <p>Photos of the activities implemented published on Flickr: <a href="https://www.flickr.com/photos/147992141@N07/collections/72157690669896345/">https://www.flickr.com/photos/147992141@N07/collections/72157690669896345/</a>;</p> <p>Interviews with participants of the best practice training courses performed, and testimonials published and disseminated;</p> <p>3 meetings with national stakeholders in the servicing sector held;</p> <p>Three best practice guides (Leak Control, Sealed System Design, Planned Preventive Maintenance) distributed and printed, 200 copies of each publication;</p> <p>Poster on the “10 Golden Rules for Maintenance of RAC Systems” prepared, distributed and 200 copies printed;</p> <p>10,000 technical rulers for the quick conversion of pressure and temperature developed, produced and distributed;</p> <p>Development and distribution of stickers/seals for dissemination of best practices in RAC systems. 12,000 stickers printed;</p> <p>Educational video for leak reduction in the servicing sector produced (3 versions are available: original video with Portuguese audio, and two subtitled versions in English and Portuguese);</p> <p>Project folder developed, printed and distributed. 1,000 folders printed;</p> <p>Posters on the training and capacity building activities developed, printed and distributed. 100 posters printed;</p> <p>Card listing the specific gravity of refrigerants developed and distributed. 5,000 cards produced;</p>	<p>Regional outreach of the activities and results of HPMP Stage II, with publications of articles in regional sector magazines, on the website and on the fan page of the Project;</p> <p>Participation in trade shows and events of the sector;</p> <p>Networking activities with other stakeholders;</p> <p>Meeting with national stakeholders of the servicing sector at national and regional level;</p>	<p>222,839.00</p>	
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		<p>Video to raise the awareness of end users towards contracting the appropriate services for air conditioning systems produced (three versions are available: original video with Portuguese audio, and two subtitled versions in English and Portuguese);</p> <p>Video for dissemination of best practices in the commercial refrigeration sector produced (three versions are available: original video with Portuguese audio, and two subtitled versions in English and Portuguese);</p> <p>Two videos of the series “Capacity Building in Focus”, whose purpose is depicting the life and work of refrigeration professionals who disseminate best practices and new technologies in the sector for the protection of the environment, were produced (Trainers Jossineide Oliveira e Silva and Willian Ramon Grassiotti);</p> <p>Five videos of the series “Best Practices in Minutes” were produced (it is a series of educational videos bringing together technology and audiovisual communication to disseminate knowledge to technicians of the refrigeration and air conditioning sector throughout Brazil, promoting best practices to enhance environment protection);</p> <p>Participation in trade shows, events, seminars, etc., of the sector and partners (e.g., two workshops and seminars held by the Project for the RAC Manufacturing Sector), FEBRAVA, AVAC-R Sector Women’s Meeting);</p> <p>Support to the awareness campaign for Ozone Layer Protection in the metro stations in the city of Belo Horizonte;</p> <p>Technical assistance provided to users of the online logbook “Pro-Ozonio”, and improvement of the app developed under HPMP Stage I, continued;</p> <p>5 coordination meetings held.</p>			
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		<p><b>Impact:</b> 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. Materials are being used and disseminated by industry associations and professional technical training institutions. Supermarkets, in particular, have contacted the Project seeking additional information on alternative refrigerants with low environmental impact as well as on refrigerant containment practices.</p>			
GIZ	Management, Monitoring and Evaluation	<p>Administration;  Management and Monitoring;  Data processing;  Quality control;  Reports;  Support in the review and development of four technical standards for the servicing sector, with participation in monthly meetings of experts at the Brazilian Association of Technical Standards - ABNT.</p>	<p>Operation of the management and monitoring unit;  Data processing;  Sampling.  Quality control;  Support in the review, discussion and development of technical standards for the servicing sector, with participation in monthly meetings of experts at the Brazilian Association of Technical Standards - ABNT.  Reports.</p>	218,813.00	
		<b>Total</b>		<b>2,651,734.00</b>	