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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Ninety-third Meeting
Montreal, 15-19 December 2023
Item 9(d) of the provisional agenda¹

PROJECT PROPOSALS: MEXICO

This document consists of the comments and recommendation of the Secretariat on the following project proposals:

Phase-down

- Kigali HFC implementation plan (stage I, first tranche) UNIDO, UNDP
and UNEP

Energy efficiency

Energy-efficiency strategy for the Kigali HFC implementation plan UNIDO

* Re-issued for technical reasons on 20 June 2024.

¹ UNEP/OzL.Pro/ExCom/93/1

PROJECT EVALUATION SHEET – MULTI-YEAR PROJECTS

Mexico

(I) PROJECT TITLE	AGENCY
Kigali HFC implementation plan (stage I)	UNIDO (lead), UNDP and UNEP

(II) LATEST ARTICLE 7 DATA (Annex F)	Year: 2022	48,447.66 mt	95,644,142 CO ₂ -eq tonnes
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(III) LATEST COUNTRY PROGRAMME SECTORAL DATA (CO ₂ -eq tonnes)							Year: 2022	
Chemical	Aerosol	Foam	Fire-fighting	AC and refrigeration			Other	Total sector consumption
				Manufacturing		Servicing		
				Other	AC			
HFC-23						25,163		25,163
HFC-32						1,314,488		1,314,488
HFC-125			2,990,096					2,990,096
HFC-134a	967,269	9,211		4,308,362	828,328	7,026,291		13,139,463
HFC-143a				809,428	1,618,811	2,967,857		5,396,095
HFC-152a	701,934							701,934
HFC-227ea			138,817					138,817
HFC-245fa		252,021						252,021
HFC-365mfc		219,001						219,001
R-404A				8,343,168		15,629,424		23,972,592
R-407C					621,435			621,435
R-410A					19,491,927	23,960,367		43,452,294
R-507A						3,308,200		3,308,200
CustMix-134		201,708						201,708
Others*		288,415	233,742	27,144	4,436	602,658	6,561	1,162,657

* HFC-236fa, HFC-43-10mee, R-407A, R-407F, R-417A, R-422A, R-422D, R-427A, R-434A, R-437A, R-438A, R-442A, R-448A, R-449A, R-449C, R-452A, R-453A, R-454A, R-454B, R-454C, R-507A, R-508B, R-513A, R-516A, and other blends (CustMix-111, CustMix-134, CustMix-166, CustMix-174 and CustMix-261).

(IV) AVERAGE 2020-2022 HFC CONSUMPTION IN SERVICING	16,763.50 mt	36,289,719 CO ₂ -eq tonnes
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(V) CONSUMPTION DATA (CO ₂ -eq tonnes)			
Baseline: average 2020-2022 HFC consumption plus 65% of HCFC baseline	76,982,664	Starting point for sustained aggregate reductions	TBD
CONSUMPTION ELIGIBLE FOR FUNDING			
Already approved	0	Remaining	TBD

(VI) ENDORSED BUSINESS PLAN		2023	2024	2025	Total
UNIDO	HFC phase-down (CO ₂ -eq tonnes)	0	0	0	0
	Funding (US \$)	2,190,362	0	0	2,190,362
UNDP	HFC phase-down (CO ₂ -eq tonnes)	0	0	0	0
	Funding (US \$)	6,605,130	0	0	6,605,130
UNEP	HFC phase-down (CO ₂ -eq tonnes)	0	0	0	0
	Funding (US \$)	56,500	0	0	56,500

(VII) PROJECT DATA			2023	2024	2025* - 2026	2027* - 2028	2029	Total
Consumption (CO ₂ -eq tonnes)	Montreal Protocol limits		n/a		76,982,664		69,284,397	n/a
	Maximum allowable		n/a		76,982,664		69,284,397	n/a
Amounts requested in principle (US \$)	UNIDO	Project costs	5,085,390	0	3,789,551	3,692,764	1,593,351	14,161,056
		Support costs	355,977	0	265,269	258,493	111,535	991,274
	UNDP	Project costs	1,433,738	0	2,053,265	1,206,050	63,541	4,756,594
		Support costs	100,362	0	143,729	84,424	4,448	332,962
	UNEP	Project costs	227,795	0	227,795	233,091	26,476	715,157
		Support costs	28,243	0	28,242	28,899	3,283	88,667
Amounts recommended in principle (US \$)	Total project costs		6,746,923	0	6,070,611	5,131,905	1,683,368	19,632,807
	Total support costs		484,582	0	437,240	371,816	119,265	1,412,903
	Total funds		7,231,505	0	6,507,851	5,503,721	1,802,633	21,045,710

*Year when the tranche is programmed

(VIII) Request for approval of funding for the first tranche (2023)		
Implementing agency	Funds recommended (US \$)	Support costs (US \$)
UNIDO	5,085,390	355,977
UNDP	1,433,738	100,362
UNEP	227,795	28,243
Total	6,746,923	484,582

Secretariat's recommendation:	Individual consideration
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PROJECT DESCRIPTION

1. On behalf of the Government of Mexico, UNIDO as the lead implementing agency has submitted a request for stage I of the Kigali HFC implementation plan (KIP), at a total cost of US \$21,726,824, consisting of US \$14,358,693, plus agency support costs of US \$1,005,109, for UNIDO, US \$4,867,500, plus agency support costs of US \$340,725, for UNDP and US \$1,031,349, plus agency support costs of US \$123,448, for UNEP, as originally submitted.²
2. The implementation of stage I of the KIP will assist the Government of Mexico in meeting the target of 10 per cent reduction from its HFC baseline consumption by 1 January 2029.
3. The first tranche of stage I of the KIP being requested at this meeting amounts to US \$9,090,220, consisting of US \$4,731,283, plus agency support costs of US \$331,190, for UNIDO, US \$3,404,500, plus agency support costs of US \$238,315, for UNDP and US \$343,783, plus agency support costs of US \$41,149, for UNEP, as originally submitted, for the period of January 2024 to December 2025.

Background

4. The Government of Mexico has ratified all amendments to the Montreal Protocol, including the Kigali Amendment on 25 September 2018. Mexico has an HCFC consumption baseline of 1,148.8 ODP tonnes or 14,799 metric tonnes (mt) and is set to completely phase out consumption of HCFCs by 1 January 2030.

Status of implementation of the HCFC phase-out management plan

5. Stage I of the HCFC phase-out management plan (HPMP) for Mexico was originally approved at the 64th meeting of the Executive Committee,³ and later revised at the 73rd and 79th meetings,⁴ to meet the 35 per cent reduction from the baseline by 2018, resulting in the phase-out of 428.2 ODP tonnes of HCFCs, at a total cost of US \$18,066,211, plus agency support costs.
6. Stage II of the HPMP for Mexico was originally approved at the 73rd meeting⁵ and later revised at the 77th, 79th, and 90th meetings,⁶ to reduce HCFC consumption by 67.5 per cent from the baseline by 2022, at a total cost of US \$11,087,772, plus agency support costs. Stage II of the HPMP will be completed by 31 December 2024, as stipulated in the Agreement between the Government of Mexico and the Executive Committee.

Status of implementation of HFC-related activities

7. As of today, the Executive Committee has approved projects and activities for US \$8.45 million value to assist Mexico in undertaking HFC-related activities in the context of the Kigali Amendment, as shown in table 1. These activities have assisted the Government *inter alia* in defining the road map to the implementation of the Kigali Amendment; modifying the legal framework to implement an HFC licensing and quota system from 2024; surveying HFC consumption, its sectoral distribution, and the needs of the consuming sectors; analyzing relevant national initiatives, policies, regulations, and standards associated with maintaining and/or enhancing energy efficiency; assisting enterprises in replacing the use of HFCs by technologies with low global-warming potential (GWP) in the domestic and commercial refrigeration manufacturing sectors; and complying with the HFC-23 by-product control obligations.

² As per the letter of 24 August 2023 from the Ministry of Environment and Natural Resources of Mexico to UNIDO.

³ Decision 64/45

⁴ Annex XIII of UNEP/OzL.Pro/ExCom/73/62 and decision 79/38.

⁵ Decision 73/58

⁶ Decisions 77/52, 79/38, and 90/46.

Table 1. Activities approved for Mexico in the context of the Kigali Amendment

Approval meeting	Project	Implementing agency	Cost (US \$)	Date of completion
74 th	Survey of ODS alternatives	UNIDO	90,000	Apr-2017
80 th	Preparation of a conversion project of commercial refrigeration manufacturing from HFC-134a and R-404A to R-600a and R-290 at Imbera	UNIDO	30,000	Dec-2018
80 th	Enabling activities for HFC phase-down	UNIDO/UNEP	250,000	Dec-2021
81 st	Conversion of commercial refrigeration manufacturing from HFC-134a and R-404A to R-600a and R-290 at Imbera	UNIDO	1,018,123	Dec-2021
81 st	Conversion of domestic refrigeration and compressor manufacturing from HFC-134a to R-600a at Mabe	UNDP/Canada	2,700,000	Nov-2020
83 rd	Project preparation for the control of HFC-23 by-product emissions in the HCFC production sector	UNIDO	55,000	Oct-2020
86 th	Project to control and phase out HFC-23 by-product emissions at Quimobásicos (approval in principle, second tranche approved at the 92 nd meeting)	UNIDO	3,833,384	Jan-2031
87 th	Preparation of the KIP	UNIDO/ UNEP/UNDP	230,000	Aug-2023
90 th	Preparation of HFC investment projects in the foam sector	UNDP	80,000	Aug-2023
90 th	Preparation of an HFC investment project in commercial refrigeration manufacturing at Friocima	UNDP	30,000	Jun-2024
91 st	Conversion from HFC-134a to R-290 in the manufacturing of commercial refrigerators at Friocima	UNDP	136,500	Dec-2024
Total			8,453,007	

Stage I of the Kigali HFC implementation plan

Policy, regulatory and institutional frameworks

8. The Secretariat of the Environment and Natural Resources (SEMARNAT) is the body responsible for formulating and conducting national policies on climate change and ozone-layer protection. SEMARNAT's General Directorate of Industry, Clean Energies and Air Quality Management (DGIELGCA) implements the actions and applicable regulations on ozone-layer protection, including allocating import quotas for substances controlled under the Montreal Protocol. The DGIELGCA is supported by the national ozone unit (NOU), which manages the implementation of activities, facilitates information sharing, and collects and verifies data related to the Montreal Protocol in Mexico.

9. Other relevant institutions include the National Customs Agency, in charge of the management, organization and operation of the customs and inspection services; the General Directorate of Integral Management of Hazardous Materials and Activities, responsible for hazardous waste management and import/export authorization; the National Commission for the Efficient Use of Energy, an administrative body of the Ministry of Energy in charge of promoting energy efficiency and its sustainable use; and the Ministry of the Economy, responsible *inter alia* for formulating and conducting policies regarding industry, foreign and domestic trade, and import/export restrictions, issuing national standards on energy efficiency, and promoting energy-efficiency programmes.

10. Mexico has a well-established import and export licensing system for substances controlled under the Montreal Protocol. Adjustments made to the country's legal framework to accommodate the requirements of the Kigali Amendment include the publication of the General Import and Export Tax Law in June 2022, which introduced 22 specific customs tariffs for HFCs pure or in blends, to ensure their correct classification and control. Since July 2022, SEMARNAT has been authorized to assign import quotas for HFCs, which will start to be applied on 1 January 2024. In December 2022, 13 additional

customs tariffs for HFCs and generic blends were issued, and in the coming months, nine further customs tariffs for HFC blends will be incorporated.

HFC consumption

11. HFCs are not produced in the country but are imported in significant volumes for use mostly in the refrigeration servicing sector (57 per cent in CO₂-equivalent (CO₂-eq) tonnes); the manufacturing of refrigeration and air-conditioning (RAC) equipment including mobile air-conditioning (MAC), aerosols, and foam products; as solvents; and for firefighting purposes. In 2022, the predominantly consumed substances were: R-410A, accounting for 45.4 per cent of total HFC consumption in CO₂-eq tonnes, R-404A (25.1 per cent), and HFC-134a (13.7 per cent), followed by other HFCs (15.8 per cent). Table 2 presents HFC consumption figures as reported under Article 7 to the Ozone Secretariat.

Table 2. HFC consumption in Mexico (2019–2022 Article 7 data)

HFC	GWP	2019	2020	2021	2022	Share of HFC consumption in 2022 (%)
mt						
HFC-32	675	0.24	6.77	221.42	1,947.39	4.0
HFC-125	3500	43.05	22.54	535.48	854.31	1.8
HFC-134a	1430	7,758.75	6,889.56	7,208.21	9,188.44	19.0
HFC-143a	4470	0.00	0.00	0.00	1,207.18	2.5
HFC-152a	124	2,710.90	3,350.36	4,053.50	5,660.76	11.7
HFC-227ea	3220	61.20	47.84	27.44	43.11	0.1
HFC-245fa	1030	3,019.61	99.34	155.09	244.68	0.5
HFC-365mfc	794	115.20	192.00	240.00	275.82	0.6
HFC-23	14800	1.10	0.25	2.68	-78.87	-0.2
R-404A	3921.6	1,717.18	1,629.57	2,019.90	6,112.96	12.6
R-407C	1773.85	163.52	147.14	170.50	350.33	0.7
R-410A	2087.5	12,420.47	13,942.86	11,592.27	20,815.48	43.0
R-507A	3985	426.74	252.69	316.94	830.16	1.7
HFC-365mfc/ HFC-227ea	963.82	537.60	164.64	233.76	209.28	0.4
Others*		73.91	388.08	534.07	786.63	1.6
Total (mt)		29,049.47	27,133.64	27,311.25	48,447.66	100
CO₂-eq tonnes						
HFC-32	675	162	4,570	149,459	1,314,488	1.4
HFC-125	3500	150,675	78,890	1,874,180	2,990,096	3.1
HFC-134a	1430	11,095,012	9,852,072	10,307,739	13,139,463	13.7
HFC-143a	4470	0	0	0	5,396,095	5.6
HFC-152a	124	336,152	415,445	502,634	701,934	0.7
HFC-227ea	3220	197,064	154,045	88,357	138,817	0.1
HFC-245fa	1030	3,110,198	102,320	159,743	252,021	0.3
HFC-365mfc	794	91,469	152,448	190,560	219,001	0.2
HFC-23	14800	16,280	3,700	39,605	-1,167,276	-1.2
R-404A	3921.6	6,734,093	6,390,522	7,921,240	23,972,592	25.1
R-407C	1773.85	290,060	261,004	302,441	621,435	0.6
R-410A	2087.5	25,927,731	29,105,720	24,198,864	43,452,308	45.4
R-507A	3985	1,700,559	1,006,970	1,263,006	3,308,200	3.5
HFC-365mfc/ HFC-227ea	963.82	518,150	158,683	225,303	201,708	0.2
Others*	-	95,599	524,645	771,326	1,103,260	1.2
Total (CO₂-eq tonnes)		50,263,203	48,211,034	47,994,455	95,644,142	100

* Including HFC-236fa, HFC-43-10mee, R-407A, R-407F, R-417A, R-422A, R-422D, R-427A, R-434A, R-437A, R-438A, R-442A, R-448A, R-449A, R-449C, R-452A, R-453A, R-454A, R-454B, R-454C, R-507A, R-508B, R-513A, R-516A, and other blends (CustMix-111, CustMix-134, CustMix-166, CustMix-174 and CustMix-261).

12. The overall HFC consumption over the last five years has grown across all sectors. In 2020–2021, a reduction of around 4 per cent from the 2019 levels was observed, primarily due to the impact of the COVID-19 pandemic.

13. In 2022, HFC consumption rapidly increased to 95.64 million CO₂-eq tonnes, doubling the consumption from the previous two years. This is explained by unprecedented imports by two foreign importers recently established in Mexico, (28.2 per cent and 7.6 per cent, respectively), and increased imports by an already established importer (28.2 per cent, or twice the 2021 imports). Other reasons for the 2022 increase in HFC consumption include the growing demand among end users, expectations in the quota allocation process, and the approaching entry into force of the country's Kigali Amendment commitments.

14. The largest increase in consumption in 2022 was for R-410A, R-404A and HFC-143a, whose use grew from a total of 32.12 million to 72.82 million CO₂-eq tonnes. Relative to other HFCs, growth in the consumption of HFC-134a has been slower due to its replacement by HFO-1234yf in the MAC systems installed in vehicles produced for export, and to conversions to R-600a and R-290a in the manufacturing of domestic and stand-alone commercial refrigerators.

Country programme implementation report

15. The Government of Mexico reported HFC sector consumption data in the 2022 country programme implementation report that is consistent with the data reported under Article 7 of the Montreal Protocol.

HFC distribution by sector

16. In 2022, the highest HFC consumption was noted in the servicing sector (50.5 per cent of total HFC consumption in the country in mt and 57.2 per cent in CO₂-eq tonnes), followed by the manufacturing of air-conditioning (AC) (21.2 per cent in mt and 22.7 per cent in CO₂-eq tonnes), commercial refrigeration (5.1 per cent in mt and 9.7 per cent in CO₂-eq tonnes) and MAC (5.0 per cent in mt and 3.6 per cent in CO₂-eq tonnes), firefighting (1.9 per cent in mt and 3.5 per cent in CO₂-eq tonnes), and the manufacturing of aerosols (13.1 per cent in mt and 1.7 per cent in CO₂-eq tonnes), foams (2.3 per cent in mt and 1.0 per cent in CO₂-eq tonnes), and domestic refrigeration (0.7 per cent in mt and 0.7 per cent in CO₂-eq tonnes), as shown in table 3. A detailed table with HFC consumption per substance and sector based on Article 7 data is provided in annex I to the present document.

Table 3. Estimated sectoral distribution of HFC consumption in Mexico (2022)

Sector	Consumption				Most commonly consumed HFCs
	mt	Share (%)	CO ₂ -eq tonnes	Share (%)	
Manufacturing					
AC	10,281	21.2	21,943,545	22.7	R-410A, R-407C, HFC-134a, HFC-143a
Commercial refrigeration	2,497	5.1	9,393,314	9.7	R-404A, HFC-134a, R-507A
MAC	2,404	5.0	3,438,006	3.6	HFC-134a
Domestic refrigeration	459	0.9	656,973	0.7	HFC-134a
Foam	1,123	2.3	970,357	1.0	HFC-245fa, HFC-365mfc, HFC-134a
Aerosols	6,337	13.1	1,669,201	1.7	HFC-152a, HFC-134a
Firefighting	921	1.9	3,362,658	3.5	HFC-125, HFC-227ea, HFC-236fa
Solvent	4	0.0	6,346	0.0	HFC-43-10mee
Total for manufacturing	24,027	49.5	41,440,400	42.8	

Sector	Consumption				Most commonly consumed HFCs
	mt	Share (%)	CO ₂ -eq tonnes	Share (%)	
Servicing	24,501	50.5	55,396,322	57.2	R-410A, HFC-134a, R-404A, R-507A, R-407C, others
Total for all sectors	48,528	100	96,836,722	100	

Manufacturing sectors

17. Mexico's manufacturing sector is heavily export-oriented, positioning the country as the second largest refrigerator exporter in the world, fourth largest exporter of AC devices, and fifth exporter of automobiles and light vehicles worldwide. The main exporting markets are the United States of America, Canada, the European Union, and countries in the Latin America region.

18. As a result, the country's demand for HFCs remains substantial. The absence of domestic HFC production leads to reliance on imports, primarily from China, the United States of America, and the European Union.

19. In 2022, there were 441 small and medium-sized enterprises (SMEs) and 89 large enterprises (with over 101 employees), many of them transnational, registered in the country's RAC manufacturing sector.

Domestic refrigeration manufacturing

20. In 2022, 2.4 million domestic refrigerators were sold in Mexico, in addition to the 31.4 million units in operation. It is expected that 4.4 million households without a refrigerator will gain access to one in the coming years. In addition to national production, important quantities of equipment are destined for export. Out of the nine domestic refrigeration manufacturers identified in the country, eight are owned by transnational capital;⁷ the only locally-owned manufacturing enterprise, Mabe Mexico, has replaced HFC-134a with R-600a in its production process.

Residential air-conditioning manufacturing

21. A total of 1.8 million AC units were sold locally in 2022, in addition to the 8.1 million units in operation and significant quantities destined for export. There are still an estimated 38.3 million people in the country who require but do not own an AC unit. Out of the 12 enterprises manufacturing unitary air conditioners in Mexico, 11 are owned by transnational capital,⁸ and one (Clima Flex) by combined Mexican and transnational capital.

Commercial refrigeration and air-conditioning manufacturing

22. In 2022, there were an estimated 6.5 million refrigeration units and 4.7 million AC units installed nationwide for commercial use; over 2.3 million commercial RAC units were sold. Most of the commercial refrigeration units used in Mexico are self-contained vertical cabinets, refrigerated display cabinets, freezers, remote condensers for cold rooms, and large-capacity centralized systems in supermarkets, while most commercial AC equipment consists of window-type and mini-split units used in commerce and service buildings, followed by rooftop package-type and multi-split AC units, high-capacity chillers, and medium- and large-sized ducted split AC appliances.

23. Commerce and service buildings are the largest HFC consumers in the sector, both for refrigeration and large and medium-sized AC installations. There are 967,000 commercial establishments with at least

⁷ Daewoo, Electrolux, LG, Panasonic, Samsung, Whirlpool Celaya, Whirlpool Apodaca and Whirlpool Ramos Arizpe.

⁸ Carrier, Daikin, Friedrich, Johnson Controls Monterrey, Johnson Controls Durango, Lennox, Mitsubishi, Nortek and Rheem Nuevo Laredo, Rheem Mexicali and Trane.

one RAC installation; of these, 63,953 are considered large-sized. In addition, there are more than 584,000 service buildings, of which 18,701 are considered large-sized; these buildings mostly use AC systems, and refrigeration for cold rooms in restaurants.

24. Commercial refrigeration manufacturing uses mostly R-404A and HFC-134a, with alternatives such as R-290 being used in self-contained commercial refrigeration units with charges of up to 150 g, and some HFC/HFO blends (mainly R-449A) locally available for medium-sized commercial refrigeration appliances including condensing units. R-449A and carbon dioxide (CO₂) are being considered as alternative options in large centralized refrigeration systems and self-contained refrigerators with charges greater than 150 g, such as large showcases or open display cabinets; the use of R-290 in the manufacture of condensing units and centralized systems is also viable but there is no experience with it.

25. AC manufacturing uses R-410A and R-407C for split, packaged, ducted and variant refrigerant flow (VRF), and HFC-134a is commonly used in chillers. Alternatives include R-290 (not widely accessible yet) and low-GWP transitional HFCs such as HFC-32, R-449C, the R-452B series, and R-454B. There are three supermarkets in the country using trans-critical CO₂-based AC systems, which so far does not look profitable.

26. The transition to HFC refrigerants in the commercial AC manufacturing sector is ongoing, with most medium-term alternatives to R-410A and HFC-134a being locally available. It is expected that due to the Kigali Amendment commitments, R-410A-based equipment exports to non-Article-5 countries will decrease, making AC manufacturers turn to alternatives.

Mobile air-conditioning manufacturing

27. Fourteen enterprises with 22 plants dedicated to the manufacture of light vehicles, including compact and sub-compact automobiles, pickups, sport utility vehicles, luxury cars and minivans, make up 95 per cent of the country's automotive sector; only one of these manufacturers (Dina Camiones, S.A. de C.V.) is locally owned. Large vehicles are manufactured by five enterprises representing 5 per cent of the automotive sector.

28. The installation of MAC equipment is required for all new vehicles, with specific refrigerant charges imposed by car manufacturers. The main refrigerant used in the sector over the last decade was HFC-134a, currently replaced in most production lines by HFO-1234yf, with some HFC consumption remaining in the manufacture of light vans and large vehicles.

Foam manufacturing

29. Polyurethane (PU) foam is manufactured for insulation in domestic and commercial refrigeration, construction and cold chain, and for footwear, automotive industry, furniture and comfort. Mexico's systems houses have phased out the use of ODSs as blowing agents and transitioned to low-GWP alternatives (i.e., hydrocarbons (HCs), methyl formate, methylal, and HFO) with assistance from the Multilateral Fund, while other parts of the market (i.e., non-assisted enterprises) had already been using or transitioning to HFCs. Out of the seven systems houses in Mexico (three local and four with non-Article-5 ownership), five (two of them local) are still consuming HFCs.

30. Extruded polystyrene (XPS) foam serves mostly in the manufacture of rigid panels for thermal insulation of a variety of buildings, including *inter alia* service and industrial buildings, warehouses, and farms.

31. In 2022, the foam sector consumed about 1,123 mt (970,357 CO₂-eq tonnes) of HFCs, accounting for 2.3 per cent of total HFC consumption and 1.0 per cent of emissions from HFC consumption in the country. The main HFCs used in PU foam manufacturing are HFC-245fa (245 mt), HFC-365mfc (276 mt),

and HFC-365mfc/227ea (209 mt), while the blowing agent used in XPS foam manufacturing is Formacel Z6 (386 mt). Commercial alternatives to HFCs used in foam production that are locally available include HCs and HFOs, noting that the safety requirements for HC use and the current price point for HFOs impede wider adoption.

Refrigeration and air-conditioning servicing sector

Technicians profile

32. There are approximately 97,750 servicing technicians in Mexico, 95,000 of whom work in the domestic and commercial RAC subsectors. Women account for 3 per cent of all sector employees, mostly in the capacity of enterprise owners, managers, or coordinators; there are very few female RAC technicians.

33. Mexico's technicians can be classified into two segments: a large group working in small workshops, not formally trained or certified, and servicing a variety of appliances across all subsectors; and a much smaller group of trained technicians, often professionally affiliated, working for equipment manufacturers and distributors who offer servicing for new devices, mainly during the first years of use.

34. About half of servicing needs are covered by individual contractors, 45 per cent by servicing workshops, and 3 per cent by end users. In terms of formal instruction, 57 per cent of all technicians have completed at least one technical training, with less than 2 per cent trained specifically on refrigerants.

35. In terms of technical capacity, about a third of all technicians have complete servicing tool sets at their disposal, a quarter declare working with HCs, often without the required equipment, and only one in 10 technicians is estimated to be fully equipped to handle HFCs. The vast majority release refrigerant into the environment and use recovered refrigerant to pressurize, sweep, and test systems for leaks; very few technicians employ good practices for refrigerant disposal and recovery.

Training and certification

36. There are 18 training institutes for refrigeration technicians in the country, eight of them participating in the HPMP and intending to continue providing dedicated training under the KIP. The National Council for the Standardization and Certification of Labour Skills, operating under the Ministry of Public Education, is responsible for developing and managing the technical competency and training standards. Currently, out of the five national standards adopted for the RAC sector,⁹ three regulate the training and certification of personnel performing the installation, operation, maintenance and start-up of AC equipment. Certification in the handling of low- or zero-GWP refrigerants such as CO₂ and HCs, used in medium- and large-sized appliances, has not yet been considered.

Refrigerant recovery, recycling and reclaiming

37. Currently, there are seven refrigerant recovery, recycling and reclaiming (RRR) centres and 24 collection and scrapping centres in Mexico. Out of the seven RRR centres in operation, two are being strengthened under the HPMP. Three centres receive commercial refrigerators for scrapping and recycling, one (Quimobásicos) destroys refrigerants, and two are currently considering relocation due to being only partly operational.

⁹ Competency standard EC0850 (Installation and maintenance of RAC systems), EC0443 (Installation and maintenance of commercial AC and refrigeration systems), EC0506 (Provision of installation and maintenance services for refrigeration systems up to 25 tonnes of refrigerant), EC1389 (Provision of preventive and corrective services to self-contained refrigeration equipment with maximum allowable charge of up to 150 g of HC refrigerant), and EC0412 (Energy-efficiency management in organizations).

38. Most of Mexico's RRR facilities are equipped with portable recovery machines and stationary reclaim units, which can be used for a limited number of gases. The main refrigerants that are recovered and handled at RRR centres are HCFC-22, HFC-134a, R-404A, R-410A, and R-507; most reclaim units cannot identify other blends or transitional HFCs such as HFC-32. There are also several regions with widespread use of RAC equipment that do not have a RRR centre.

Mobile air-conditioning servicing and refrigerated transport

39. MAC technicians also fall into two categories: a trained minority, for the most part employed by car dealers to service new cars during the first years of use, and the majority of informal technicians operating in small workshops, with either scarce or no formal training. Seven per cent of all MAC servicing employees are women, who work mainly as owners, managers, and coordinators.

40. Over 90 per cent of MAC technicians are not trained; over a half of them dispose of complete tool sets for MAC servicing; and about 20 per cent are fully equipped in terms of refrigerant management. Nearly half of the technicians release refrigerants into the environment, and only under 5 per cent recover and properly dispose of refrigerants using the RRR facilities.

41. Despite the transition from HFC-134 to HFO-1234yf that has taken place in the MAC manufacturing sector, a large existing fleet of vehicles using HFCs will continue to require servicing in the foreseeable future, demanding technical skills and equipment suitable for handling both types of refrigerant from servicing technicians.

Local installation and assembly subsector

42. There are different types of technicians and enterprises undertaking the assembly and installation of RAC systems in Mexico. Mini-split AC units are installed by electro-plumbers, masons, or electro-architects with soldering skills. Medium and large-sized RAC applications charged on site are habitually installed by independent enterprises, certified by manufacturers and specializing in either AC or commercial refrigeration equipment (condensing units and centralized systems). VRF AC systems, also charged on site, require specialized contractors. Other large systems, such as rooftop-package AC equipment and chilled water chillers for AC, are pre-charged by the manufacturer but still require an assembly enterprise to install them. Stage I of the KIP lists 18 enterprises, noting that there are many more that work on the installation and assembly of RAC systems in Mexico.

Other sectors (aerosol, firefighting)

43. In 2022, 1.7 per cent of total HFC consumption in the country was in the aerosol sector, which comprises both foreign and locally-owned enterprises consuming primarily HFC-152a used as a propellant in the manufacturing of several household aerosols, and HFC-134a used by several laboratories in the manufacturing of metered-dose inhalers (MDIs). The use of HFCs is essential in the health sector, so this consumption is not considered for phase-down during stage I of the KIP.

44. Around 3.5 per cent of the country's 2022 HFC consumption was in the firefighting subsector. HFC-125, HFC-236fa and HFC-227ea are the main substances used in portable fire extinguishers and pressure fire-suppression systems. This sector is not addressed in stage I of the KIP.

Phase-down strategy for stage I of the Kigali HFC implementation plan

Overarching strategy

45. The Government of Mexico is proposing four stages for the KIP. Stage I is to be implemented simultaneously with the HPMP until 2029. Stages II and III are expected to last six years each (2030–2035 and 2035–2040), while stage IV is planned for a period of five years, from 2041 until 2045.

HFC baseline and proposed reductions

46. The Government of Mexico reported its Article 7 data for 2020–2022. By adding 65 per cent of the country's HCFC baseline in CO₂-eq tonnes to its average HFC consumption in 2020–2022, the HFC baseline has been established at 76,982,664 CO₂-eq tonnes, as shown in table 4.

Table 4. HFC baseline for Mexico (CO₂-eq tonnes)

Baseline calculation	2020	2021	2022
HFC annual consumption	48,211,034	47,994,455	95,644,142
HFC average consumption in 2020–2022	63,949,877		
HCFC baseline (65%)	13,032,787		
Established HFC baseline	76,982,664		

47. Because of the export orientation of the RAC manufacturing sector in Mexico, HFC restrictions existing in non-Article-5 importing countries may help generate a shift to alternatives. On the other hand, a possible increase in HFC consumption is also expected due to nearshoring and a predicted increase in the RAC and MAC manufacturing capacity. The Government of Mexico and UNIDO have projected an estimated HFC consumption of 102.9 and 114.10 CO₂-eq tonnes in 2024 and 2029, respectively, in a business-as-usual scenario based on an annual average growth rate of 1.7 per cent in the 2023–2029 period. Noting that HFC consumption in 2022 was already 24 per cent above the baseline level, immediate action is needed to ensure compliance in 2024.

48. Stage I of the KIP proposes to reduce HFC consumption in the country by 10 per cent by 2029. This will require an effective application of the HFC import quota from 1 January 2024 onwards to ensure compliance with the freeze, followed by activities in prioritized sectors as described below.

Proposed activities

49. The national strategy for HFC phase-down prioritizes sectors with significant consumption measured in CO₂-eq tonnes, where commercially available low-GWP alternatives exist, and where an impact on HFC reductions can be achieved in a cost-effective manner. Accordingly, the following sectors and activities have been prioritized in stage I: servicing (including training, certification and provision of equipment for RAC and MAC technicians and the strengthening of the RRR network); commercial refrigeration and residential and commercial AC including local installation and assembly (technical assistance and tools for enterprises and demonstration projects for end users); and the PU foam sector (conversion of the entire sector).

50. In addition, stage I will include crosscutting activities to ensure compliance with the consumption targets and support the overall implementation of stage I, including policy and regulatory instruments (operation of a system to allocate and issue import quotas, provision of updated training and equipment to customs, consideration of other supporting regulatory measures), public awareness-building including gender mainstreaming, and project coordination and monitoring. It was also determined that assistance to customs and the servicing sector will require continuity throughout all stages of the KIP.

51. The KIP aims to create synergies with the existing environmental policies on nationally determined contributions, energy efficiency, and waste management, and to strengthen initiatives such as the RRR network. The pilot project on energy efficiency, submitted separately to the present meeting, is expected to support the demonstration projects for end users under the KIP and the transition to low-GWP alternatives by updating and developing new minimum energy performance standards (MEPS) and labelling programmes aiming to inhibit the use of appliances based on HFCs.

Polyurethane foam sector plan

52. Stage I aims to achieve the complete phase-out of HFC consumption in the PU foam manufacturing sector. A total of 444 mt (353,760 CO₂-eq tonnes) of HFCs consumed by more than 150 PU foam downstream users will be phased out with assistance from five local systems houses. The systems houses and their downstream users are listed in table 5.

Table 5. Systems houses and downstream users consuming HFCs in Mexico

Systems house	Ownership	Number of identified downstream users
BASF	Non-Article-5	Not available
Dow	Non-Article-5	4
Eiffel	Article 5	62
Maxima Dimension	Article 5	89
Synthesia Technology	Non-Article-5	4

53. UNDP will follow the approach used in the foam sector plan to phase out HCFC-141b. Assistance to downstream users will be provided through systems houses, which will identify users, verify their eligibility, assist in project design, develop formulations based on the selected alternatives, oversee the transfer of the technology, and supervise its adoption. Non-Article-5-owned systems houses will not receive funding, but their eligible downstream users can be assisted through the project. Given that the plant supplying HFC-365mfc will close production, the project focuses on avoiding the replacement of HFC-365mfc by HFC-245fa, which is also used in the sector.

54. In addition to the 444 mt of HFCs being directly phased out through the project, the remaining consumption of HFCs in the PU foam sector, whether used by ineligible enterprises or blended locally for export, will be phased out through the establishment of a ban on the import and use of HFCs pure or contained in pre-blended polyols for the manufacturing of PU foam by 1 January 2029. Using as reference the average consumption of the last three (baseline) years, the total amount of HFCs to be phased out in the PU foam sector under stage I of the KIP is 596.43 mt (545,791 CO₂-eq tonnes), as presented in table 6.

Table 6. Consumption of HFCs in the PU foam sector to be phased out under stage I of the KIP

Substance	2020	2021	2022	Average 2020-2022
mt				
HFC-245fa	99.34	155.09	244.68	166.37
HFC-365mfc	192.00	240.00	275.82	235.94
HFC-365mfc/HFC-227ea blend (93:7)	166.56	206.51	209.28	194.12
Total in mt	457.90	601.60	729.78	596.43
CO₂-eq tonnes				
HFC-245fa	102,320	159,743	252,020	171,361
HFC-365mfc	152,448	190,560	219,001	187,336
HFC-365mfc/HFC-227ea blend (93:7)	160,534	199,038	201,708	187,094
Total in CO₂-eq tonnes	415,302	549,341	672,730	545,791

55. The technology selected for conversions in the PU foam sector is HFO reduced with water, as it has low GWP, it is available in the country, it is not flammable and hence it can be used by smaller enterprises, and it requires minimum-to-no incremental capital costs (ICCs). The main challenges to introducing this technology include the high cost of the blowing agent, the complexity of developing systems reduced with water, the low boiling point of the blowing agent, and the increased complexity of operations and logistics due to the short shelf life of HFOs (four months) compared to HFCs (one year).

56. The ICCs required include assistance in developing foam formulations to be provided to two eligible local systems houses (US \$20,000 each), with additional US \$1,000 per downstream user allotted

for project management. At downstream-user level, ICCs are required for testing and trials (US \$3,000/enterprise), with additional costs including international technical assistance (US \$60,000), local technical assistance (US \$72,000), and updates to the regulation banning the use of HFCs in foams (US \$20,000). The total ICCs for the project amount to US \$792,000, including US \$660,000 requested from the Multilateral Fund. The estimated incremental operating costs (IOCs) are US \$2,200,000, based on the price difference between HFC-reduced systems and HFO-reduced systems.

57. The total cost of the project has been estimated at US \$2,992,000, including US \$2,860,000 requested from the Multilateral Fund.

Policies and regulations, refrigeration servicing sector, awareness building, and gender mainstreaming

58. The proposed policy and regulatory instruments, activities in the refrigeration servicing sector including local installation and assembly, and the public awareness and gender mainstreaming initiatives, including their cost breakdown as submitted and subsequently adjusted, are presented in table 7.

Table 7. Description and cost breakdown of activities in stage I of the KIP

Item	Agency	Activity description	Funding (US \$)	
			Submitted	Adjusted
<i>I. Policies, regulations, and strategic planning for the reduction of HFC supply and demand</i>				
Quota and licensing	UNIDO	Development of an electronic licensing procedure for quota requests and import approvals at Government level to allow online management of the official quota allocation procedure, interactions between importers and Government offices, and accurate measurement of national HFC and HCFC consumption levels	723,911	148,571
Customs strengthening	UNEP	Training of 180 customs officers in person and 339 virtually on control measures related to new tariff regulations for HFCs and HFC blends, the safe handling of flammable refrigerants, and labelling of equipment	508,575	261,300
	UNIDO/UNEP	Provision of equipment ¹⁰ to 15 customs offices and two laboratories to strengthen surveillance during the import and export of HFCs (UNIDO) and provision of protective equipment to 55 customs officers and inspectors, supplied every two years (UNEP)	263,139	373,271
Legislative strengthening	UNDP	Development of regulations to inhibit or prohibit imports and sales of new equipment with high-GWP HFCs	30,000	30,000
	UNIDO	Annual market study on HFC prices and national trends in refrigerant consumption to inform decision makers on HFC control measures	150,000	150,000
	UNDP	Study and proposal for a pilot project to impose a carbon tax on HFC-based RAC equipment	36,000	36,000
	UNDP	Design and pilot phase of an official registry of RAC equipment and HFC consumption by end users	30,000	30,000
	UNDP	Guidelines for the adoption of low-GWP refrigerants in commercial buildings, <i>inter alia</i> supermarkets, stores, and distribution centres	15,000	15,000
	UNDP	Study on refrigerant standards and labelling programmes	24,000	24,000
	UNDP	Preparation and application of a district cooling proposal to reduce refrigerant needs at commercial and institutional spaces	35,000	35,000
<i>Subtotal for I</i>			<i>1,815,625</i>	<i>1,103,142</i>

¹⁰ Refrigerant identifiers, sampling cylinders, manifolds for several HFCs, valves, connections, wrenches, and vacuum pump.

Item	Agency	Activity description	Funding (US \$)	
			Submitted	Adjusted
II. National HFC phase-down plan implementation (servicing sector only)				
Capacity building for servicing technicians in the RAC and MAC sectors	UNIDO	<p><u>RAC technician certification scheme</u>: Development of two national standards and five standards on labour competencies and skills; accreditation of 20 training centres; evaluation and certification of 14 instructors/evaluators in seven training centres; evaluation and certification of 700 technicians; and distribution of equipment¹¹ to 700 technicians not equipped under the HPMP</p> <p><u>RAC technician training</u>: Development of training courses and evaluation instruments; creation of manuals for instructors and technicians; updates to the training platform; creation of technical training support material; virtual training for 40 instructors; evaluation and certification of 40 instructors; training of 4,500 technicians in person and 648 remotely; and training abroad provided to selected certified instructors and highest-performing technicians</p>	6,312,653	7,081,323
	UNIDO	<p><u>MAC technician certification scheme</u>: Development of one national standard and four standards on labour competencies and skills; accreditation of five training centres to provide in-person training; evaluation and certification of 300 technicians; training, evaluation and certification of 10 instructors/evaluators (two per centre); and provision of equipment¹² to 200 certified technicians not equipped under the HPMP</p> <p><u>MAC technician training</u>: Development of training courses and evaluation instruments; creation of manuals for instructors and technicians; updates to the training platform; creation of technical training support material; virtual training for 40 trainers; evaluation and certification of 23 instructors; and training of 880 technicians in person and 40 remotely</p>	2,878,669	2,878,669
	<i>Subtotal for RAC and MAC servicing</i>			9,191,322
Strengthening of the refrigerant RRR network	UNDP	Establishment of a mechanism to ensure self-sustained RRR operations (definition of the business model for additional RRR operators in new regions, identification of additional regulatory measures to support RRR operations, identification of potential additional RRR operators, awareness activities to promote RRR, establishment of a process to select beneficiaries); and strengthening and expansion of the RRR network (upgrade of two existing RRR centres, establishment of six additional RRR centres in regions not yet covered by the network, provision of equipment and tools for 10 recovery and recycling centres)	1,655,000	1,655,000
	<i>Subtotal for RRR</i>		1,655,000	1,655,000

¹¹ Including *inter alia* recovery unit and cylinders, vacuum pump, leak detectors, manifolds, scale, ATEX fan, welding equipment, thermometer, tube kit, and multimeter.

¹² Including *inter alia* recovery and recycling unit and cylinders, vacuum pump, leak detectors, manifold, scales, welding equipment, thermometer, tube kit, and multimeter.

Item	Agency	Activity description	Funding (US \$)	
			Submitted	Adjusted
Projects and activities in the local installation and assembly subsector	UNIDO	Pilot project to reduce HFC use in the assembly of commercial refrigeration equipment at SMEs (provision of refrigerant-handling packages ¹³ and tools for flammable refrigerants or CO ₂), and technical assistance in the design and optimization of RAC systems using low-GWP alternatives	500,000	500,000
	UNIDO	Demonstration project for the introduction of ammonia (NH ₃) and CO ₂ in cascade and secondary loop systems for supermarket refrigeration at end users	500,000	500,000
	UNIDO	Promotion of the use of low-GWP refrigerants in the installation of new cold rooms in the food chain	500,000	500,000
	UNIDO	Demonstration project for the introduction of R-290 and CO ₂ cascade and secondary loop systems for commercial refrigeration	500,000	500,000
	UNIDO	Demonstration projects to replace HFC-based AC chillers with chillers based on R-290 or NH ₃ , and to promote the use of natural refrigerant technologies	500,000	500,000
	UNIDO	Replacement of R-410A-based VRF systems with systems based on HFC-32	240,000	240,000
	<i>Subtotal for local installation and assembly</i>			<i>2,740,000</i>
<i>Subtotal for II</i>			<i>13,586,332</i>	<i>14,354,992</i>
<i>III. Public awareness activities, including gender mainstreaming</i>				
Public awareness and gender	UNEP	Campaign to support programmes and policies related to gender mainstreaming	234,000	234,000
	UNEP	Dissemination campaign targeting undergraduate students (outreach and awareness videos) to encourage women to choose RAC-related careers	60,000	60,000
	UNEP	Identification and promotion of good practices for gender mainstreaming at RAC sector enterprises	45,000	45,000
	UNEP	Promotion of technical careers among female high school students	75,000	75,000
<i>Subtotal for III</i>			<i>414,000</i>	<i>414,000</i>
Total for activities in the servicing sector			15,815,947	15,872,134
Project coordination, monitoring, reporting and verification				
Project coordination and monitoring	UNIDO	Coordination and monitoring of the quota and licensing system, customs strengthening programme, and activities in the servicing and local installation and assembly subsectors	1,305,336	789,222
	UNDP	Coordination and monitoring of legislative strengthening and RRR network activities	182,500	265,094
	UNEP	Coordination and monitoring of the customs strengthening programme, public awareness activities, and the implementation of gender policies	93,759	39,857
Subtotal for project coordination, monitoring, reporting and verification			1,581,595	1,094,173
Total for policy and regulatory measures, servicing including local installation and assembly, awareness, gender mainstreaming, and coordination			17,397,542	16,966,307

¹³ Including *inter alia* flammable refrigerant charging stations, handheld detectors, tools to seal process tubes, and recovery units.

Project implementation, coordination and monitoring

59. The project implementation and monitoring unit (PMU) will work with the implementing agencies, the NOU, DGIELGCA, and participating stakeholders to manage, coordinate, and follow up on the action plan established for stage I, remaining in close communication and collaboration with its HPMP counterpart. Four consultants will support the national coordinator in overseeing the implementation of the first tranche of the KIP: a database manager monitoring the application of the licensing and quota system, a legal advisor for administrative procedures, a project manager specializing in RAC and energy efficiency, and an assistant providing overall support. The budget breakdown by implementing agency for PMU expenses under stage I, submitted at a total amount of US \$1,581,595, is presented in table 7 above.

Gender policy implementation

60. The NOU and SEMARNAT personnel underwent introductory training on gender policy implementation in 2020 and established a consultancy to develop a gender analysis of the RAC sector and an action plan for gender mainstreaming in all Montreal Protocol activities. The difficulties encountered by women working in the sector identified by the gender analysis, are addressed in the action plan to strengthen women's presence in the RAC workforce by generating the necessary conditions for their participation, including in decision-making processes.

61. The Government of Mexico will ensure the participation of women in the training and certification programmes for customs officers and RAC technicians; promote the participation of women in RAC training programmes at secondary and vocational schools; and sensitize stakeholders to the gender mainstreaming policy of the Multilateral Fund. Women working in the field will be encouraged to join professional associations; a number of tools provided under the KIP will be earmarked for use by female technicians; gender-disaggregated data will be mandatorily collected; and the involvement of the National Women's Institute in the implementation of the KIP will be sought. Component III in table 7 includes the budget breakdown for activities to support gender mainstreaming during stage I of the KIP.

62. The implementing agencies' results framework requires the inclusion of gender-responsive indicators, targets, and baseline data to monitor progress in promoting gender equality. Project staff has completed the UN Women online training courses, UNIDO's gender focal point was consulted during the preparation of the proposal, and gender will be considered in the recruitment of international and national experts.

Total cost of stage I of the Kigali HFC implementation plan

63. The budget for stage I has been established at US \$20,257,542. The cost of activities in the refrigeration servicing sector (including local installation and assembly, policy measures, and awareness-building) has been established in line with decision 92/37. The activities proposed under stage I of the KIP and their cost as submitted and subsequently adjusted based on discussions with the Secretariat is presented in table 8.

Table 8. Cost of activities to be implemented in stage I of the KIP for Mexico (US \$)

Component	Cost as submitted	Adjusted cost
Foam sector plan	2,860,000	2,666,500
Refrigeration servicing sector plan	15,815,947	15,872,134
PMU	1,581,595	1,094,173
Total	20,257,542	19,632,807

Coordination of activities under HCFC phase-out and HFC phase-down plans

64. The fifth and last tranche of stage II of the HPMP for Mexico, implemented over the 2023–2024 period, will be carried out simultaneously and in coordination with the first tranche of stage I of the country's KIP.

65. Activities under stage I of the KIP were designed to expand the impact of those started under the HPMP. Both the HPMP and the KIP focus on the operation and control of the country's import licensing and quota system. Activities undertaken to strengthen the customs' capacities will be crucial to the monitoring and control of both HCFCs and HFCs. The combined implementation of both plans is also expected in the capacity-building activities in the RAC and MAC servicing sectors, including the development of labour competency standards for good servicing practices and the related evaluation and certification processes for technicians, as well as the provision of training on the safety aspects of handling alternatives to HCFCs and HFCs during equipment charging, maintenance, servicing, refrigerant RRR, and final disposal. The strengthened infrastructure of training centres and the RRR network will ensure the proper handling of both HCFCs and HFCs and prevent their release into the atmosphere.

66. Stage I of the KIP will be implemented in three tranches. The schedule of HFC phase-down and HCFC phase-out commitments, and of the KIP and HPMP tranches is presented in annex II to the present document, while activities to be implemented simultaneously under the HPMP and the KIP are listed in annex III.

Activities planned in the first tranche of stage I of the Kigali HFC implementation plan

67. The first funding tranche of stage I of the KIP, in the total amount of US \$9,191,697, will be implemented between January 2024 and December 2025. The proposed activities and their cost breakdown are detailed in table 9.

Table 9. Activities for implementation under the first tranche of the KIP and their cost

Item	Activity description	Agency	Funding (US \$)	
			Submitted	Adjusted
<i>Foam sector plan</i>				
Foam sector	Foam sector plan for systems houses	UNDP	2,860,000	888,833
Total for the foam sector			2,860,000	888,833
<i>Refrigeration servicing sector, policy measures, awareness building, and gender mainstreaming</i>				
<i>I. Policies, regulations, and strategic planning for the reduction of HFC supply and demand</i>				
Quota and licensing	Development of the electronic licensing procedure for quota requests, import approval at the Government level	UNIDO	723,911	148,571
Customs strengthening	Customs training activities	UNEP	169,525	87,100
	Provision of equipment to customs offices and protection equipment to customs officers	UNIDO	253,129	324,577
Legislative strengthening	Market study on HFC prices and national trends in refrigerant consumption and demand	UNIDO	50,000	25,000
	Design and pilot phase of an official registry of RAC equipment and HFC consumption by end users	UNDP	30,000	0
	Guidelines for the adoption of low-GWP refrigerants in commercial buildings, <i>inter alia</i> supermarkets, stores, and distribution centres	UNDP	15,000	15,000
	Preparation and application of a district cooling proposal to reduce refrigerant needs at commercial and institutional spaces	UNDP	35,000	35,000
Subtotal for I			1,276,565	635,248

Item	Activity description	Agency	Funding (US \$)	
			Submitted	Adjusted
II. National HFC phase-down plan implementation (servicing sector only)				
Capacity building for the RAC and MAC servicing technicians	RAC servicing: training, certification, and delivery of equipment to servicing technicians; and development of official competency standards	UNIDO	1,290,425	2,023,459
	MAC servicing: training, certification, and delivery of equipment to servicing technicians; and development of official competency standards	UNIDO	988,706	930,364
Strengthening the RRR network	Establishment of a mechanism to ensure self-sustained RRR operations (definition of the business model for additional RRR operators in new regions, identification of additional regulatory measures to support RRR operations, identification of potential additional RRR operators, awareness activities to promote RRR, and establishment of a process to select beneficiaries)	UNDP	415,000	415,000
Projects and activities in the local installation and assembly subsector	Pilot project to reduce HFC use in the assembly of commercial refrigeration equipment at SMEs	UNIDO	500,000	500,000
	Demonstration project for the introduction of NH ₃ and CO ₂ in cascade and secondary loop systems for supermarket refrigeration at end users	UNIDO	500,000	500,000
	Promotion of the use of low GWP refrigerants in the installation of new cold rooms in the food chain	UNIDO	0	350,000
Subtotal for II			3,694,131	4,718,823
III. Public awareness and gender-mainstreaming activities				
Public awareness and gender policy implementation	Campaign to support programmes and policies related to gender mainstreaming	UNEP	78,000	78,000
	Dissemination campaign (outreach and awareness videos) targeting undergraduate students to encourage women to choose RAC-related careers	UNEP	20,000	15,000
	Identification and promotion of good practices for gender mainstreaming at RAC sector enterprises	UNEP	15,000	15,000
	Promotion of technical careers among female high school students	UNEP	25,000	20,000
Subtotal for III			138,000	128,000
Total for activities in the refrigeration servicing sector, policy measures, and awareness-building			5,108,696	5,482,071
Total for activities in the foam and servicing sectors			7,968,696	6,370,904
Project coordination, monitoring, reporting, and verification				
KIP coordination and monitoring	Coordination and monitoring of the quota and licensing system, customs strengthening programme, and activities in the servicing and local installation and assembly subsectors	UNIDO	430,116	283,418
	Coordination and monitoring of legislative strengthening and RRR network activities	UNDP	49,500	79,905
	Coordination and monitoring of the customs strengthening programme, public awareness activities, and the implementation of gender policies	UNEP	31,253	12,695
Subtotal for project coordination, monitoring, reporting, and verification			510,870	376,019
Total cost of the first tranche of stage I of the KIP (foam + servicing + coordination)			8,479,566	6,746,923

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

68. The Secretariat reviewed stage I of the KIP for Mexico in light of the existing policies and guidelines of the Multilateral Fund, including decisions 91/38¹⁴ and 92/37,¹⁵ stage II of the HPMP, and the 2023–2025 business plan of the Multilateral Fund.

HFC consumption levels

69. In 2021, Mexico's HFC consumption decreased to 27,311.25 mt (47,994,455 CO₂-eq tonnes) from previous levels, followed by an increase to a level of 48,447.66 mt (95,644,142 CO₂-eq tonnes) in 2022, exceeding the baseline level by 24 per cent. The Secretariat notes that the behavior in consumption varies among substances. For example, HFC-32 consumption increased substantially between 2019 and 2022, possibly due to the adoption of HFC-32 as an alternative in several applications in Mexico and countries importing equipment manufactured in Mexico. However, HFC-32 only represents 1.4 per cent of the 2022 consumption. Other substances whose consumption increased or started in 2022 and which account for a small portion of total national consumption are HFC-125, HFC-143a, and R-407C.

70. The consumption of R-410A and R-507A in 2022 was almost double that of the pre-pandemic levels, and consumption of R-404A more than tripled. Because of their high GWP, the overall increase in the consumption of HFCs expressed in CO₂-eq tonnes is more prominent. The submission explained that the growth was due to HFC import increases by an already established importer and two recently established non-Article-5 importers. While these importers had declared that the consumption would be used in the servicing sector, the imports had not been contrasted with actual market demand. Other possible reasons for the increase include expectations with regard to the quota allocation process, and the entry into force of the Kigali Amendment commitments.

71. Based on this information, the Secretariat was unclear on whether the 2022 HFC imports represented the regular needs of the manufacturing and servicing sectors, and requested that UNIDO provide an estimate of the amounts of HFCs that might have been imported in 2022 to respond to the quota allocation process or the Kigali Amendment controls. UNIDO explained that the actual demand for HFCs in the servicing and RAC manufacturing sectors was unknown. Surveys were carried out with importers and manufacturing enterprises regarding demand and distribution, but only partial responses were received from some enterprises. In the absence of reliable information describing real market demand, the country considers its 2022 consumption as actual demand.

72. The Secretariat acknowledges the complexity faced by Article 5 countries in characterizing their HFC consumption and trends, especially given the distortions caused by the COVID-19 pandemic during at least two of the baseline years. At present, the data on HFC consumption, as well as data coming from the consuming sectors, are insufficient for a complete understanding of the 2022 consumption increase in Mexico or of the overall trends in HFC consumption. The Secretariat considers it important to continue monitoring the country's HFC consumption behavior over the coming years to determine whether the high imports reported in 2022 are representative of the local market's regular consumption needs or were an isolated occurrence, expecting that by the time the next tranche request is submitted in 2025, the availability of data on longer-term HFC consumption trends will allow more clarity on the issue.

¹⁴ In the absence of the cost guidelines for HFC phase-down, to consider HFC individual investment projects and stage I of KIPs on a case-by-case basis, without setting a precedent for the cost guidelines or any future HFC individual investment projects and stage I of KIPs.

¹⁵ Level and modalities of funding for HFC phase-down in the refrigeration servicing sector.

Overarching strategy*Non-Article-5 ownership and exports to non-Article-5 countries in the manufacturing sector*

73. The submission provided a comprehensive analysis of HFC consumption by sector, including the identification of enterprises with non-Article-5 ownership in the RAC and MAC sectors. It would seem that a substantial portion of HFC consumption in manufacturing may be by non-Article-5 owned enterprises or for export to non-Article-5 countries, but the magnitude of that consumption is uncertain. The Secretariat requested additional details on HFC consumption related to manufacturing by non-Article-5-owned enterprises and exports to non-Article-5 countries in the MAC (HFC-134a), residential AC (R-410A and HFC-143a), domestic and commercial stand-alone refrigeration (HFC-134a), and other relevant sectors. However, this information was not available.

Starting point for sustained reductions in HFC consumption

74. The established baseline for HFC consumption in Mexico is 76,982,664 CO₂-eq tonnes, as shown in table 4 above. The methodology for calculating the starting point for sustained reductions in HFC consumption is still under discussion. The Secretariat notes that the starting point will be established once the Executive Committee agrees on the above-mentioned methodology.

75. In line with previous decisions,¹⁶ the HFC consumption reduced by stand-alone investment projects previously approved for Mexico will be deducted from the starting point, once the latter is established. These deductions equal 70.96 mt (101,470 CO₂-eq tonnes) of HFC-134a and 5.91 mt (23,187 CO₂-eq tonnes) of R-404A associated with the conversion project at Imbera, 198 mt (283,140 CO₂-eq tonnes) of HFC-134a associated with conversion project at Mabe, and 5.18 mt (7,407 CO₂-eq tonnes) of HFC-134a associated with the conversion project at Friocima.

Policy, regulatory and institutional frameworks*HFC licensing and quota system*

76. Decision 87/50(g) requests the bilateral and implementing agencies, when submitting stage I of the KIPs, to include confirmation that the country has an established and enforceable national system of licensing and quotas for monitoring HFC imports/exports in place, consistent with decision 63/17.

77. Accordingly, the Government of Mexico has incorporated HFCs into its licensing system for the imports and exports of controlled substances since June 2022, and SEMARNAT has been authorized to assign import quotas for HFCs as of 1 January 2024.¹⁷ The HFC import quotas will be provided to importers by specific substance in mt and their equivalent in CO₂-eq tonnes, but the total quota allowable by enterprise for the year will be assigned in CO₂-eq tonnes, giving flexibility to importers in terms of substances requested from the National Authority. The national HFC import quotas issued for 2024 will amount to 76.9 CO₂-eq tonnes, in line with the Montreal Protocol control measures.

¹⁶ Decisions 81/64, 81/65 and 92/35.

¹⁷ A letter of 24 August 2023 from the Ministry of Environment and Natural Resources of Mexico to UNIDO confirms that Mexico has a sound legal and institutional system to implement the HFC import quota allocation mechanism as of 1 January 2024, and that the relevant instruments have been published in the Official Gazette of the Federation, and therefore are publicly available for importers and the public.

Technical and cost-related issues

Polyurethane foam sector plan

Eligibility of enterprises

78. In the absence of cost guidelines for the phase-down of HFCs, the Secretariat reviewed the PU foam sector plan on the basis of precedent projects implemented in the context of HCFC phase-out, and elements of decision XXVIII/2 of the parties that had been agreed on in principle by the contact group discussing the cost guidelines, including on second and third conversions, the cut-off date for eligible capacity, and the cost-effectiveness threshold for the PU foam sector.

79. Upon request, UNDP provided a list of 156 downstream users associated with the systems houses participating in the project. Upon comparison with the downstream users assisted under the HPMP, the Secretariat noted that nine of the enterprises included in the project had already been assisted under the HPMP to convert to low-GWP alternatives. These enterprises were removed from the proposal and the Secretariat calculated the cost based on the remaining 147 enterprises.

80. As in the case of precedent comparable projects, given the number and size of the downstream users involved, it was not possible to verify their individual eligibility. A complete verification of eligibility will be based on the cost guidelines for HFC phase-down. Acknowledging the difficulty of collecting data from a large number of small enterprises in the preparatory stage, the Secretariat considers it important to have a clear inventory of Mexican enterprises receiving Multilateral Fund assistance, noting that many have already been assisted in converting to low-GWP alternatives under the HPMP. In order to address this concern, the Secretariat proposed that UNDP report with each KIP tranche request on the validation of eligibility of downstream users receiving assistance from the Multilateral Fund. This information would be reported to the Executive Committee. UNDP agreed to continue updating the list of enterprises, and to ensure that funding would only be provided to eligible enterprises and manufacturing lines. Funding associated with enterprises found to be non-eligible would be returned to the Fund.

Availability of selected technologies in the market

81. Noting the difficulties that other countries in the region have had in accessing selected technologies, UNDP explained upon request that the availability of HFO was not an issue in Mexico, likely due to the proximity of the United States of America market and the free trade agreements with the United States and Canada. UNDP provided reassurance that the conversion of the PU foam sector would be implemented on time and without facing difficulties in obtaining HFOs. UNDP also indicated that the project would be completed before the completion of the stage in 2029, that it would ensure that the current consumption of HFC-365mfc and the HFC-365mfc/HFC-227ea blend did not migrate to HFC-245fa once production of HFC-365mfc had ceased, and that the reductions in HFC consumption achieved through the conversion would be sustained and expanded to non-eligible enterprises by the issuance of a ban on the import and use of HFCs in the PU foam sector by the end of the project.

Incremental costs

82. The ICCs requested in the PU foam proposal submitted under stage II of the HPMP were lower than the costs approved for comparable projects addressing SMEs through systems houses in the context of HPMPs for countries in the region. No ICCs were requested for equipment as the technology selected can operate with the same equipment as the one used for HFCs. ICCs were adjusted from US \$660,000 to US \$466,500 by only including 147 enterprises, reducing the amount for technical assistance, decreasing the amount for training and trials from US \$3,000 to US \$1,300 for enterprises with consumption below 500 kg/year in line with precedent projects, and by removing the funding requested for the development of

formulations for the two local systems houses, as assistance for this purpose had already been provided under the HPMP.

83. Regarding the IOCs, UNDP reported that the prices of HFC-365mfc and HFC-245fa were between US \$12.00/kg and US \$13.00/kg, while the price of HFO-1233zd(E) was US \$19.50/kg. In discussing potential savings that could take place by reducing the HFO formulation with water, based on a previous demonstration project implemented by UNDP in Colombia, UNDP clarified that the systems houses in Mexico were already using HFC-based systems optimized with large amounts of water and methylal to reduce the costs without affecting the systems' thermal conductivity and dimensional stability. HFOs can also be reduced with water, but only to a certain extent to maintain the characteristics of the foam, especially in the early stages of technology development.

84. Based on the price and amount of the blowing agents used in the system, the Secretariat calculated IOCs for replacing the three currently used HFCs with HFO at a level similar to the US \$4.95/kg calculated by UNDP, entailing no adjustments to the IOCs. UNDP indicated that there were additional costs for the chemicals used in the system and additional logistical costs due to a shorter shelf life of HFOs (four months versus 12 months for HFCs). However, these costs were not taken into consideration in the calculation of the IOCs.

85. With adjustments made to the ICCs, the cost for the PU foam sector plan was agreed at US \$2,666,500, at a cost-effectiveness level of US \$6.00/kg.

86. With the implementation of this project, the Government of Mexico commits to issuing a ban on the import and use of HFCs pure or contained in pre-blended polyols in the manufacturing of PU foam by 1 January 2029. Through this regulatory measure, an additional 152.46 mt of HFCs used in the manufacturing of PU foam by non-eligible enterprises or blended in polyols and exported to other countries will be phased out at no additional cost to the Multilateral Fund. Taking these additional indirect reductions into consideration, the overall HFC reductions obtained through the PU foam sector plan amount to 596.43 mt, at a total cost-effectiveness of US \$4.47/kg.

Local installation and assembly subsector

87. Decision 92/39(d) allows the submission of projects in the local installation and assembly subsector in the context of KIPs to be considered on a case-by-case basis. The Secretariat noted that the activities included in the local installation and assembly subsector in stage I of the KIP for Mexico were incorporated as part of refrigeration servicing sector activities, within the cost-effectiveness threshold of US \$5.10/kg applied to the sector.

88. Activities proposed for this subsector included the provision of technical assistance and tools to eight enterprises installing a variety of RAC systems in the commercial RAC sector, and five pilot projects to replace or install RAC systems operating with low-GWP alternatives in different applications. Similar activities have been approved in the past in the context of the refrigeration servicing sector.

89. Regarding whether the eight local installation and assembly enterprises receiving technical assistance and tools could commit to stop using HFCs, UNIDO explained that at this point it was not possible, as they worked with many applications and there were other enterprises still in the market using HFCs. UNIDO explained that this project would provide installation and assembly enterprises with accredited, up-to-date technical data, which they would use to promote new equipment and installations to potential customers. The data obtained from case studies and pilot projects at end users implemented in conjunction with this project would assist the enterprises in promoting energy-efficient equipment based on low-GWP alternatives while demonstrating energy savings. The process of transitioning the entire subsector to low-GWP alternatives is expected to extend beyond stage I and require additional efforts at the enterprise, end-user, and component-supplier levels.

90. In justifying the wide variety of selected pilot projects, UNIDO explained that they had been prioritized based on *inter alia* the impact of the applications; replicability in working with business chains (e.g., supermarkets); support from the National Association of Department and Self-Service Stores; site availability and suitable access to demonstrate the technology and equipment and train technicians; applications for which long-term alternatives had not been fully developed; and systems with clear potential to demonstrate simple energy savings through new equipment and improved operations.

91. UNIDO also indicated that the demonstration projects represented only one phase of the project. Upon completion of the pilot projects, the Government will promote their replication by the same beneficiaries throughout their business chains, and by other enterprises. To ensure that this initiative becomes part of a broader industry change process, the Government will implement a strategy of hands-on exposure, knowledge dissemination and awareness-raising for other end users and assemblers.

92. The Multilateral Fund will cover part of the initial investment for the installation of new systems in the form of technical assistance for system design and partial costs of equipment and installation, in order to make the project viable for the end user. The specific items to be covered by the Fund will be determined based on the system being replaced and the selected technology. All pilot projects will be co-financed by the beneficiary end users. UNIDO provided an estimation of co-financing and replicability of the demonstration projects, as shown in table 10.

Table 10. Indicative impact and co-financing of the demonstration projects at end users*

Project	Baseline technology	Units co-financed	Impact**	Funds requested (US \$)	Co-financing (US \$)
Demonstration project for the introduction of NH ₃ and CO ₂ in cascade and secondary loop systems for supermarket refrigeration at end users	HFC-134a R-410A	1 NH ₃ /CO ₂ 1 NH ₃ /CO ₂ / brine	8	500,000	1,600,000
Demonstration and promotion of the use of low-GWP refrigerants in the installation of new cold rooms in the food chain (R-290 or other technology depending on the system)	HFC-134a R-404A	2	400	500,000	240,000
Demonstration project for the introduction of R-290 and CO ₂ cascade and secondary loop systems for commercial refrigeration	HFC-134a R-404A R-507A	1 R-290/CO ₂ 1 R-290/CO ₂ / glycol	8	500,000	635,000
Demonstration projects to replace HFC-based AC chillers with chillers based on R-290, NH ₃ , or HFO	HFC-134a R-410A	2 R-290 1 NH ₃ 1 HFO	40	500,000	400,000
Demonstration projects to replace R-410A-based VRF systems with systems based on HFC-32	R-410A	5	50	240,000	300,000
Total		23	906	2,240,000	3,175,000

* Not including technical assistance provided to the local installation and assembly enterprises.

**Expected replicability in terms of adoption of additional RAC systems based on the demonstrated technologies as a result of the project. In some cases, e.g. in centralized systems that require larger investment and longer payback period, outcomes may be expected beyond the duration of stage I.

93. The Secretariat acknowledges that the figures provided by UNIDO are indicative and the replicability will depend in part on the additional actions proposed to support the project, as well as on market-related factors. Regarding the HFC reductions to be achieved, they will depend on the selected systems' refrigerant charge and annual refrigerant needs for servicing, which will only be determined once the sites are verified. UNIDO reassured the Secretariat that those baseline parameters would be measured

to have a proper understanding of the project's impact in terms of HFC reductions and energy-efficiency gains, which would be the main arguments disseminated in the bid for scaling up.

94. The Secretariat notes that all activities will be implemented as part of the strategy for the refrigeration servicing sector and that the project intends to start facilitating the transition to low-GWP alternatives in a variety of commercial refrigeration applications by combining technical assistance and tools provided to enterprises installing these systems with demonstration projects at end users and the dissemination of achieved results. In addition, the development of relevant MEPS for some of these applications through the pilot project on energy efficiency also submitted to the present meeting will further support the sector's transition to energy-efficient and low-GWP alternatives.

95. In line with decision 92/36(g), the Secretariat requested UNIDO, upon completion of the project, to submit a final report on its implementation, including the HFC phase-out and energy-efficiency gains achieved. The Secretariat also considers important that the progress reports to be submitted with future tranche requests include partial information on the progress achieved in these projects as it can inform other Article 5 countries.

Servicing sector

96. The activities proposed in the refrigeration servicing sector fall into four main categories: development of policies; training, certification and tooling of RAC and MAC technicians; strengthening and expansion of the RRR network; and awareness building. The plan proposes activities that will extend beyond the implementation timeframe of stage I, including the development of standards and strengthening of the technician certification scheme and RRR infrastructure, and will be implemented in coordination with the ongoing HPMP activities to avoid duplication of efforts, as shown in annex III to the present document. UNIDO reported that stage III of the HPMP would be prepared in light of the activities already included in the KIP.

97. Upon discussing the details of proposed activities, a few adjustments were made including the partial reallocation of funds requested for the development of the electronic licensing procedure for the quota system to additional training and certification activities, and the allocation of funds for the provision of equipment for customs officers to only one agency (UNIDO).

98. The Secretariat notes that a substantive portion of the resources in the plan are allocated to the training and certification of technicians and the provision of tools and equipment to certified technicians. Regarding the implementation of this component in light of the ongoing training activities under the HPMP, UNIDO explained that one labour competency standard was developed for RAC servicing under the HPMP, while under the KIP two competency standards would be updated and seven others would be developed, including three for RAC servicing and four for MAC servicing, a sector not covered by previous training.¹⁸ The RAC and MAC technician training and certification programmes under the KIP will be aligned with the competency standards to be developed, which extend beyond the already provided training on good practices. In addition, with funds reallocated from the quota system activity to the training programme, the Government will expand the latter to cover such additional areas as the design, optimization and installation of RAC systems using low-GWP technologies in commercial refrigeration, given the extensive consumption of high-GWP refrigerants in this sector. This additional training will be made available to enterprises installing RAC systems and will support other activities included in the KIP for that subsector.

99. Regarding the strengthening of the RRR network in light of the current HPMP activities, UNDP explained that only two RRR centres were being assisted under the HPMP, while the KIP intended to

¹⁸ Provision of installation and maintenance of AC systems with different refrigerant charges (some of them containing A2L refrigerants) in several applications in the RAC sector, and provision of preventive and corrective maintenance services to MAC systems for different categories of vehicles.

expand the scope of the RRR network by strengthening additional existing centres and establishing others in regions with large HFC consumption that are not yet served. The project also aims to establish a mechanism to ensure that RRR operations can be executed in a self-sustained manner. The RRR centres and 104 collection and scrapping centres were crucial in the implementation of a large-scale project to replace nearly two million RAC equipment units over the 2009-2012 period. The business model for RRR operations needs to be adapted to current conditions to allow for an economically feasible expansion. The project will also identify additional regulatory measures to support RRR operation, including possible additions to the competency standards for servicing activities.

100. On the preparation and application of a district cooling proposal to reduce refrigerant needs at commercial and institutional spaces (US \$35,000), UNDP clarified that it aimed to identify opportunities for linking the use of cold and heat by several users to reduce relative refrigerant charges and optimize refrigeration capacity. The study will analyze the relevant regulatory framework, identify potential buildings to implement district cooling, and generate recommendations. The investments required to implement district cooling are to be covered by the potential users.

Total project cost

101. UNIDO had initially estimated the cost of implementation of stage I of the KIP for Mexico at US \$20,257,542, including US \$2,860,000 for the PU foam sector, US \$15,815,947 for the refrigeration servicing sector, and US \$1,581,595 for the PMU. The Secretariat's total estimate aligns with that submitted by UNIDO, with certain differences in cost distribution, as detailed in the following paragraphs and table 7 above.

102. The average HFC consumption in the refrigeration servicing sector during the baseline years in Mexico was 16,763.50 mt, or 36,289,719 CO₂-eq tonnes. At the 92nd meeting, the Executive Committee agreed on funding at a level of up to US \$5.10/kg for countries with consumption above 360 mt in servicing (decision 92/37(b)(iii)). The Secretariat calculated the cost of stage I of the KIP for Mexico using the methodology for converting US \$/kg to US \$/CO₂-eq tonnes in the servicing sector described in annex I of document 92/46.¹⁹

103. With an HFC consumption baseline of 76,982,664 CO₂-eq tonnes, a 10 per cent reduction of the baseline amounts to 7,698,266 CO₂-eq tonnes. Mexico has already received funding to phase out 415,204 CO₂-eq tonnes with the conversions at Mabe, Imbera and Friocima. In addition, the PU foam sector plan will phase down an additional 545,790 CO₂-eq tonnes of HFCs; therefore, reductions required from the servicing sector to reach the 10 per cent reduction target are 6,737,272 CO₂-eq tonnes.

104. To determine the cost of reducing 6,737,262 CO₂-eq tonnes in the servicing sector at US \$5.10/kg, the Secretariat converted this consumption to mt using the average GWP of the HFC consumption in the servicing sector in baseline years (HFC consumption in servicing in CO₂-eq tonnes (36,289,719) divided by HFC consumption in servicing in mt (16,763.50)). The average GWP thus obtained was 2,165, with phase-out tonnage required to reach the 10 per cent reduction target amounting to 3,112.18 mt.

105. The cost of phasing out 3,112.18 mt at US \$5.10/kg is US \$15,872,134. By adding the PU foam sector plan cost, agreed at US \$2,666,500, as well as the PMU costs, estimated at 6 per cent of the cost of the activities in the KIP,²⁰ the total cost of stage I of the KIP (without agency support costs) amounts to US \$19,632,807, as shown in table 11.

¹⁹ Paper on the starting point for sustained aggregate reductions based on discussions at the 91st meeting in the contact group on the cost guidelines for the phase-down of HFCs (decision 91/64(a)).

²⁰ The assistance provided under the Multilateral Fund for the implementation of HPMP stages includes, in addition to the funded reductions, a budget for project coordination and monitoring, amounting to between 5 and 10 per cent of the cost of the stage, based on the size and characteristics of the country.

Table 11. Cost calculation for activities under stage I of the KIP for Mexico

<i>HFC consumption data</i>		
Established HFC consumption baseline	CO ₂ -eq tonnes	76,982,664
Average HFC consumption in the servicing sector in baseline years	mt	16,763.50
	CO ₂ -eq tonnes	36,289,719
Average GWP of HFC consumption in the servicing sector		2,165
<i>Reduction target for stage I of the KIP</i>		
10 per cent reduction from the HFC baseline	CO ₂ -eq tonnes	7,698,226
Reductions already funded (Mabe, Imbera, Friocima)	CO ₂ -eq tonnes	415,204
Reductions from the PU foam sector plan	CO ₂ -eq tonnes	545,790
Reductions required from the servicing sector	CO ₂ -eq tonnes	6,737,272
	mt	3,112.18
<i>Cost of stage I of the KIP for the servicing sector</i>		
Agreed cost-effectiveness threshold	US \$/kg	5.10
Cost of phasing down 3,112.18 mt at US \$5.10/kg	US \$	15,872,134
PU foam sector plan (funds as agreed)	US \$	2,666,500
Project management costs (6% of the total cost of stage I)	US \$	1,094,173
Total project cost	US \$	19,632,807

106. Table 12 summarizes the cost of stage I of the KIP, including the previously approved stand-alone projects. Regarding the funding requested at the present meeting, while its overall recommended level was reduced from US \$20,257,542 to US \$19,632,807, there is a small increase of funding in the refrigeration servicing sector and a reduction in the PMU costs, taking into consideration the funding approved for the same purpose under the HPMP.

Table 12. Agreed cost of stage I of the KIP (including previously approved projects)

Component of stage I of the KIP	Cost as submitted (US \$)	Agreed cost (US \$)	Reductions from baseline	
			CO ₂ -eq tonnes	%
Conversion at Mabe	n/a	3,687,000	283,140	0.37
Conversion at Imbera	n/a	886,818	124,657	0.16
Conversion at Friocima	n/a	136,500	7,407	0.01
Total for previously approved stand-alone projects	n/a	4,710,318	415,204	0.54
PU foam sector plan	2,860,000	2,666,500	545,790	0.71
Refrigeration servicing sector activities	15,815,947	15,872,134	6,737,272	8.75
PMU	1,581,595	1,094,173	0	0.0
Total funds requested at the 93rd meeting	20,257,542	19,632,807	7,283,062	9.46
Grand total for stage I of the KIP	n/a	24,343,125	7,698,266	10.00

107. The funding for stage I of the KIP will be released in four tranches, the first one (2023) accounting for 34 per cent of the total value of stage I, the second (2025) for 31 per cent, the third (2027) for 26 per cent, and the fourth (2029) for 9 per cent (10 per cent of servicing), as shown in annex II to the present document. It was also agreed that the funding for the PU foam sector would be requested in three tranches rather than one, as the majority of the cost is related to IOCs and there is no large procurement of equipment to be undertaken at the beginning of the project. This adjustment allowed for accommodating more servicing sector activities in the first tranche. The cost of the first tranche, as agreed, is reflected in table 9 above.

Impact on the climate

108. The conversion of the remaining PU foam manufacturing enterprises in Mexico will avoid the emissions into the atmosphere of an estimated 542,596 CO₂-eq tonnes per year, as shown in table 13.

Table 13. Impact on the climate of conversions in the PU foam sector plan (including eligible and ineligible reductions)

Substance	GWP	mt/year	CO ₂ -eq tonnes/year
Before conversion			
HFC-245fa	1,030	166.37	171,361
HFC-365mfc	794	235.94	187,336
HFC-365mfc/HCFC-227ea blend	964	194.12	187,093
Total			545,790
After conversion			
HFO-1233zd	6	532.33	3,194
Impact			-542,596

109. The activities proposed in the servicing sector, including *inter alia* the strengthening of the infrastructure for refrigerant RRR, the promotion of low-GWP alternatives through pilot projects, and the provision of tools, training and certification on good servicing practices to technicians, indicate that the implementation of stage I of the KIP will reduce refrigerant emissions into the atmosphere, resulting in climate benefits. A calculation of the impact on the climate of the activities in the KIP indicates that Mexico will have achieved annual emission reductions of 6,737,272 CO₂-eq tonnes of HFCs, calculated as the reductions required in the servicing sector to reach the final target set in stage I.

Sustainability of the HFC phase-down and assessment of risks

110. The commitments and activities of stage I of the KIP will be sustained over time with the implementation and strengthening of the licensing and quota system for HFCs; the development of policies, including the ban on imports and use of HFCs in PU foam upon completion of the sector plan; and the eventual ban on HFC-134a in small self-contained refrigeration units once the conversion project at Friocima is completed. The adoption of standards for equipment containing HFCs and for low-GWP alternatives; the adoption of competency standards; the implementation of technician certification through local institutions; and the strengthening of local training institutes will also contribute to the sustainability of the activities implemented.

111. Potential risks to the timely implementation of activities include importers trying to introduce HFCs under non-controlled tariff codes to skip quota control, which will be mitigated by the continuous training of customs officers. There is also the risk of an unexpected increase in HFC consumption in manufacturing due to nearshoring, which will be addressed through close contacts between the NOU and the manufacturers to anticipate such fluctuations and manage quota distribution without exceeding the targets. The risk of demonstration projects not generating the expected response to increase the shift to new technologies will be addressed through communication campaigns to spread the benefits of conversions based on results. Finally, the risk of an insufficient response from technicians to the training and certification programmes will be addressed by the communication strategy promoting the programmes and the periodic monitoring and review of feedback.

112. The NOU will periodically monitor the progress of planned activities, identify any additional risks, analyze deviations from planned activities, and propose adjustments to the strategy when necessary.

Co-financing

113. All pilot projects to demonstrate low-GWP technologies at end-user sites will be co-financed by the beneficiary end users. In particular, the project to transition from R-404A to lower-GWP refrigerants in condensing units and centralized commercial refrigeration systems will be carried out with funding granted by the Government of Canada within the framework of bilateral cooperation between Canada and Mexico.

2023-2025 business plan of the Multilateral Fund

114. UNIDO, UNDP, and UNEP are requesting US \$19,632,807, plus agency support costs, for the implementation of stage I of the KIP for Mexico. The total value of US \$13,739,355, including agency support costs, requested for the period 2023–2025, is US \$4,887,093 above the amount in the business plan. The reason for this is that although the overall level of funds for stage I was reduced, it was agreed to have four tranches rather than three, with the second tranche taking place in 2025 rather than in 2026, as originally planned.

Draft Agreement

115. A draft Agreement between the Government of Mexico and the Executive Committee for stage I of the KIP has not been prepared as the Agreement template is still under consideration by the Executive Committee.

116. If the Executive Committee so wishes, the funds for stage I of the KIP for Mexico could be approved in principle, and funds for the first tranche could be approved on the understanding that the Agreement would be prepared and presented at a future meeting, before the submission of the second tranche, and once the Agreement template has been approved.

RECOMMENDATION

117. The Executive Committee may wish to consider:

- (a) Approving, in principle, stage I of the Kigali HFC implementation plan (KIP) for Mexico for the period 2023-2025 to reduce HFC consumption by 10 per cent of the country's estimated baseline by 2029, in the amount of US \$21,045,710, consisting of US \$14,161,056, plus agency support costs of US \$991,274, for UNIDO, US \$4,756,594, plus agency support costs of US \$332,962, for UNDP and US \$715,157, plus agency support costs of US \$88,667, for UNEP, as reflected in the schedule contained in annex II of the present document;
- (b) Noting:
 - (i) That the Government of Mexico will establish its starting point for sustained aggregate reductions in HFC consumption based on guidance provided by the Executive Committee;
 - (ii) That, once the cost guidelines for HFC phase-down are agreed by the Executive Committee, the reductions from the country's remaining HFC consumption eligibility for funding will be determined in line with these guidelines;
 - (iii) That the reductions from the country's remaining HFC consumption eligible for funding referred to in subparagraph (b)(ii) above will be deducted from the starting point referred to in subparagraph (b)(i);
 - (iv) The commitment from the Government of Mexico to issue a ban on the import and use of HFC pure or contained in pre-blended polyols in the manufacturing of polyurethane foam by 1 January 2029;
 - (v) That upon completion of the end-user technology demonstration projects in the local installation and assembly subsector included in stage I of the KIP, UNIDO will submit a final report on the implementation of these projects, including the

HFC phase out and energy efficiency gains achieved, in line with decision 92/36(g);

- (c) Approving the first tranche of stage I of the KIP for Mexico, and the corresponding tranche implementation plan, in the amount of US \$7,231,505 consisting of US \$5,085,390, plus agency support costs of US \$355,977, for UNIDO, US \$1,433,738, plus agency support costs of US \$100,362, for UNDP and US \$227,795, plus agency support costs of US \$28,243, for UNEP; and
- (d) Requesting the Government of Mexico, UNIDO, UNDP, UNEP and the Secretariat to finalize the draft Agreement between the Government of Mexico and the Executive Committee for the reduction in consumption of HFCs, including the information contained in the annex referred to in subparagraph (a) above, and to submit it to a future meeting once the KIP Agreement template has been approved by the Executive Committee.

ENERGY-EFFICIENCY STRATEGY FOR THE KIGALI HFC IMPLEMENTATION PLAN IN MEXICO

Background

118. On behalf of the Government of Mexico, UNIDO has submitted, in line with decision 91/65, a strategy to maintain and/or enhance the energy efficiency of replacement technologies and equipment in the context of the Kigali HFC implementation plan (KIP), in the amount of US \$2,917,238, plus agency support costs of US \$204,207, as originally submitted.²¹

Status of implementation of energy-efficiency-related activities funded by the Multilateral Fund

119. Since 2018, the national ozone unit (NOU) has explored energy efficiency as a necessary complement to maximizing the benefits of HFC phase-down under the Kigali Amendment. Following the implementation of the enabling activities for HFC phase-down in Mexico, the Government has produced documents exploring the existing standards and the state of refrigeration and air-conditioning (RAC) technologies in Mexico and other countries,²² the road map to the implementation of the Kigali Amendment in the country (2019), and the national cooling action plan (2021).

120. The conversion projects at Mabe and Imbera enterprises were completed in November 2020 and December 2021, respectively, resulting in the replacement of approximately 198 metric tonnes (mt) or 283,140 CO₂-equivalent (CO₂-eq) tonnes of HFC-134a with R-600a in six lines manufacturing domestic refrigerators. The final report from Mabe's conversion indicates that the energy-efficiency savings from the products manufactured by the enterprise increased from an average of 3-14 per cent above the relevant standard (NOM 015-2012) to 22-32 per cent above the standard. The enterprises provided substantial co-financing to achieve these and other improvements.

Energy-efficiency pilot project

121. Information regarding the ratification of the Kigali Amendment by the country; policy, regulatory, and institutional frameworks for the implementation of the Montreal Protocol; HFC consumption and its distribution by sector; the established HFC baseline; and activities proposed for implementation under stage I of the KIP and the first tranche submitted to the current meeting, is contained in paragraphs 1 to 117 of the present document.

Policy, regulatory and institutional framework

122. The Ministry of Energy (SENER) is the national body responsible for overseeing energy policies and ensuring a sustainable, competitive, and comprehensive energy supply, while the National Commission for the Efficient Use of Energy (CONUEE) is an autonomous branch of SENER mandated to promote energy efficiency as the country's primary technical entity in sustainable energy consumption.

123. Other stakeholders involved with energy efficiency include the Electric Energy Savings Trust Fund (FIDE), a non-profit entity in charge of initiatives to bolster energy security, conservation, and efficient use; the Ministry of Environment and Natural Resources (SEMARNAT), responsible for Mexico's environmental conservation strategy, compliance with the Montreal Protocol, and determining climate-change commitments in the nationally determined contributions; the Ministry of the Economy (SE), which is in charge of trade strategies and economic policies and has a crucial role in endorsing and promulgating official Mexican standards (NOMs) on energy efficiency, equivalent to minimum energy

²¹ As per the letter of 24 August 2023 from the Ministry of Environment and Natural Resources of Mexico to UNIDO.

²² Enabling activities for HFC phase-down in Mexico: Refrigerators and air conditioners. Standards and technologies

performance standards (MEPS); manufacturers; HFC importers; end users; technicians; and relevant industry and end-user associations.²³

124. One the most important mechanisms to regulate the RAC market in the country are the NOMs on energy efficiency. Currently, there are seven NOMs regulating RAC equipment (four for air-conditioning (AC) and three for refrigeration appliances). Mexico also has a voluntary labelling system, in which a FIDE label is applied to products to indicate their energy efficiency. Because of the NOMs' importance for future regulations related to HFCs and alternatives with low global-warming potential (GWP), collaboration with energy-efficiency authorities is necessary to guarantee the introduction of guidelines and regulations regarding RAC equipment that will assist the country in meeting its commitments under the Kigali Amendment. The NOM (MEPS) regulatory status for RAC equipment in Mexico is presented in table 1.

Table 1. Status of NOM (MEPS) for RAC equipment in Mexico

Applications regulated by the NOMs on energy efficiency	Standard		
	Mandatory NOM/MEPS	Voluntary FIDE label	Hydrocarbon (HC)
Domestic refrigerators	In place	In place	<150 g
Self-contained commercial (closed) refrigerators	In place	In place	<150 g
Split AC units	In place	In place	No standard
Inverter AC units	In place	In place	No standard
Fourth AC units	In place	In place	No standard
Central AC units up to 5 refrigerant tonnes (TR)	In place	In place	No standard
Heat pump AC units	In place <18kW	In place <18kW	No standard
Condensing/evaporative units	In place	No standard	No standard
AC unit packages up to 20 TR	Draft	No standard	No standard
Self-contained commercial refrigerators without doors	No standard	No standard	No standard
Centralized refrigeration systems	No standard	No standard	No standard
AC chillers	No standard	No standard	No standard
Variant refrigerant flow (VRF) AC units	No standard	No standard	No standard

Project objective

125. The submitted proposal sets out, within the framework of document UNEP/OzL.Pro/ExCom/92/47, the activities considered necessary for maintaining and/or enhancing energy efficiency while phasing down HFCs in Mexico. The following areas of work were prioritized for stage I of the KIP based on their impact on market transformation, effectiveness, sustainability, and cost:

- (a) *Training and technical assistance for the refrigeration servicing sector including demonstration projects:* Technical assistance for training and certification programmes for technicians for maintaining the energy efficiency of refrigeration, air-conditioning, and heat pump (RACHP) equipment and demonstration projects for end users, that are replicable and scalable, relating to energy-efficient RACHP equipment and foam products using low-GWP technologies;
- (b) *MEPS and labelling programmes:* Development/strengthening of the MEPS and other measures including labelling programmes to incorporate the relevant provisions of the Kigali Amendment relating to controlled substances for RACHP equipment; capacity building to establish energy-efficiency testing and certification centres for RACHP equipment at the national and regional levels; and technical assistance to establish new energy-efficiency standards; and

²³ Including *inter alia* the Association for Standardization and Certification (ANCE); Association of domestic appliances manufactures; Association of refrigeration industry manufacturers; Association of department and self-service stores (ANTAD); and the Association of distributors of the RAC industry (ANDIRA).

- (c) *Coordination with energy-efficiency authorities and capacity building of the NOU: Support for strengthening the institutional coordination between the NOU and CONUEE to facilitate the inclusion of relevant provisions of the Kigali Amendment in activities related to energy efficiency for the RACHP and foam sectors; capacity building for the NOU to develop and manage projects for maintaining and/or enhancing energy efficiency while phasing down HFCs; and capacity building of customs and enforcement bodies to control and monitor imported equipment to ensure its compliance with energy-efficiency standards and refrigerant labelling schemes covering RACHP sectors using alternative refrigerants.*

Proposed activities

126. The following nine activities related to the prioritized areas of work are proposed to be implemented within 36 months:

Project 1: Incorporation of guidelines for the use of alternatives to HFCs in CONUEE's energy-efficiency programmes (US \$350,000)

- (a) This project includes a survey to establish the country's current inventory of RAC equipment (US \$150,000); the retrofit/substitution of 100 chillers and packaged AC units, as well as 250 split AC units in public buildings, and associated training (US \$150,000); and the preparation with CONUEE of a manual on good practices on energy efficiency and low-GWP alternatives for buildings and small businesses (US \$50,000);

Project 2. Upgrade and enforcement of the existing MEPS for RAC equipment (US \$175,000)

- (b) The project will assess in detail any updates or modifications needed for each of the existing seven NOMs (MEPS) for RAC equipment. The review will focus on adaptations in line with current market dynamics, technological advancements, the introduction of low-GWP refrigerants, restrictions on HFC usage, and other critical factors relevant to HFC phase-down;

Project 3. Development of standards for open self-contained commercial refrigerators (US \$150,000)

- (c) This project aims to develop reference standards for self-contained commercial refrigerators without doors, centralized refrigeration systems, AC chillers, and VRF AC units to reduce sales of equipment with high-GWP refrigerants such as R-404A and encourage the sales and installations of equipment with R-290 charges greater than 150 g (in line with UL 60335-2-89 and other international standards, including EN 378). With this standard, the annual manufacturing of about 50,000 R-404A-based units could transition to R-290;

Project 4. Development of a standard on energy efficiency and safety in centralized commercial refrigeration systems for supermarkets (US \$150,000)

- (d) The project seeks to develop a national reference that establishes MEPS for components of centralized systems (condensing units and compressors), as well as minimum safety guidelines for the handling of substances alternative to HFCs, specifically carbon dioxide (CO₂). This could facilitate the transition of approximately 400 centralized systems installed per year with R-404A (1,500 kg per system) to CO₂-based technology;

Project 5. Development of a national standard on energy efficiency and safety for chilled water chillers for AC (US \$150,000)

- (e) This project aims to develop a national standard for AC chillers including energy-efficiency aspects and guidelines for the use of hydrocarbons (HCs) and A2L refrigerants in line with the last international maximum refrigerant charge recommendations. This will have an impact on close to 3,000 HFC-134a- and R-410A-based chillers commercialized per year for office buildings, large hotels, hospitals, and public buildings;

Project 6. Demonstration projects for medium and long-term technology for centralized systems in supermarkets (US \$652,238)

- (f) This project will co-finance the replacement of two supermarket refrigeration systems of similar size, type and ambient conditions, one with a trans-critical CO₂-based system, and one with a new R-454A system (with retrofit or centralized system change) to demonstrate and compare the long-term energy-efficiency and economic benefits of both systems. The project will phase out 1,500 kg of R-404A in the two installations and expects energy savings of 990 to 2,000 MWh/year, at a cost of US \$1.94 million, of which US \$652,238 are being requested from the Multilateral Fund;

Project 7. Best practices for energy efficiency and low-GWP alternatives for large-scale facilities – food distribution centre in Mexico City (US \$320,000)

- (g) This project, aimed at reducing the consumption of R-404A in condensing units at the CDMX Supply Center (food distribution centre in Mexico City),²⁴ includes training for technicians (US \$20,000); 15 kits of equipment for technicians in CDMX (US \$90,000); retrofitting of 100 condensing units (US \$123,000); demonstrative substitution of 10 condensing units (US \$67,000); and supervision (US \$20,000);

Project 8. Programme for energy efficiency and low-GWP alternatives in commercial refrigeration systems (supermarkets, convenience stores) (US \$470,000)

- (h) This project includes designing a plan to reduce HFC consumption in supermarkets and convenience stores (US \$18,750); providing training and manuals to technicians and local installation and assembly enterprises on best practices for energy efficiency (US \$80,000); the installation of 15 new condensing units in supermarkets, the adoption of energy-management systems in three centralized systems, and the adoption/pilot phase of the draft standard to be developed under Project 4 (US \$351,250); and dissemination campaigns (US \$20,000); and

Project 9. Programme for energy efficiency and low-GWP alternatives in AC for buildings (commerce and services) (US \$500,000)

- (i) This project includes the design of a plan to reduce HFC consumption in AC in buildings (US \$18,750); providing training and manuals to technicians and assembly enterprises on best practices on energy efficiency (US \$80,000); the retrofitting of 80 chillers and packaged units and installation of 50 split AC units in buildings, and the adoption/pilot phase of the draft standard to be developed under Project 5 (US \$351,250); the substitution of 25 room AC units by units with low-GWP refrigerant and inverter technology in Government buildings (US \$30,000); and dissemination campaigns (US \$20,000).

²⁴ This food market feeds 20 million people and directly generates 70,000 jobs; it has a total area of 327 hectares.

127. The following requirements will be considered during the implementation of Projects 6 to 9, which include pilot interventions at end users: the identification of pilots from different regions in the country, assessment of the baseline situation regarding their RAC systems and energy use, identification of opportunities for improvement and proposing energy-efficiency solutions, implementation of the pilots, data monitoring and analysis to measure project impact through the installation of energy meters and sensors, training, awareness, and performance evaluation, financial and environmental impact assessment, dissemination of the results, and scaling up and advocacy for supportive policies and incentives from relevant authorities to encourage the widespread adoption of energy-efficient refrigeration technologies.

Total cost of the pilot project

128. The total cost of the project to maintain and enhance the energy efficiency of replacement technologies and equipment in the context of HFC phase-down amounts to US \$2,917,238, plus agency support costs, and will be implemented between January 2024 and December 2026, as shown in table 2.

Table 2. Cost of the strategy to maintain and/or enhance the energy efficiency of replacement technologies and equipment in the context of the KIP in Mexico

Energy-efficiency project	Cost (US \$)	Duration	Mitigation (CO ₂ -eq kilotonnes)
<i>Institutional coordination with energy-efficiency authorities and capacity building of the NOU</i>			
Project 1. Incorporation of guidelines for the use of alternatives to HFCs in CONUEE energy-efficiency programs, including pilot stage in the case of public buildings	350,000	2025 2026	18.47
<i>Strengthening of MEPS for RAC equipment with alternatives to HFCs</i>			
Project 2. Upgrade and enforcement of the 7 existing MEPS for RAC equipment	175,000	2024 2026	n.a.
Project 3. Standard proposal for open self-contained commercial refrigerators	150,000	2026	n.a.
Project 4. Energy-efficiency/safety standard for centralized commercial refrigeration systems for supermarkets	150,000	2024	n.a.
Project 5. Energy-efficiency/safety standard for chilled water chillers for AC	150,000	2025	n.a.
<i>Demonstration projects on energy efficiency and low-GWP alternatives in commercial RAC</i>			
Project 6. Trans-critical CO ₂ demonstration project in a centralized supermarket/distribution centre system (co-financing)	652,238	2025	30.03
<i>Training and technical support for the servicing sector and assembly</i>			
Project 7. Best practices on energy efficiency and low-GWP alternatives in a food distribution centre in Mexico City	320,000	2025 2026	1.85
Project 8. Programme for energy efficiency and low-GWP alternatives in commercial refrigeration systems (supermarkets and convenience stores)	470,000	2024 2025	80.09
Project 9. Programme for energy efficiency and low-GWP alternatives in AC for buildings (commerce and services)	500,000	2025 2026	14.83
TOTAL	2,917,238		175.37

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

129. In line with decision 91/65, confirmation from the Government of Mexico has been received that the NOU has established a close relationship with CONUEE and other relevant institutions related to energy-efficiency standards and will coordinate with them to facilitate the consideration of refrigerant transition when developing energy-efficiency standards in the relevant sectors/applications; that the information on project progress, results and key learning will be made available, as appropriate; that the date of completion of the project will be set at no more than 36 months after the date of approval by the

Executive Committee; and that a detailed project report will be submitted to the Executive Committee within six months of the date of completion of the project.

Coordination of energy-efficiency activities funded outside of the Multilateral Fund

130. Noting the ongoing implementation of a project on energy efficiency in public buildings funded by the Global Environment Facility (GEF) and implemented with the World Bank, which has already started to replace AC systems in several hospitals, the Secretariat requested clarification on how activities under the present project would be coordinated with that initiative. The Secretariat also sought confirmation that, if Mexico had mobilized or were to mobilize funding from sources other than the Multilateral Fund for energy-efficiency components when phasing down HFCs, the project would not result in the duplication of activities among those funded by the Multilateral Fund and those funded from other sources.

131. UNIDO explained that the GEF project focused on municipal buildings (including hospitals), which were not within the scope of the proposal submitted to the Multilateral Fund, and did not include requirements on low-GWP replacements for AC units. On the other hand, the present proposal includes energy-efficiency activities focused on the public federal (not municipal) buildings under Project 1; nevertheless, if any facility identified under the present proposal has or will receive funding from other support mechanisms for energy efficiency for RAC equipment, it would be ruled out as a potential beneficiary to avoid duplication with funding from the Multilateral Fund.

Policy, regulatory and institutional framework

132. The Secretariat notes that the project includes relevant upgrades of the existing MEPS and the development of additional MEPS that combine energy-efficiency and safety considerations to allow the use of low-GWP alternatives and avoid the continued growth in the use of controlled substances, where feasible, in line with decision 91/65(b)(iii). The relevant bodies to work on this task (CONUEE, SE, FIDE, ANCE) have been identified, contacted and integrated into the proposal to develop and approve standards and test requirements, and relevant industry associations (ANTAD, ANDIRA) have been consulted and incorporated into some projects to facilitate information sharing on RAC equipment, participate in working groups, and support technical activities and training.

Technical and cost-related issues

133. The Secretariat noted that the energy-efficiency strategy prepared by the Government of Mexico and UNIDO to support the KIP was comprehensive and included key activities to enhance energy efficiency while phasing down HFCs. It was also noted that the strategy covered a wide range of areas and objectives that might extend beyond the pilot nature of this funding window. The nine projects proposed included *inter alia* the adoption or updates of seven MEPS, the development of three new standards, and interventions (retrofits/replacement/new installations) in a large number of chillers, split AC units and condensing units to be implemented over a three-year period. The Secretariat discussed with UNIDO the scope, impact, and cost of each of the projects and how they related to each other and to the KIP.

134. Upon discussion, it was agreed that only some projects included in the strategy would be prioritized as follows:

Strengthening of MEPS for RAC equipment with alternatives to HFCs

- (a) Projects 2, 4 and 5 were kept in the proposal, noting that updates of the seven existing MEPS and the development of three additional ones would be an effective instrument to regulate the RAC market, and that each updated/new MEPS would represent an opportunity to incorporate guidelines for the adoption of low-GWP alternatives, an aspect that is currently not considered in most of them. Upon discussion on the minimum budget

required to ensure appropriate revisions of the existing MEPS, and the development and dissemination of the new ones, the cost of these projects was adjusted as shown in table 3 below;

- (b) Project 3 (standard proposal for open self-contained commercial refrigerators) was removed because it primarily related to the safety aspects in promoting the introduction of low-GWP alternatives (i.e., increase in refrigerant charge above 150 g in line with the latest international standards), which is an activity that could be undertaken as part of the activities under the KIP or the HPMP;

Training and technical support for the servicing sector and assembly and demonstrations

- (c) Project 6 was removed as stage I of the KIP already included activities to demonstrate trans-critical CO₂ at end-user sites where energy performance could be measured, and Project 7 was removed as retrofits of R-404A using lower-GWP technologies in condensing units were an activity primarily focused on the reduction of the refrigerant's GWP that could be implemented in the context of HFC phase-down;
- (d) Project 8 was kept in the proposal as it would support the introduction of the new MEPS on centralized commercial refrigeration systems (Project 4) and provide assistance to the local installation and assembly enterprises that installed these systems on energy-efficiency aspects not included in the KIP. The project was adjusted by removing the installation of new condensing units;
- (e) Project 9 was kept as it would support the introduction of the new MEPS for chillers (Project 5). The project was adjusted to a pilot scale by including only 10 retrofits of chillers and the installation of five split AC units; and

Institutional coordination with energy-efficiency authorities and capacity building of the NOU

- (f) Project 1, which includes an inventory of RAC equipment, the retrofit of 350 AC units and a manual on good practices for energy efficiency and low-GWP alternatives, was adjusted. UNIDO explained that the inventory was needed because the current one, undertaken under KIP preparation, did not include energy-efficiency variables such as cooling capacity, years in operation of the equipment, type of equipment, MEPS compliance, distribution by climate, or refrigerant in use. It was agreed to keep the inventory and the manual but remove the retrofits proposed.

Agreed cost of the pilot project

135. The agreed activities and cost of the proposal are included in table 3.

Table 3. Agreed costs of activities

Energy-efficiency project	Funding requested (US \$)	Agreed cost (US \$)
<i>Institutional coordination with energy-efficiency authorities and capacity building of the NOU</i>		
Project 1. Incorporation of guidelines for the use of alternatives to HFCs in CONUEE energy-efficiency programmes (inventory of RAC equipment and development of a manual)	350,000	134,980
<i>Strengthening of MEPS for RAC equipment with alternatives to HFCs</i>		
Project 2. Upgrading and enforcement of the 7 existing MEPS for RAC equipment	175,000	109,375

Energy-efficiency project	Funding requested (US \$)	Agreed cost (US \$)
Project 4. Energy-efficiency/safety standard for centralized commercial refrigeration systems for supermarkets	150,000	89,277
Project 5. Energy-efficiency/safety standard for chilled water chillers for AC	150,000	104,988
<i>Training and technical support for the servicing sector and assembly</i>		
Project 8. Programme for energy efficiency and low-GWP alternatives in commercial refrigeration systems - supermarkets and convenience stores (training for assembly enterprises, provision of kits to measure energy efficiency in pilots under the KIP, energy management systems in 3 enterprises, adoption/pilot phase of the standard developed in Project 4)	470,000	180,000
Project 9. Programme for energy efficiency and low-GWP alternatives in AC for buildings - commerce and services (10 retrofits of chillers, installation of 5 split AC units, provision of kits to measure energy efficiency, energy management systems in 3 enterprises, adoption/pilot phase of the standard developed in Project 5)	500,000	320,000
<i>Projects removed</i>		
Project 3. Standard proposal for open self-contained commercial refrigerators	150,000	
Project 6. Trans-critical CO ₂ demonstration project in a centralized supermarket/distribution centre system (co-financing)	652,238	
Project 7. Best practices for energy efficiency and low-GWP alternatives in a food distribution centre in Mexico City	320,000	
Total	2,917,238	938,620

Sustainability of the pilot project and assessment of risks

136. In line with decision 91/65(b)(v), UNIDO explained that to ensure broad replicability in the country and the region, the project would focus on commercial chain enterprises (e.g., hotels, supermarkets, and restaurants) with intensive use of RAC that could be monitored in a cooperative manner. The retrofits, replacements, and other energy-efficiency actions undertaken at end-user sites will demonstrate benefits in terms of energy efficiency and the adoption of low-GWP technologies, which will be replicated in an easier way by the same enterprises at other sites from their chain in the country or the region. The NOU would ensure with continuous monitoring and verification that replication would occur at each enterprise.

137. The results will be disseminated to other enterprises with the institutional support of CONUEE, SEMARNAT, and associations such as ANTAD, ANDIRA, CANIRAC (restaurants) and AMHM (hotels and motels), among others.

RECOMMENDATION

138. The Executive Committee may wish to consider approving the pilot project to maintain and/or enhance the energy efficiency of replacement technologies and equipment in the context of HFC phase-down for Mexico, in the amount of US \$938,620, plus agency support costs of US \$65,703 for UNIDO, noting:

- (a) That the Government of Mexico has committed to meeting the conditions referred to in decision 91/65(b)(iv)b. to b(iv)d.; and
- (b) That the project would be operationally completed no later than December 2026, and that a detailed project report would be submitted to the Executive Committee within six months of the date of completion of the project.

Annex I

HFC CONSUMPTION BY SECTOR AND SUBSTANCE IN MEXICO (2022 COUNTRY PROGRAMME DATA)

Sector	HFC-125	HFC-134a	HFC-143a	HFC-152a	R-404A	R-410A	R-507A	Other HFCs and blends	Total	Share of total (%)
mt										
Manufacturing (mt)										
Domestic refrigeration	0	459	0	0	0	0	0	0	459	0.9
Commercial refrigeration:										
Stand-alone	0	138	0	0	7	0	0	0	145	5.1
Condenser units*	0	11	181	0	755	0	0	0	948	
Supermarket central*	0	0	0	0	1,365	0	0	40	1,404	
Subtotal refrigeration	0	608	181	0	2,127	0	0	40	2,956	6.1
Residential AC	0	0	362	0	0	2,082	0	2	2,446	21.2
Commercial AC	0	579	0	0	0	7,256	0	0	7,835	
Subtotal AC	0	579	362	0	0	9,338	0	2	10,281	
MAC:										
Cars, small vans	0	2,387	0	0	0	0	0	0	2,387	5.0
Larger vehicles	0	17	0	0	0	0	0	0	17	
Subtotal MAC	0	2,404	0	0	0	0	0	0	2,404	
Aerosol*	0	676	0	5,661	0	0	0	0	6,337	13.1
Foam	0	6	0	0	0	0	0	1,116	1,123	2.3
Firefighting*	854	0	0	0	0	0	0	67	921	1.9
Solvent	0	0	0	0	0	0	0	4	4	0.0
Subtotal manufacturing (mt)	854	4,275	543	5,661	2,127	9,338	0	1,230	24,027	49.5
Servicing (mt)										
Domestic refrigeration	0	974	0	0	0	0	0	0	974	13.4
Commercial refrigeration:										
Stand-alone	0	83	0	0	12	0	0	0	95	
Condenser units	0	11	181	0	755	0	0	0	947	
Centralized	0	0	0	0	3,149	0	830	254	4,233	
Industrial and transport refrigeration	0	164	0	0	69	0	0	3	237	
Subtotal refrigeration	0	1,232	181	0	3,985	0	830	257	6,486	
Residential AC	0	0	483	0	0	7,748	0	2,205	10,437	30.7

Sector	HFC-125	HFC-134a	HFC-143a	HFC-152a	R-404A	R-410A	R-507A	Other HFCs and blends	Total	Share of total (%)
Commercial AC	0	579	0	0	0	3,730	0	168	4,478	
Subtotal AC	0	579	483	0	0	11,478	0	2,373	14,913	
MAC:										
Cars, small vans	0	3,052	0	0	0	0	0	0	3,052	
Larger vehicles	0	50	0	0	0	0	0	0	50	
Subtotal MAC	0	3,102	0	0	0	0	0	0	3,102	6.4
Subtotal servicing (mt)	0	4,913	664	0	3,985	11,478	830	2,630	24,501	50.5
Total all sectors (mt)	854	9,188	1,207	5,661	6,112	20,816	830	3,860	48,528	100
CO₂-eq tonnes										
Manufacturing (CO₂-eq tonnes)										
Domestic refrigeration	0	656,973	0	0	0	0	0	0	656,973	0.7
Commercial refrigeration:										
Stand-alone	0	197,238	0	0	29,069	0	0	6	226,313	
Condenser units*	0	16,139	809,414	0	2,962,187	0	0	6	3,787,746	9.7
Supermarket central*	0	0	0	0	5,351,912	0	0	27,343	5,379,255	
Subtotal refrigeration	0	870,350	809,414	0	8,343,168	0	0	27,355	10,050,287	10.4
Residential AC	0	0	1,618,828	0	0	4,345,231	0	4,174	5,968,233	
Commercial AC	0	828,333	0	0	0	15,146,978	0	1	15,975,312	
Subtotal AC	0	828,333	1,618,828	0	0	19,492,209	0	4,175	21,943,545	22.7
MAC:										
Cars, small vans	0	3,413,053	0	0	0	0	0	0	3,413,053	
Larger vehicles	0	24,953	0	0	0	0	0	0	24,953	
Subtotal MAC	0	3,438,006	0	0	0	0	0	0	3,438,006	3.6
Aerosol*	0	967,268		701,934	0	0	0	0	1,669,201	1.7
Foam	0	9,211		0	0	0	0	961,146	970,357	1.0
Firefighting*	2,990,098	0		0	0	0	0	372,560	3,362,658	3.5
Solvent	0	0		0	0	0	0	6,346	6,346	0.0
Subtotal manufacturing (CO₂-eq tonnes)	2,990,098	6,113,167	2,428,243	701,934	8,343,169	19,492,209	0	1,371,581	41,440,401	42.8

Sector	HFC-125	HFC-134a	HFC-143a	HFC-152a	R-404A	R-410A	R-507A	Other HFCs and blends	Total	Share of total (%)
Servicing (CO₂-eq tonnes)										
Domestic refrigeration	0	1,393,128	0	0	0	0	0	0	1,393,128	
Commercial refrigeration:										
Stand-alone	0	118,396	0	0	48,106	0	0	0	166,502	
Condenser units	0	16,139	809,414	0	2,962,187	0	0	0	3,787,740	
Centralized	0	0	0	0	12,347,401	0	3,308,200	374,596	16,030,196	
Industrial and transport refrigeration	0	234,675	0	0	271,730	0	0	27,886	534,291	
Subtotal refrigeration	0	1,762,338	809,414	0	15,629,424	0	3,308,200	402,482	21,911,858	22.6
Residential AC	0	0	2,158,438	0	0	16,173,049	0	1,782,472	20,113,959	
Commercial AC	0	828,333	0	0	0	7,787,389	0	319,159	8,934,881	
Subtotal AC	0	828,333	2,158,438	0	0	23,960,438	0	2,101,631	29,048,840	30.0
MAC:										
Cars, small vans	0	4,364,439	0	0	0	0	0	0	4,364,439	
Larger vehicles	0	71,184	0	0	0	0	0	0	71,184	
Subtotal MAC	0	4,435,623	0	0	0	0	0	0	4,435,623	4.6
Subtotal servicing (CO₂-eq tonnes)	0	7,026,294	2,967,852	0	15,629,424	23,960,438	3,308,200	2,504,114	55,396,322	57.2
Total all sectors (CO₂-eq tonnes)	2,990,098	13,139,461	5,396,095	701,934	23,972,593	43,452,647	3,308,200	3,875,695	96,836,723	100

Annex II

**SCHEDULE OF HFC PHASE-DOWN AND HCFC PHASE-OUT COMMITMENTS AND FUNDING TRanches
UNDER THE KIGALI HFC IMPLEMENTATION PLAN AND THE HCFC PHASE-OUT MANAGEMENT PLAN FOR MEXICO**

Kigali HFC implementation plan (stage I)

Row	Particulars	2023	2024	2025	2026	2027	2028	2029	Total
1.1	Montreal Protocol reduction schedule of Annex F substances (CO ₂ -eq tonnes)	n/a	76,982,664	76,982,664	76,982,664	76,982,664	76,982,664	69,284,397	n.a
1.2	Maximum allowable total consumption of Annex F substances (CO ₂ -eq tonnes)	n/a	76,982,664	76,982,664	76,982,664	76,982,664	76,982,664	69,284,397	n.a
2.1	Lead IA (UNIDO) agreed funding (US \$)	5,085,390	0	3,789,551	0	3,692,764	0	1,593,351	14,161,056
2.2	Support costs for Lead IA (US \$)	355,977	0	265,269	0	258,493	0	111,535	991,274
2.3	Cooperating IA (UNDP) agreed funding (US \$)	1,433,738	0	2,053,265	0	1,206,050	0	63,541	4,756,594
2.4	Support costs for Cooperating IA (US \$)	100,362	0	143,729	0	84,424	0	4,448	332,962
2.5	Cooperating IA (UNEP) agreed funding (US \$)	227,795	0	227,795	0	233,091	0	26,476	715,157
2.6	Support costs for Cooperating IA (US \$)	28,243	0	28,242	0	28,899	0	3,283	88,667
3.1	Total agreed funding (US \$)	6,746,923	0	6,070,611	0	5,131,905	0	1,683,368	19,632,807
3.2	Total support costs (US \$)	484,582	0	437,240	0	371,816	0	119,265	1,412,903
3.3	Total agreed costs (US \$)	7,231,505	0	6,507,851	0	5,503,721	0	1,802,633	21,045,710

HCFC phase-out management plan (stages II and III)

Row	Particulars	2023	2024	2025	2026	2027	2028	2029	2030	Total
1.1	Montreal Protocol reduction schedule of Annex C, Group I substances (ODP tonnes)	746.72	746.72	373.36	373.36	373.36	373.36	373.36	0.00	n/a
1.2	Maximum allowable total consumption of Annex C, Group I substances (ODP tonnes)	373.36	[TBD]	[TBD]	[TBD]	[TBD]	[TBD]	[TBD]	0.00	n/a
3.1	Total agreed funding (US \$)	450,600	[TBD]	[TBD]	[TBD]	[TBD]	[TBD]	[TBD]	[TBD]	[TBD]
3.2	Total support costs (US \$)	31,542	[TBD]	[TBD]	[TBD]	[TBD]	[TBD]	[TBD]	[TBD]	[TBD]
3.3	Total agreed costs (US \$)	482,142	[TBD]	[TBD]	[TBD]	[TBD]	[TBD]	[TBD]	[TBD]	[TBD]

Annex III

**SIMULTANEOUS IMPLEMENTATION OF THE HCFC PHASE-OUT MANAGEMENT PLAN
AND THE KIGALI HFC IMPLEMENTATION PLAN IN MEXICO**

Stage II of the HPMP			Stage I of the KIP			Combined cost (US \$)
Strategic lines	Activities	Cost (US \$)	Strategic lines	Activities	Funds requested (US \$)	
Policy and regulatory instruments	Quota system: Updates to and operation of the quota and licensing system; periodic updates of the ODS import, export and production registry and monitoring system from stage I, installation of a new workstation to monitor system performance, and updates to HCFC-related legislation	37,500	Policy and regulatory instruments	Quota system: Development of an electronic licensing procedure for quota requests and import approvals at Government level to allow online management of the official quota allocation procedure, interaction between importers and Government offices, and accurate measurement of national HFC and HCFC consumption	148,571	186,071
	Customs training: Two additional workshops on new legislation, harmonized customs system, new refrigerants and their identification codes, intelligence systems, smuggling patterns, and ODS identification methods to prevent or identify illegal trade	80,000		Customs training: Training of 180 customs officers in person and 339 virtually on control measures related to new tariff regulations for HFCs and HFC blends, the safe handling of flammable refrigerants, and labelling of equipment; equipment provided to 15 customs offices and two laboratories; and protective equipment to be provided to 55 customs officers every two years	634,571	714,571
				Other regulatory actions: Development of regulations to inhibit or prohibit the imports and sales of new devices using high-GWP HFCs; market study on HFC prices and local trends in refrigerant demand; a study and proposal for a carbon-tax pilot project for RAC equipment using HFCs as refrigerants, based on GWP values; design and pilot phase of an official registry of RAC equipment and HFC consumption by end users; guidelines for the adoption of low-GWP refrigerants in commercial building codes, including <i>inter alia</i> supermarkets, stores, and distribution centres; a study on refrigerant standards and labelling programmes;	320,000	320,000

Stage II of the HPMP			Stage I of the KIP			Combined cost (US \$)
Strategic lines	Activities	Cost (US \$)	Strategic lines	Activities	Funds requested (US \$)	
				preparation and application of a district cooling proposal to reduce refrigerant needs at commercial and institutional spaces		
Cleaning agent phase-out in the servicing sector	Training of 4,000 technicians and flushing kits provided to more than 1,000 technicians and servicing enterprises to avoid HCFC emissions during servicing	1,385,990				1,385,990
Technician training programme in the refrigeration servicing sector	Agreements with training schools to train the trainers; training of 4,500 technicians on good servicing practices focused on AC; strengthening of vocational institutes with training equipment, a manual on best practices in refrigeration and AC for 6,000 technicians, and servicing tools provided to 1,650 technicians and servicing enterprises; and development of a manual on the management and use of substances alternative to HCFCs	4,500,600	Training, certification and equipment for RAC and MAC servicing technicians	<p><u>RAC technician certification scheme</u>: Development of two national standards and five standards on labour competencies and skills; accreditation of 20 training centres; evaluation and certification of 14 instructors/ evaluators in seven training centres; evaluation and certification of 700 technicians; and distribution of equipment to 700 technicians not equipped under the HPMP</p> <p><u>RAC technician training</u>: Development of training courses and evaluation instruments; creation of manuals for instructors and technicians; updates to the training platform; creation of technical training support material; virtual training for 40 instructors; evaluation and certification of 40 instructors; training of 4,500 technicians in person and 648 remotely; and training abroad provided to selected certified instructors and highest-performing technicians</p> <p><u>MAC technician certification scheme</u>: Development of one national standard and four standards on labour competencies and skills; accreditation of five training centres to provide in-person training; evaluation and certification of 300 technicians not trained under the HPMP; training, evaluation and certification of 10 instructors/evaluators (two per centre); and provision of equipment to 200 certified technicians not equipped under the HPMP</p>	9,191,322	14,460,592

Stage II of the HPMP			Stage I of the KIP			Combined cost (US \$)
Strategic lines	Activities	Cost (US \$)	Strategic lines	Activities	Funds requested (US \$)	
				<u>MAC technician training</u> : Development of training courses and evaluation instruments; creation of manuals for instructors and technicians; updates to the training platform; creation of technical training support material; virtual training for 40 trainers; evaluation and certification of 23 instructors; and training of 880 technicians in person and 40 remotely		
Refrigerant recovery, recycling, and reclamation (RRR)	Strengthening of the RRR network by assisting two existing RRR centres	281,200	RRR	Establishment of a mechanism to ensure self-sustained RRR operations; establishment of six RRR centres; provision of tools for 10 recovery and recycling centres; and updating two existing RRR centres	1,655,000	1,936,200
Demonstration of low-GWP alternatives	Hydrocarbon demonstration project and training	650,000	Local installation and assembly: demonstration of low-GWP alternatives	Pilot project to reduce the use of HFCs in the assembly of commercial refrigeration equipment at SMEs; and five projects to demonstrate the adoption of low-GWP technologies in such applications as centralized systems, condensing units, and cold rooms	2,740,000	3,390,000
Public awareness	Media campaigns and other dissemination actions to support the timely phase-out of HCFCs and facilitate the introduction of HCFC-free products	80,000	Public awareness and gender mainstreaming	Public awareness campaigns for different stakeholders, including a dissemination campaign for undergraduate students to encourage women to pursue careers in the RAC sector, and the promotion of good practices in KIP implementation, including incorporation of the gender perspective, among the RAC sector enterprises	414,000	494,000
Total for stage I of the HPMP		7,015,290	Total for stage I of the KIP		15,872,134	22,887,424