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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 agenda[1]

PROJECT PROPOSALS: CHINA

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

Phase-out

HCFC phase-out management plan (stage II):	UNDP, UNEP, UNIDO, World Bank, Austria, Germany, Italy, and Japan
• Extruded polystyrene foam sector plan – sixth tranche	UNIDO and Germany
• Polyurethane foam sector plan – fourth tranche	World Bank
• Industrial and commercial refrigeration and air-conditioning sector – fifth tranche	UNDP
• Solvent sector plan – sixth tranche	UNDP
• Refrigeration and air-conditioning servicing sector plan and the national enabling programme – sixth tranche	UNEP, Germany and Japan

Energy efficiency

• Demonstration project of replacing HFC-134a with R-744 in the field of electric vehicles	UNIDO

[1] UNEP/OzL.Pro/ExCom/93/1

Overarching strategy for stage II of the HCFC phase-out management plan for China

Note by the Secretariat

Background

1. At its 76th and 77th meetings, the Executive Committee approved stage II of the HCFC phase-out management plan (HPMP) for China with associated sectors plans, and at the 79th meeting, the Agreement with the Government of China for the implementation of stage II of the HPMP was approved.

2. The HCFC consumption limits and targeted phase-out amounts associated with the six sector plans for the period 2016-2026, as per the Agreement for stage II of the HPMP approved at the 79th meeting, are shown in table 1.

Table 1. HCFC consumption limits and targeted phase-out by sector for stage II of the HPMP for China as per the Agreement approved at the 79th meeting (ODP tonnes)

Maximum allowable consumption							
Sector	**2016-2017**	**2018-2019**	**2020-2021**	**2022**	**2023-2024**	**2025**	**2026**
National	16,978.9	15,048.1	**11,772.0	n/a	n/a	n/a	n/a
XPS foam*	2,286.0	2,032.0	1,397.0	1,397.0	762.0	165.0	0.0
PU foam*	4,449.6	3,774.5	2,965.7	2,965.7	1,078.4	330.0	0.0
ICR*	2,162.5	2,042.4	**1,609.9	n/a	n/a	n/a	n/a
RAC*	3,697.7	2,876.0	**2,259.7	n/a	n/a	n/a	n/a
Solvent	455.2	395.4	321.2	321.2	148.3	55.0	0.0
Servicing*	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Targeted phase-out							
Sector	**2018**	**2020**	**2023**	**2025**	**2026**	**Total**	**Reduction from baseline (%)**
XPS foam*	254.0	635.0	635.0	597.0	165.0	2,286	100 in 2026
PU foam*	675.1	808.8	1,887.3	748.4	330.0	4,449.6	100 in 2026
ICR*	120.1	432.5	n/a	n/a	n/a	552.6	33 in 2020
RAC*	821.7	616.3	n/a	n/a	n/a	1,438	45 in 2020
Solvent	59.8	74.2	172.9	93.3	55.0	455.2	100 in 2026
Servicing*	n/a	734.0	n/a	n/a	n/a	734.0	n/a
Total	**1,930.7**	**3,300.8**	**2,695.2**	**1,438.7**	**550.0**	**9,915.4**	

* XPS = extruded polystyrene; PU = polyurethane; ICR = industrial and commercial refrigeration and air-conditioning; RAC = room air-conditioning manufacturing and heat pump water heaters; Servicing = refrigeration and air-conditioning servicing and the national enabling programme

** National maximum allowable consumption for 2020 only; for the 2021-2026 period, it was expected to be determined at the time of submission of stage III of the HPMP.

3. All second tranche requests except that for the polyurethane (PU) foam sector plan were approved at the 80th and 81st meetings. At the 82nd and 83rd meetings, consideration of all subsequent tranche requests was deferred to the 84th meeting. Details on the consideration of these funding tranches and decisions taken by the Executive Committee are included in annex I to the present document.

4. At the 84th meeting, upon consideration of all stage II funding tranche requests for sector plans submitted by the relevant bilateral and implementing agencies on behalf of the Government of China, the Executive Committee decided, *inter alia* (decision 84/69(a)):

(i) To request the relevant bilateral and implementing agencies, on behalf of the Government of China, to submit, at the 85th meeting, the 2020 funding tranche requests for the PU foam, extruded polystyrene (XPS) foam, industrial and commercial refrigeration and air-conditioning (ICR) and solvent sector plans of stage II of the HPMP;

(ii) To approve the revised Appendix 2-A, "The Targets and Funding," of the Agreement between the Government of China and the Executive Committee for stage II of the HPMP approved at the 79th meeting, as contained in Annex XXII to the report of the 84th meeting (document UNEP/OzL.Pro/ExCom/84/75), to reflect the revised maximum allowable total consumption of HCFCs in row 1.2 and the revised total funding in rows 3.1, 3.2 and 3.3 and the sector funding and support costs;

(iii) To request the Government of China, through the relevant bilateral and implementing agencies, to submit, no later than eight weeks prior to the 86th meeting, a revised plan of action that included related activities and information on the technology selected, and associated funding tranches to extend through 2026 stage II of the room air-conditioning manufacturing and heat pump water heaters (RAC), ICR, and refrigeration servicing sectors and enabling programme and, for the RAC and ICR sector plans, the maximum allowable sectoral consumption levels of HCFC as described in rows 1.3.1 and 1.3.4;

(iv) Also to request the Government of China, through the relevant bilateral and implementing agencies, to submit, at the 86th meeting, figures for potential revisions to Appendix 2-A for:

a. Row 1.2 specifying the maximum allowable total consumption of HCFCs in 2021-2026 to reflect the information under subparagraph (a)(iii) above;

b. The XPS foam, PU foam and solvent sector funding tranches for 2021-2026 in rows 2.2.1 to 2.2.4, 2.3.1 to 2.3.2 and 2.6.1 to 2.6.2, respectively; and

c. Tonnages associated with lines 4.1.1 to 4.6.3 to reflect the information in subparagraph (a)(iii) above;

(v) Further to request the Government of China to update the information on necessary revisions to reflect the present decision for the approved XPS foam, PU foam and solvent sector plans;

(vi) To approve US $1,000,000, plus agency support costs of US $120,000 for UNEP, for the refrigeration and air-conditioning servicing sector and enabling programme, consistent with the revised Appendix 2-A referred to in subparagraph (a)(ii) above; and

(vii) To request UNDP as the lead implementing agency of the overall stage II of the HPMP, on behalf of the Government of China, to submit, at the 86th meeting, a draft revised Agreement between the Government of China and the Executive Committee reflecting only the relevant outcomes approved at the 84th meeting or those relevant to subparagraphs (a)(iii) and (a)(iv) above, and the revised plan of action for the RAC, ICR and refrigeration and air-conditioning servicing sectors and enabling programme also due for submission at the 86th meeting.

5. At the 85th meeting, the Executive Committee approved the third tranches of the XPS foam, ICR, and solvent sector plans, as well as the second tranche of the PU foam sector plan that had been submitted prior to adoption of decision 84/69 but had been deferred.

6. At the 86th meeting, the implementing agencies submitted revised plans of action for all sectors under stage II, addressing all elements of decision 84/69, including HCFC phase-out targets from 2021 to 2026, related activities, information on selected technologies, associated funding tranches, and a draft revised Agreement. The Executive Committee noted the revised sector plans and approved the revised Agreement for stage II of the HPMP (decision 86/34).

7. The revised HCFC consumption limits and targeted phase-out amounts associated with the six sector plans of stage II for the period 2016-2026 are shown in table 2.

Table 2. Consumption limits and targeted phase-out by sector for stage II of the HPMP for China as per the Agreement approved at the 86th meeting (ODP tonnes)

Maximum allowable consumption							
Sector	**2016-2017**	**2018-2019**	**2020-2021**	**2022**	**2023-2024**	**2025**	**2026**
National	16,978.9	15,048.1	11,772.0	11,772.0	8,618.0	5,063.5	4,513.5
XPS foam	2,286.0	2,032.0	1,397.0	1,397.0	762.0	165.0	0.0
PU foam	4,449.6	3,774.5	2,965.7	2,965.7	1,078.4	330.0	0.0
ICR	2,162.5	2,042.4	1,609.9	1,609.9	1,369.6	780.9	780.9
RAC	3,697.7	2,876.0	2,259.7	2,259.7	1,614.1	1,232.6	1,232.6
Solvent	455.2	395.4	321.2	321.2	148.3	55.0	0.0
Servicing	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Targeted phase-out							
Sector	**2018**	**2020**	**2023**	**2025**	**2026**	**Total**	**Reduction from baseline by 2026 (%)**
XPS foam	254.0	635.0	635.0	597.0	165.0	2,286.0	100
PU foam	675.1	808.8	1,887.3	748.4	330.0	4,449.6	100
ICR	120.1	432.5	240.3	588.7	-	1,381.6	67.5
RAC	821.7	616.3	645.6	381.5	-	2,465.1	70
Solvent	59.8	74.2	172.9	93.3	55.0	455.2	100
Servicing	n/a	734.0	n/a	n/a	n/a	734.0	n/a
Total	**1,930.7**	**3,300.8**	**3,581.1**	**2,408.9**	**550.0**	**11,771.5**	**n/a**

8. At the 91st meeting, relevant bilateral and implementing agencies submitted requests for the fifth tranches of sector plans for XPS foam, solvent, and refrigeration and air-conditioning servicing and the national enabling programme.[2]

Submission to the 93rd meeting

9. Relevant bilateral and implementing agencies submitted requests for the sixth tranches of the XPS foam, solvent and refrigeration servicing sector plans, and for the fourth and fifth tranche, respectively, of the PU foam and ICR sector plans. The summary of funding approved so far and requested at the present meeting is shown in table 3.

Table 3. Funding approved and requested for selected sectors under stage II of the HPMP (US $)

Sector plan	Lead and cooperating agencies	Funding approved	Funding requested
XPS foam	UNIDO, Germany	33,405,298	3,000,000
PU foam	World Bank	13,112,039	5,000,000
ICR	UNDP	44,464,531	8,000,000
RAC	UNIDO, Austria, Italy	36,062,981	0
Solvent	UNDP	23,045,909	2,000,000
Servicing	UNEP, Germany, Japan	11,329,132	2,000,000
Total		**161,419,890**	**20,000,000**

[2] The full name of the refrigeration and air-conditioning servicing sector and the national enabling programme is abbreviated to "refrigeration servicing sector" in the present document.

Status of ratification of the Kigali Amendment

10. On 17 June 2021, the Permanent Mission of the People's Republic of China to the United Nations deposited its letter of acceptance of the Kigali Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer (hereinafter referred to as the Kigali Amendment) with the Secretary-General of the United Nations. The Amendment entered into force on 15 September 2021. Following its acceptance, the Government of China revised its regulations with the purpose of including HFCs in its jurisdictional scope and further enhancing liability for engaging in illegal activities involving controlled substances. On 29 September 2021, the Ministry of Ecology and the Environment (MEE), the National Development and Reform Commission, and the Ministry of Industry and Information Technology jointly issued an updated Catalogue of Controlled Ozone-Depleting Substances (ODSs) in China, including HFCs in its scope. Since 1 November 2021, the import and export license management system has applied to substances listed in the revised Catalogue, including HFCs.

HCFC consumption

11. The Government of China reported HCFC consumption for 2022 under Article 7 of the Montreal Protocol as shown in table 4.

Table 4. HCFC consumption in China from 2018 to 2022 (Article 7 data)

Year	2018	2019	2020	2021	2022	Starting point
Metric tonnes (mt)						
HCFC-22	178,658	*173,656	133,450	127,721	134,065	209,006
HCFC-123	991	958	868	946	952	507
HCFC-124	5	38	(23)	(32)	22	140
HCFC-133/133a	0	0	(17)	0	0	0
HCFC-141b	38,057	38,449	28,976	25,276	27,796	53,502
HCFC-142b	5,367	6,500	2,149	4,577	1,949	22,624
HCFC-225ca/cb	38	0.57	0	0	0	17
Total	**223,105**	**219,600**	**165,404**	**158,488**	**164,784**	**285,796**
ODP tonnes						
HCFC-22	9,826	9,551	7,340	7,025	7,374	11,495
HCFC-123	20	19	17	19	19	10
HCFC-124	0.12	0.83	(0.51)	(0.69)	0.48	3
HCFC-133/133a	0	0	(1.08)	0	0	0
HCFC-141b	4,186	4,229	3,187	2,780	3,058	5,885
HCFC-142b	349	422	140	297	127	1,471
HCFC-225ca/cb	1	0.017	0	0	0	1
Total	**14,382**	**14,223**	**10,683**	**10,121**	**10,577**	**18,865**

* Country programme data.

12. HCFC consumption in China continues to be dominated by three substances: HCFC-22, HCFC-141b and HCFC-142b, which collectively account for 99.8 per cent of the country's consumption expressed in ODP tonnes. The overall HCFC consumption in ODP tonnes in 2022 was slightly higher than in 2021, but it remained below the 2018, 2019 and 2020 consumption levels, the reduction targets established by the Montreal Protocol, and the maximum allowable consumption stated in the Agreement with the Executive Committee. Sectoral reductions in HCFC consumption are discussed in detail in the stand-alone progress reports on the implementation of the XPS foam, PU foam, ICR, solvent, and refrigeration servicing sector plans contained in the present document.

13. The Government has also reported the country programme (CP) data for 2022. Table 5 presents the country's HCFC consumption per sector, confirming compliance with the manufacturing sector consumption limits set out in rows 1.3.1, 1.3.2, 1.3.3, 1.3.4 and 1.3.5 of Appendix 2-A of the Agreement for stage II of the HPMP.

Table 5. HCFC consumption per sector in China in 2022 (CP data) (ODP tonnes)

Substance	XPS foam	PU foam	ICR*	RAC*	Solvent	Servicing
HCFC-22	1,292.5	0.0	1,567.5	1,595.0	0.0	2,918.6
HCFC-141b	0.0	2,782.5	0.0	0.0	275.0	0.0
HCFC-142b	65.0	0.0	4.2	0.0	0.0	57.5
HCFC-123	0.0	0.0	10.8	0.0	0.0	8.2
HCFC-124	0.0	0.0	0.0	0.0	0.0	0.5
Total	**1,357.5**	**2,782.5**	**1,582.5**	**1,595.0**	**275.0**	**2,984.8**
Maximum allowable consumption	1,397.0	2,965.7	1,609.9	2,259.7	321.2	n/a

* Consumption breakdown between the ICR and RAC sectors is submitted by the implementing agencies.

14. The Government of China continues to monitor HCFC consumption in each sector. Every year, the Foreign Environmental Cooperation Centre (FECO) collects data from multiple sources, including beneficiary enterprises, verification reports of the production sector, the licensing system, and the industrial associations. The data is cross-verified with actual consumption by enterprises only for some sectors (such as RAC, with limited enterprises) and substances (HCFC-22). In sectors with many small and medium-sized enterprises (SMEs) (i.e., XPS foam, PU foam, ICR, and servicing), HCFCs are monitored through the national licensing and quota system for imports, exports, production, and consumption. Domestic production quotas regulate HCFC sales in the local market and subsequent consumption by SMEs. Quotas are also issued to enterprises in each sector with annual consumption of over 100 mt of HCFCs.

15. In cooperation with the local ecology and environment bureaus (EEBs), FECO continues to strengthen policies to support reductions in HCFC consumption, and the MEE oversees quota management while strengthening relevant control measures regarding HCFC production and consumption, including three bans on HCFC consumption issued in 2023 for three subsectors: pipelines, solar energy water heaters of the PU foam sector, and medical solvents. The MEE, jointly with the Ministry of Industry and Information Technology, has also issued a catalogue of recommended alternatives to ODSs to promote conversion and transformation in different sectors.

Verification of consumption of HCFCs in China

16. The World Bank commissioned an independent verification of the 2022 HCFC production and consumption figures in China, which confirmed that the consumption reported for 2022 was within the limits established by the Agreement. Based on the verification report, minor revisions were made to the data submitted under Article 7 of the Montreal Protocol and the CP data report.

Verification of the manufacturing sector conversions

17. UNDP, UNIDO, and the World Bank submitted technical reports to verify conversions completed in the PU foam, ICR, RAC, and solvent sectors in 2022, in line with subparagraph 5(c) of the Agreement. No conversions were completed in 2022 in the XPS foam sector, but UNIDO has submitted two updated reports, prepared after in-person visits to two plants converted in 2021; the visits could not take place at the time due to restrictions related to the COVID-19 pandemic. The verification reports confirmed the completion of all projects and the amounts of HCFCs phased out, as well as the commitment of the converted enterprises not to revert to the use of HCFCs. An overview of verifications by sector is shown in table 6.

Table 6. Verified phase-out of HCFCs by sector achieved in 2022 through funded conversions

Sector	Number of lines and enterprises	Verified phase-out of HCFCs	
		mt	%
XPS foam	No verifications due	n/a	n/a
PU foam*	8 lines in 3 enterprises	466.17	20
ICR*	2 lines in 2 enterprises	606.09	58
RAC	1 line in 1 enterprise	**n/a	**n/a
Solvent	49 lines in 2 enterprises	276.72	100

*Combined data for verifications carried out in 2021 and 2022.

**The verified enterprise is a compressor manufacturer.

Progress overview of the implementation of stage II of the HCFC phase-out management plan

18. The main achievements in the implementation of stage II of the HPMP include:

(a) Establishment and continuous enforcement of the licensing and quota system to control consumption in all manufacturing sectors, including the application of quota permits to enterprises consuming more than 100 mt of HCFCs per year, resulting in compliance with relevant consumption limits throughout the period of implementation;

(b) *XPS foam sector*: The contract between FECO and UNIDO was signed in September 2017. Eleven enterprises have completed conversion to carbon dioxide (CO_2) with other low-global-warming-potential (GWP) co-blowing agents, phasing out 4,604 mt (259.48 ODP tonnes) of HCFCs. Eight additional enterprises with a combined HCFC consumption of 2,818 mt (156.51 ODP tonnes) have signed procurement contracts with suppliers and completed equipment procurement, and two enterprises consuming 910 mt (50.32 ODP tonnes) of HCFCs have signed conversion subcontracts. All ongoing conversions are expected to be completed by the end of 2025;

(c) *PU foam sector*: The contract between FECO and the World Bank was signed in January 2019. The first 11 participating enterprises completed conversions to water-blown, hydrofluoroolefin, or cyclopentane foam-blowing technology, collectively phasing out 1,189 mt (130.79 ODP tonnes) of HCFC-141b. Twelve additional enterprises with joint consumption of 1,068 mt (117.48 ODP tonnes) are at different stages of implementation, with conversions expected to be completed between October 2023 and June 2025;

(d) *ICR sector:* The work plan for the implementation of the fourth tranche was signed by FECO and UNDP in April 2022. Of all conversion projects with contracts signed under the first three tranches, 16 lines have completed national acceptance, phasing out 2,248 mt (123.65 ODP tonnes) of HCFC-22, and two lines at an advanced stage of conversion are expected to obtain project acceptance in November 2023. After the approval of the fourth tranche at the 88th meeting in 2021, the contracts for conversion of four manufacturing lines have been signed and the enterprises are conducting project design; one enterprise has been identified for conversion and is awaiting verification of baseline consumption. Several technical assistance activities have also been completed to support the sector's transition to non-HCFC technologies;

(e) *RAC manufacturing sector:* Eight RAC manufacturing enterprises and four compressor manufacturers signed agreements to convert their manufacturing lines to R-290 to phase out 2,958.58 mt (162.72 ODP tonnes) of HCFC-22. Of these, four RAC manufacturing enterprises and two compressor manufacturers have completed conversions; equipment for the remaining six enterprises has been procured and delivered, with installation and trials in progress. A further three RAC manufacturing lines and five lines manufacturing heat pump water heaters, with an aggregated consumption of 1,559.18 mt (85.75 ODP tonnes) of HCFC-22, were verified as eligible, and a conversion of one RAC manufacturing line to R-290 was completed using the enterprise's own funding. Contracts have been signed with 13 research institutes to develop research and development projects for the introduction of R-290 technology; three of those projects are complete, and the majority have completed their mid-term reports and shared findings with RAC enterprises and other stakeholders at a review meeting held by FECO in July 2022;

(f) *Solvent sector*: FECO signed two batches of contracts with a total of 49 enterprises. Out of the first batch of 24 enterprises with 514 production lines and a combined consumption of 1,176.2 mt (129.4 ODP tonnes) of HCFC-141b, 22 have completed conversions and

received national acceptance, and two have withdrawn due to closures and consumption phased out. The second batch of contracts, at a total value of US $2,000,907, was signed in July 2022 with 25 eligible enterprises, covering 347 production lines with a verified consumption of 372.2 mt (40.9 ODP tonnes) of HCFC-141b. Out of those, 23 have completed their production conversion activities and are awaiting national acceptance, and two have completed the procurement of equipment; and

(g) *Refrigeration servicing sector*: The agreement between FECO and UNEP for the fifth tranche was signed in July 2023. Training on the new codes and standards was held for 500 technicians attending in-person and 5,000 participating online; terms of reference for five new codes and standards, technical specifications for ODS recycling, requirements for ODS destruction, and a study on developing a certification system for handling recovered ODSs were completed; meetings were held with 138 participants from EEBs on ODS management at local and provincial levels and on law enforcement and inspection; EEBs trained 950 provincial, city and county personnel on the Montreal Protocol; online training on ODS import and export management was held for 2,000 customs officers; 90 national customs officers were trained in combatting illegal ODS trade; one online and one in-person workshop on ODS control measures, policies, and regulations were held for 430 participants from import/export enterprises; 772 servicing technicians, including 150 women, were trained on good practices; final training sessions on cold storage maintenance and the operation of ammonia/CO_2-based equipment were conducted with handbooks provided; the Chinese Association of Refrigeration and four manufacturers signed contracts to participate in the commercial refrigeration after-sales programme, while the fifth manufacturer delivered training to 350 technicians on the after-sales system for R-290 RAC servicing; the second batch of pilot cities launched their activities, and lessons learned were shared by the first batch of pilot cities; a guidebook on HCFC management was distributed to 100 supermarkets; the International Ozone Day was celebrated; and the Ozone2Climate Technologies roadshow and roundtable hosted over 1,000 in-person and 5,000 virtual participants.

Disbursement of funds

19. As of October 2023, of the US $161,419,890 approved for all tranches of sector plans under stage II of the HPMP in China, US $138,803,047 (86 per cent) had been disbursed from implementing agencies to FECO, and FECO disbursed US $116,183,073 (72 per cent) to beneficiaries,[3] as shown in table 7.

Table 7. Disbursements by sector under stage II of the HPMP (as of October 2023)

Funding by sector / Implementing agencies (IAs)		Tranche 1	Tranche 2	Tranche 3	Tranche 4	Tranche 5	Total
	XPS foam (UNIDO/Germany)						
Approved (US $)		7,514,867	9,000,000	9,890,431	5,000,000	2,000,000	33,405,298
Disbursed from IAs to FECO	Amount (US $)	7,514,867	9,000,000	9,890,431	3,988,914	600,000	30,994,212
	Ratio (%)	100	100	100	80	30	93
Disbursed by FECO	Amount (US $)	7,400,495	9,000,000	9,890,431	1,985,398	497,140	28,773,464
	Ratio (%)	98	100	100	40	25	86
	PU foam (World Bank)						
Approved (US $)		7,045,027	2,067,012	4,000,000	n/a	n/a	13,112,039
Disbursed from IA to FECO	Amount (US $)	7,045,027	2,067,012	3,200,000	n/a	n/a	12,312,039
	Ratio (%)	100	100	80	n/a	n/a	94

[3] The milestones for disbursing funding for the XPS foam, PU foam, ICR, RAC and solvent sector plans include signing the conversion contract (30 per cent payment); completion of design and procurement contract (20 per cent); completion of prototype manufacture, conversion of lines and performance test (30 per cent); and trial production, training, and equipment disposal upon project acceptance (20 per cent).

Funding by sector / Implementing agencies (IAs)		Tranche 1	Tranche 2	Tranche 3	Tranche 4	Tranche 5	Total
Disbursed by FECO	Amount (US $)	7,045,027	1,977,618	3,181,699	n/a	n/a	12,204,344
	Ratio (%)	100	96	80	n/a	n/a	93
	ICR (UNDP)						
Approved (US $)		13,368,756	20,000,000	2,095,775	9,000,000	n/a	44,464,531
Disbursed from IA to FECO*	Amount (US $)	13,298,756	19,775,000	1,696,516	7,180,000	n/a	41,950,272
	Ratio (%)	99	99	81	80	n/a	94
Disbursed by FECO	Amount (US $)	13,177,878	17,073,330	798,781	2,118,389	n/a	33,168,378
	Ratio (%)	99	85	38	23	n/a	75
	RAC (UNIDO/Austria/Italy)						
Approved (US $)		15,562,981	16,000,000	4,500,000	n/a	n/a	36,062,981
Disbursed from IAs to FECO	Amount (US $)	14,571,089	7,900,000	**0	n/a	n/a	22,471,089
	Ratio (%)	94	49	0	n/a	n/a	62
Disbursed by FECO	Amount (US $)	6,327,301	5,974,407	**1,108,806	n/a	n/a	13,410,514
	Ratio (%)	41	37	25	n/a	n/a	37
	Solvent (UNDP)						
Approved (US $)		2,821,937	3,777,190	12,946,782	2,500,000	1,000,000	23,045,909
Disbursed from IA to FECO	Amount (US $)	2,796,937	3,741,089	12,944,409	1,966,000	492,000	21,940,435
	Ratio (%)	99	99	100	79	49	95
Disbursed by FECO	Amount (US $)	2,796,937	***3,742,190	12,595,383	1,286,487	266,184	20,687,181
	Ratio (%)	99	99	97	51	27	90
	Servicing (UNEP/Germany/Japan)**						
Approved (US $)		3,679,132	2,650,000	1,000,000	2,000,000	2,000,000	11,329,132
Disbursed from IAs to FECO*****	Amount (US $)	3,669,000	2,640,000	925,000	1,401,000	500,000	9,135,000
	Ratio (%)	100	100	93	70	25	81
Disbursed by FECO	Amount (US $)	3,658,514	2,419,652	916,338	544,143	400,545	7,939,192
	Ratio (%)	99	91	92	27	20	70
	TOTAL funding for all sectors						
Approved by the ExCom (US $)		49,992,700	53,494,202	34,432,988	18,500,000	5,000,000	161,419,890
Disbursed from IAs to FECO	Amount (US $)	48,895,676	45,123,101	28,656,356	14,535,914	1,592,000	138,803,047
	Ratio (%)	98	84	83	79	32	86
Disbursed by FECO	Amount (US $)	40,406,152	40,187,197	28,491,438	5,934,417	1,163,869	116,183,073
	Ratio (%)	81	75	83	32	23	72

* Interest accrued from the funds held by FECO of US $103,708, US $97,468, US $99,480, and US $159,433 for the period 2015-2021 was deducted from the approved funds before transfer.
** Disbursement from FECO to beneficiaries is higher than from UNIDO to FECO given disbursements by FECO with its own resources.
*** Consisting of US $3,741,089 plus US $1,101 of interest accrued up to December 2016 and offset from the transfer for the second tranche, according to decision 80/17(b).
**** An additional US $1,000,000 was approved at the 84th meeting.
***** Reference for disbursement in the refrigeration servicing sector.

20. At the time of submission of the tranche requests (12 weeks prior to the 93rd meeting), the rate of fund disbursement from FECO to beneficiaries in the XPS foam, PU foam ICR, solvent and servicing sectors was above 20 per cent. The tranche request for the RAC sector plan was withdrawn because the overall disbursement rate of the third (2021) tranche was below the 20 per cent disbursement threshold.

Implementation under COVID-19

21. The impact of the COVID-19 pandemic on the implementation of stage II activities in China was still perceptible in 2022, especially in terms of travel and logistics. Specifically, progress in the manufacturing conversion projects has been delayed because the required field surveys, verifications, and onsite visits could not take place or had to be postponed. To minimize the impact of these restrictions, FECO used online meetings and video supervision to carry out its work, and is presently carrying out the delayed activities.

Financial report of the project management unit

22. In line with decision 81/46(b), UNDP submitted the project management unit (PMU) expenditures for stages I and II of the HPMP as of December 2022, as presented in annex II to the present document.

Disbursement of funds and interest accrued under stages I and II

23. In line with decision 69/24, information on interest accrued at the end of 2022 from funds previously transferred for the implementation of sector plans was provided through an audit report of disbursements made in all sectors,[4] as shown in table 8. The report indicates that "the financial statement of project grant and disbursement of the HPMP (stages I and II) complies with the rules of the Montreal Protocol on ODS and the Chinese Institution Accounting Standard. The statement of project grant and expenditure has been fairly and justly presented in all material respects from 1 January to 31 December 2022 by FECO."

Table 8. Interest accrued under stages I and II of the HPMP in China as of 31 December 2022 (US $)

Sector plan and implementing agencies	Stage I	Stage II	Total
XPS foam (UNIDO/Germany)	-	736	736
PU foam (World Bank)	-	132	132
ICR (UNDP)	1,925	20,315	22,240
RAC (UNIDO/Austria/Italy)	7,682	806	8,488
Solvent (UNDP)	-	9,849	9,849
Servicing (UNEP/Germany/Japan)	-	6,398	6,398
Total for all sector plans	**9,607**	**38,237**	**47,844**

Tranche progress reports and funding requests

24. Detailed stand-alone progress reports on the implementation of the XPS foam, PU foam, ICR, solvent, and refrigeration servicing sector plans and the associated tranche requests for funding are included in the present document, following the Note by the Secretariat. Each provides a report on the implementation of the ongoing tranche and level of fund disbursement, an implementation plan for the next tranche, comments by the Fund Secretariat, and a recommendation.

25. The Secretariat notes that the Government of China has been in compliance[5] with the HCFC consumption targets established for each sector, that substantive progress and fund disbursement have been achieved in all sectors, and that all technical and cost issues have been resolved.

Secretariat's recommendation

26. The Executive Committee may wish, with regard to the interest accrued by the Government of China up to 31 December 2022 on funds previously transferred for the implementation of sector plans under stages I and II of the HCFC phase-out management plan (HPMP), as per decisions 69/24 and 77/49(b)(iii), to request the Treasurer:

(a) To offset future transfers to UNIDO by US $736, representing interest accrued from funds previously transferred for the implementation of the extruded polystyrene foam sector plan under stage II of the HPMP;

(b) To offset future transfers to the World Bank by US $132, representing interest accrued from funds previously transferred for the implementation of the polyurethane foam sector plan under stage II of the HPMP;

[4] Submitted by UNDP on 7 September 2022.
[5] Based on the verified consumption in 2022.

(c) To offset future transfers to UNDP by US $22,240, representing interest accrued from funds previously transferred for the implementation of the industrial and commercial refrigeration sector plan under stages I and II of the HPMP;

(d) To offset future transfers to UNIDO by US $8,488, representing interest accrued from funds previously transferred for the implementation of the room air-conditioning sector plan under stages I and II of the HPMP;

(e) To offset future transfers to UNDP by US $9,849, representing interest accrued from funds previously transferred for the implementation of the solvent sector plan under stage II of the HPMP; and

(f) To offset future transfers to UNEP by US $6,398, representing interest accrued from funds previously transferred for the implementation of the refrigeration and air-conditioning servicing sector plan and the national enabling programme under stage II of the HPMP.

PROJECT EVALUATION SHEET – MULTI-YEAR PROJECTS

China

(I) PROJECT TITLE	AGENCY	MEETING APPROVED	CONTROL MEASURE
HCFC phase-out plan (stage II) XPS foam sector	UNIDO (lead) and Germany	Approved: 77th Revised: 86th	100% phase-out by 2026

(II) LATEST ARTICLE 7 DATA (Annex C Group l)	Year: 2022	10,577.35 ODP tonnes

(III) LATEST COUNTRY PROGRAMME SECTORAL DATA (ODP tonnes)						Year: 2022
Chemical	Aerosol	Foam	Refrigeration		Solvent	Total sector consumption
			Manufacturing	Servicing		
HCFC-22		1,292.50	3,162.50	2,918.58		7,373.58
HCFC-123			10.80	8.23		19.03
HCFC-124				0.48		0.48
HCFC-141b		2,782.54			275.00	3,057.54
HCFC-142b		65	4.23	57.48		126.71

(IV) CONSUMPTION DATA (ODP tonnes)			
2009-2010 baseline	19,269.00	Starting point for sustained aggregate reductions	18,865.44
CONSUMPTION ELIGIBLE FOR FUNDING			
Already approved	12,161.02	Remaining	6,704.42

(V) ENDORSED BUSINESS PLAN		2023	2024	2025	Total
UNIDO	ODS phase-out (ODP tonnes)	152.60	50.87	203.47	406.94
	Funding (US $)	3,210,000	1,070,000	4,280,000	8,560,000

(VI) PROJECT DATA			2016	2017	2018 2019	2020*	2021	2022	2023	2024	2025	2026	Total
Montreal Protocol consumption limits (ODP tonnes)			17,342.1	17,342.1	17,342.1	12,524.9	12,524.9	12,524.9	12,524.9	12,524.9	6,262.4	6,262.4	n/a
Maximum allowable consumption (ODP tonnes)			2,286.0	2,286.0	2,032.0	1,397.0	1,397.0	1,397.0	762.0	762.0	165.0	0.0	n/a
Funding agreed in principle (US $)**	UNIDO	Project costs	7,514,867	8,732,614	0	9,890,431	4,400,000	2,000,000	3,000,000	1,000,000	4,000,000	3,534,654	44,072,566
		Support costs	526,041	567,620	0	692,330	308,000	140,000	210,000	70,000	280,000	247,426	3,085,080
	Germany	Project costs	-	267,386	0	0	600,000	0	0	0	0	0	867,386
		Support costs	-	31,877	0	0	73,535	0	0	0	0	0	105,412
Funds approved by ExCom (US $)		Project costs	7,514,867	9,000,000	0	9,890,431	5,000,000	2,000,000	0	0	0	0	33,405,298
		Support costs	526,041	599,497	0	692,330	381,535	140,000	0	0	0	0	2,339,403
Total funds recommended for approval at this meeting (US $)		Project costs							3,000,000				3,000,000
		Support costs							210,000				210,000

* The third (2018) tranche was submitted to the 82nd, 83rd, and 84th meetings and deferred for consideration at the 85th meeting (decisions 82/71(b), 83/55 and 84/69(a)).
** Total adjusted value of stage II of the HPMP for the XPS foam sector plan and the funding level of tranches between 2020 and 2026 were approved at the 86th meeting (decision 86/34).

Secretariat's recommendation:	Individual consideration

PROJECT DESCRIPTION

27. On behalf of the Government of China, UNIDO as the lead implementing agency has submitted a request for funding for the sixth tranche of the extruded polystyrene (XPS) foam sector plan of stage II of the HCFC phase-out management plan (HPMP), at the amount of US $3,000,000, plus agency support costs of US $210,000, for UNIDO only.[6] The submission includes a progress report on the implementation of the fifth tranche of the XPS foam sector plan, the tranche implementation plan for 2024, and verification reports in line with subparagraph 5(c) of the Agreement between the Government of China and the Executive Committee.

28. This submission is based on the revised plan of action for the XPS foam sector for the period 2021--2026 at the total amount of US $18,534,654, plus agency support costs, approved by the Executive Committee at the 86th meeting. The value of the adjusted total funding approved in principle for stage II of the XPS foam sector plan is US $44,939,952, plus agency support costs (decisions 86/34 and 86/38).

29. Stage II of the XPS foam sector plan comprises four groups of activities: policy and regulatory interventions, an investment component to assist enterprises with conversions, technical assistance to strengthen the technical capacity of the sector and to promote the adoption of alternatives with low global-warming potential (GWP), and project management. The original plan proposed to assist 124 enterprises in phasing out 1,265 ODP tonnes of HCFCs, while the remaining consumption of 1,021 ODP tonnes was to be phased out by non-assisted enterprises; the revised plan approved in 2020 sets out to directly assist 21 enterprises in phasing out 466.32 ODP tonnes, with the remaining consumption of 930.68 ODP tonnes (based on the 2020 target of 1,397 ODP tonnes) to be phased out by non-assisted enterprises.

Progress report on the implementation of the fifth tranche of stage II of the extruded polystyrene foam sector plan

Investment activities

30. The contract between the Foreign Environmental Cooperation Centre (FECO) and UNIDO for the implementation of stage II of the XPS foam sector plan was signed in September 2017. Eleven enterprises have already completed their conversions to carbon dioxide (CO_2) with other low-GWP co-blowing agents,[7] phasing out 4,604 metric tonnes (mt) or 259.48 ODP tonnes of HCFCs.

31. Eight additional enterprises with a consumption of 2,818 mt (156.51 ODP tonnes) of HCFCs have signed procurement contracts with suppliers and completed equipment procurement, and the remaining two enterprises consuming 910 mt (50.32 ODP tonnes) of HCFCs have signed conversion subcontracts. All ongoing conversions are expected to be completed by the end of 2025. The progress of conversion activities at these enterprises is summarized in table 1.

Table 1. Status of progress at XPS foam enterprises selected for conversion

Status of implementation	Number of enterprises	HCFC consumption in 2016*		Value of contract (US $)
		mt	ODP tonnes**	
Project completed (passed project acceptance)	11	4,604	259.48	25,627,068
Equipment procurement contract signed	8	2,818	156.51	11,443,979
Conversion subcontract signed	2	910	50.32	3,320,040
Total	**21**	**8,332**	**466.32**	**40,391,087**

* 2016 is the year used as reference for HCFC consumption for stage II of the HPMP.

** ODP tonnes are calculated by the actual amount of HCFC-22 and HCFC-142b used by each enterprise.

[6] As per the letter of 22 September 2023 from the Ministry of Ecology and the Environment of China to UNIDO.

[7] Alcohol for XPS board thickness below 60 mm; alcohol and small amounts of HFC-152a (GWP of 124) for XPS board thickness above 60 mm.

Verification of converted manufacturing lines

32. In accordance with subparagraph 5(c)[8] of the Agreement, UNIDO commissioned in 2022 the verification of six manufacturing lines in all four XPS foam enterprises that had completed their conversions to CO_2 in 2021, phasing out 1,514.51 mt (85.87 ODP tonnes) of HCFCs, which represents 35 per cent of phase-out achieved so far in the sector under stage II. No verifications were due at the present meeting as no conversions were completed in 2022; however, as the original verifications had taken place virtually due to the COVID-19-related travel restrictions, UNIDO has submitted two updated reports, prepared after in-person visits to two plants converted in 2021. Both reports have corroborated the original findings, stating that the enterprises had permanently ceased their use of HCFCs in XPS foam production and started manufacturing using CO_2-based technology in line with the relevant national product standards. The verifications also confirmed that the allocation of funds was transparent and within the cost-effectiveness thresholds, and that the replaced baseline equipment was destroyed.

Technical assistance activities

33. Technical assistance activities implemented in 2022-2023 included: technical support provided by the implementation support agency (ISA) to FECO and the 11 enterprises in their day-to-day operations, conversion processes, on-site baseline verifications and promotion of alternative technologies; training on safety at XPS foam enterprises and distribution of a brochure on manufacturing safety; and preparation of the terms of reference for carrying out research on thermal bonding machines to facilitate HCFC phase-out at small and medium-sized enterprises (SMEs).

Level of fund disbursement

34. As of October 2023, of the US $33,405,298 approved so far, US $28,773,464 (86 per cent) had been disbursed by FECO to beneficiaries, as shown in table 2. The balance of US $4,631,834 will be disbursed in 2024-2025.

Table 2. Status of disbursements for stage II of the XPS foam sector plan (US $)

Description		Tranche					
		First	**Second**	**Third**	**Fourth**	**Fifth**	**Total**
Funds approved	UNIDO	7,514,867	8,732,614	9,890,431	4,400,000	2,000,000	32,537,912
	Germany	0	267,386	0	600,000	0	867,386
	Total	**7,514,867**	**9,000,000**	**9,890,431**	**5,000,000**	**2,000,000**	**33,405,298**
Disbursement from implementing agencies to FECO	UNIDO	7,514,867	8,732,614	9,890,431	3,960,000	600,000	30,697,912
	Germany*	0	267,386	0	28,914	0	296,300
	Total	**7,514,867**	**9,000,000**	**9,890,431**	**3,988,914**	**600,000**	**30,994,212**
	Rate (%)	100	100	100	80	30	93
Disbursement from FECO to beneficiaries	**Total**	**7,400,495**	**9,000,000**	**9,890,431**	**1,985,398**	**497,140**	**28,773,464**
	Rate (%)	98	100	100	40	25	86
Fund balance		114,372	0	0	3,014,602	1,502,860	4,631,834

* According to the implementation requirements, funding is directly disbursed from the Government of Germany to beneficiaries and goods/service providers.

Implementation plan for the sixth tranche of stage II of the extruded polystyrene foam sector plan

35. FECO will continue enforcing quota permits for the XPS foam enterprises consuming more than 100 mt of HCFCs per year while supervising the ongoing conversions to CO_2-based technology at the

[8] The country has to submit a verification report of a random sample of at least 5 per cent of the manufacturing lines which had completed their conversion in the year to be verified, on the understanding that the total aggregated HCFC consumption of the random sample of the manufacturing lines represents at least 10 per cent of the sector consumption phased out in that year.

10 beneficiary enterprises and providing them with technical and safety assistance. The ISA will support the enterprises through day-to-day operational management, supervision, training, guidance in the implementation of activities, facilitating safe conversions, and carrying out verifications. The following technical assistance activities will continue during the sixth tranche: workshops and awareness activities on transition to low-GWP technologies offered to XPS foam enterprises, equipment suppliers, experts, local ecology and environment bureaus (EEBs), firefighting bureaus, research institutes, and relevant agencies; ongoing revision of a product standard on XPS foam for foundation insulation prior to floor heating; and research on the use of CO_2-based thermal bonding technology to produce XPS foam thicker than 60 mm. Table 3 presents the budget for activities to be carried out under the sixth tranche.

Table 3. Budget for the sixth tranche of stage II of the XPS foam sector plan in China (UNIDO)

Item	Budget (US $)
Conversion of XPS foam enterprises to CO_2-based technology	2,835,000
Technical assistance including ISA's support, supervision, and verification	0
Project monitoring, including:	
- Project and support staff	97,515
- Domestic and international travel (respectively US $7,425 and US $1,155)	8,580
- Domestic meetings	6,600
- Consulting services	5,940
- Operating costs: office operation, facilities and equipment, computer, phone, other	46,365
Project monitoring subtotal	165,000
Total	**3,000,000**

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

Report on HCFC consumption

36. The consumption of HCFCs in the XPS foam manufacturing sector in 2022 amounted to 24,500 mt (1,357 ODP tonnes), which is below the 1,397 ODP tonnes allowable consumption set out in the Agreement between the Government of China and the Executive Committee, as shown in table 4.

Table 4. Consumption of HCFCs in the XPS foam sector

Description		2018	2019	2020	2021	2022
Consumption*	mt	34,000	33,500	24,500	23,500	24,500
	ODP tonnes	1,920	1,898	1,363	1,318	1,357
Maximum allowable consumption**	mt	35,339	35,339	24,296	24,296	24,296
	ODP tonnes	2,032	2,032	1,397	1,397	1,397
Phase-out targets	mt	4,416	n/a	11,043	n/a	n/a
	ODP tonnes	254	n/a	635	n/a	n/a

* 2018-2022: As per the country programme implementation report.
** As per the Agreement approved at the 86th meeting for stage II from 2016 to 2022.

37. Reductions in consumption since 2018 have been achieved through conversions of XPS foam enterprises; strict implementation of production, domestic sales and consumption quotas required for manufacturing enterprises consuming over 100 mt of HCFCs; mandatory registration of enterprises; and the involvement of EEBs in supervision and monitoring. Through the technical assistance component, the Government continues to strengthen the industry's technical capacity to adopt low-GWP alternatives and ensure that further reductions are achieved and sustained.

38. In 2023, China needs to reduce its current HCFC consumption by 595 ODP tonnes to reach the target of 762 ODP tonnes. Noting that the 10 ongoing conversions will only phase out 207 ODP tonnes, the

Secretariat sought an explanation on how additional phase-out will be achieved. UNIDO explained that reductions would be achieved by the application of policy measures, including the quota on HCFC production, import and export. In addition, FECO continues to work with the local EEBs to promote alternative technologies for XPS foam and with UNIDO to provide technical support to XPS foam enterprises, especially SMEs, to adopt low-GWP alternatives.

Status of progress

39. The Secretariat noted that several technical assistance activities had no progress as planned. UNIDO explained that some awareness activities, such as workshops for enterprises and equipment suppliers, had to take place online due to the COVID-19-related restrictions imposed in 2021 and 2022, and were being carried out in person only now. The revision of a product standard on XPS foam for foundation insulation prior to floor heating has also started, but the study tour to Europe to share knowledge on policies and low-GWP technologies in XPS foam manufacturing, including advances in thermal bonding, has not taken place yet due to travel restrictions related to the COVID-19 pandemic. The tour is expected to be carried out next year.

40. Regarding the benefits of using thermal bonding technology by SMEs phasing out HCFCs, UNIDO explained that during the implementation of the HPMP, CO_2-based technology had been found to require a higher level of technical skills from the workers.[9] The converting SMEs required assistance from equipment suppliers, and their product costs were higher. It is expected that thermal bonding technology will help simplify the manufacturing of thick panels and reduce downtime. UNIDO will work with an equipment supplier on this research, with a contract to be signed before the end of 2023. The Secretariat considers that continued implementation of these technical assistance activities is important for SMEs, for the most part converting without assistance from the Multilateral Fund.

Project implementation and monitoring

41. As the lead implementing agency for the HPMP in China, UNDP provided a cumulative report on the project management unit (PMU) expenditures, in line with decision 81/46(b). The PMU expenditures related to stage II of the XPS foam sector plan are summarized in table 5.

Table 5. PMU cumulative expenditures for stage II of the XPS foam sector plan (2017-2022)

Item	Description	Cost (US $)
Sector-specific costs	Project staff	1,162,190
	Domestic travel	113,174
	International travel	3,821
	Domestic meetings	68,814
	International meetings	0
	Consulting service	78,136
Subtotal for sector-specific costs		**1,426,135**
Operational costs	Shared costs (support staff, computers, internet, printing, office operation and maintenance)	1,323,092
Total disbursement		***2,749,227**

* Including US $1,760,491 funded by stage II of the HPMP and US $988,736 co-financed by the Government of China.

Gender policy implementation

42. In line with the Multilateral Fund operational policy on gender mainstreaming (decisions 84/92 and 90/48(c)), activities implemented throughout stage II of the XPS foam sector plan included ongoing

[9] CO_2-based technology requires co-blowing with alcohol for panels with thickness below 60 mm, or with alcohol and HFC-152a for panels with thickness above 60 mm.

encouragement of women attending training and technical assistance activities, with women accounting for 42 per cent of all training participants so far. Two women were recruited for the ISA team, and two female technical and safety experts have provided technical support in the implementation of the sector plan, including policy and technical advice, review of projects involving advanced technology or specialized equipment, and technical presentations in training workshops and seminars.

Sustainability of the HCFC phase-out and assessment of risks

43. In discussing potential risks to the sustained adoption of low-GWP technology in the XPS foam sector in China, UNIDO reassured the Secretariat that CO_2-based technology was considered mature for use in the country, with conversion results disseminated by FECO. Both FECO and local EEBs will continue to support the sector in its conversion to low-GWP alternatives through ongoing technical assistance, regular monitoring, and supervision conducted to prevent illegal resurgence of HCFCs in the provinces and cities with the highest concentration of XPS foam enterprises, especially those that had completed their conversions. UNIDO further explained that the sector's conversion was supported by quotas imposed on HCFC production, imports, and exports. Following its acceptance of the Kigali Amendment, the Government of China continues to revise the regulation on the management of ozone-depleting substances (ODSs) to include HFCs in its scope of jurisdiction and to further enhance the country's capacity for countering illegal activities involving controlled substances.

Conclusion

44. The Government of China remains in compliance with the Montreal Protocol and its Agreement with the Executive Committee with regard to the XPS foam sector plan, including the consumption target agreed for 2022. Significant progress achieved in the implementation of stage II of the HPMP so far includes the completed conversions of 11 enterprises and associated phase-out of 4,604 mt (259.48 ODP tonnes) of HCFCs. Although no verifications were due for 2022, two reports were submitted to the 93rd meeting for conversions completed in 2021, updated after in-person visits to the manufacturing plants. Both reports corroborated the findings of the original verifications that had been conducted virtually. A total of 24.9 per cent of funds approved for the fifth tranche have been disbursed to beneficiary enterprises. Funds from the sixth tranche will be used to complete the ongoing conversions to low-GWP alternatives in 10 enterprises and to continue the implementation of policy-related and technical assistance activities, including *inter alia* training in support of sectoral transition provided by the ISA to the XPS foam enterprises, revision of a product standard, and optimisation of CO_2-based technology through continued research on the use of thermal bonding in XPS foam production.

RECOMMENDATION

45. The Executive Committee may wish to consider:

(a) Noting the progress report on the implementation of the fifth tranche of the extruded polystyrene (XPS) foam sector plan of stage II of the HCFC phase-out management plan (HPMP) for China; and

(b) Approving the sixth tranche of the XPS foam sector plan of stage II of the HPMP for China, and the corresponding 2024 tranche implementation plan, in the amount of US $3,000,000, plus agency support costs of US $210,000 for UNIDO.

PROJECT EVALUATION SHEET – MULTI-YEAR PROJECTS

China

(I) PROJECT TITLE	AGENCY	MEETING APPROVED	CONTROL MEASURE
HCFC phase-out plan (stage II) PU foam sector	World Bank	Approved: 77th Revised: 86th	100% phase-out by 2026

(II) LATEST ARTICLE 7 DATA (Annex C Group l)	Year: 2022	10,577.35 ODP tonnes

(III) LATEST COUNTRY PROGRAMME SECTORAL DATA (ODP tonnes)						Year: 2022
Chemical	Aerosol	Foam	Refrigeration		Solvent	Total sector consumption
			Manufacturing	Servicing		
HCFC-22		1,292.50	3,162.50	2,918.58		7,373.58
HCFC-123			10.80	8.23		19.03
HCFC-124				0.48		0.48
HCFC-141b		2,782.54			275.00	3,057.54
HCFC-142b		65	4.23	57.48		126.71

(IV) CONSUMPTION DATA (ODP tonnes)			
2009--2010 baseline	19,269.00	Starting point for sustained aggregate reductions	18,865.44
CONSUMPTION ELIGIBLE FOR FUNDING			
Already approved	12,161.02	Remaining	6,704.42

(V) ENDORSED BUSINESS PLAN		2023	2024	2025	Total
World Bank	ODS phase-out (ODP tonnes)	785.81	157.16	785.81	1,728.78
	Funding (US $)	5,350,000	1,070,000	5,350,000	11,770,000

(VI) PROJECT DATA			2016	2017	2018 2019	2020*	2021	2022	2023	2024	2025	2026	Total
Montreal Protocol consumption limits (ODP tonnes)			17,342.1	17,342.1	17,342.1	12,524.9	12,524.9	12,524.9	12,524.9	12,524.9	6,262.4	6,262.4	n/a
Maximum allowable consumption (ODP tonnes)			4,449.6	4,449.6	3,774.5	2,965.7	2,965.7	2,965.7	1,078.4	1,078.4	330.0	0.0	n/a
Agreed funding (US $)**	World Bank	Project costs	7,045,027	0	0	2,067,012	4,000,000	0	5,000,000	1,000,000	5,000,000	4,200,000	28,312,039
		Support costs	493,152	0	0	144,691	280,000	0	350,000	70,000	350,000	294,000	1,981,843
Funds approved by ExCom (US $)		Project costs	7,045,027	0	0	2,067,012	4,000,000	0	0	0	0	0	13,112,039
		Support costs	493,152	0	0	144,691	280,000	0	0	0	0	0	917,843
Total funds requested for approval at this meeting (US $)		Project costs							5,000,000				5,000,000
		Support costs							350,000				350,000

* The second (2017) tranche was submitted to the 84th meeting and deferred for consideration at the 85th meeting (decision 84/69(a)).

** Total adjusted value of stage II of the HPMP for the PU foam sector plan and the funding level of tranches between 2020 and 2026 were approved at the 86th meeting (decision 86/34).

Secretariat's recommendation:	Individual consideration

PROJECT DESCRIPTION

46. On behalf of the Government of China, the World Bank as the designated implementing agency has submitted a request for funding for the fourth tranche of the polyurethane (PU) rigid foam sector plan of stage II of the HCFC phase-out management plan (HPMP), at a total cost of US $5,000,000, plus agency support costs of US $350,000.[10] The submission includes a progress report on the implementation of the third tranche, the tranche implementation plan for 2024, and verification reports in line with subparagraph 5(c) of the Agreement between the Government of China and the Executive Committee.

47. This submission is based on the revised plan of action for the PU foam sector for the period 2021-2026 at the total amount of US $19,200,000, plus agency support costs, approved by the Executive Committee at the 86th meeting. The value of the adjusted total funding approved in principle for stage II of the PU foam sector plan is US $28,312,039, plus agency support costs (decisions 86/34 and 86/39).

48. Stage II of the PU foam sector plan comprises four groups of activities: policy and regulatory interventions, an investment component to assist enterprises with conversions, technical assistance to support the sector's conversion to alternatives with low global-warming potential (GWP), and project management. The investment component proposes to phase out 379.30 ODP tonnes through conversions of individual enterprises, and to channel technical assistance activities, including the development of foam-blowing formulations, through 19 systems houses to downstream users, many of which are small and medium-sized enterprises (SMEs), noting that the number of systems houses or individual conversion projects to be funded may be adjusted according to circumstances that arise during implementation.

Progress report on the implementation of the third tranche of stage II of the polyurethane foam plan

Investment activities

49. The contract between the Foreign Environmental Cooperation Centre (FECO) and the World Bank for the implementation of stage II of the PU rigid foam sector plan was signed on 8 January 2019. Out of the 25 PU foam enterprises for which baseline information has been verified (i.e., non-Article 5 ownership, baseline equipment, HCFC consumption and financial data), 23 enterprises consuming 2,257 metric tonnes (mt) of HCFC-141b were selected as beneficiaries and have signed contracts with FECO for conversion to water-blown, hydrocarbon (HC) or hydrofluoroolefin (HFO) technology.

50. To date, 11 of these enterprises have completed conversions to water-based technology (five), HFO (two), and cyclopentane (four), including project acceptance in 2021 and 2022. The remaining 12 enterprises are at different stages of implementation, with conversions expected to be completed between October 2023 and June 2025. The status of progress of the conversions of the 23 assisted enterprises is presented in table 1.

Table 1. Conversion progress at PU foam enterprises assisted under the first three tranches of stage I

Status of implementation	Technology selected	Number of enterprises	HCFC consumption in 2016*		Value of contract (US $)
			mt	ODP tonnes	
Project completed	Water-based	5	611.49	67.26	3,031,027
	HC	4	410.15	45.12	3,469,807
	HFO	2	167.53	18.43	1,695,072
Equipment procured	HC	2	290.29	31.93	1,741,764
Equipment being procured	HC	1	27.02	2.97	162,102
Site verification completed	Water-based	6	560.75	61.68	2,242,988
	HFO	3	189.59	20.85	758,352
Total		**23**	**2,256.82**	**248.25**	**13,101,112**

* 2016 is the reference year for HCFC consumption for stage II of the HPMP.

[10] As per the letter of 22 September 2023 from the Ministry of Ecology and Environment of China to the World Bank.

Verification of converted manufacturing lines

51. In accordance with subparagraph 5(c)[11] of the Agreement, the World Bank submitted the following verification reports of manufacturing lines converted:

(a) One verification report for two manufacturing lines in one PU foam enterprise converted to cyclopentane in 2022 with associated phase-out of 43.17 mt (4.78 ODP tonnes) of HCFCs. This represents more than 5 per cent of the lines that completed their conversion in 2022 and 12 per cent of the amount of HCFCs phased out in the same year;

(b) Two verification reports for six manufacturing lines in two PU foam enterprises converted to water-based technology in 2021 with associated phase-out of 423 mt (46.53 ODP tonnes) of HCFCs. This represents 23 per cent of the lines converted in 2021 and 51 per cent of the HCFC phase out in the same year.

52. The verification reports confirmed *inter alia* that the enterprises had permanently ceased their use of HCFCs in PU foam production and started manufacturing with the selected alternative technology, and that the replaced baseline equipment was destroyed. The level of funds provided was consistent with the signed contracts and the enterprises co-financed capital and operational costs.

Technical assistance activities

53. In 2022-2023, the implementation support agency (ISA) provided technical assistance to FECO in terms of project implementation, financial appraisal and performance verifications at beneficiary enterprises, and project acceptance workshops for the completed conversions. FECO organized training workshops on the application of alternative technologies, including safety considerations, and on project implementation procedures, for 12 enterprises starting their conversions, and completed research on the ban on HCFC-141b used as a blowing agent in the pipe insulation subsector.[12] In September 2023, the Ministry of Ecology and the Environment (MEE) issued a ban on the use of HCFC-141b as a blowing agent in the pipe insulation and solar water heater subsectors, expected to enter into force on 1 December 2023.

Monitoring by the local ecology and environment bureaus

54. In line with decision 84/39(c)(iii),[13] the Government of China reported through the World Bank that the local ecology and environment bureaus (EEBs) continued to exercise their registration systems with HCFC consumers, to conduct routine monitoring and management of enterprises dealing with ozone-depleting substances (ODSs) in their regions, and to enforce the established regulations, for example by imposing penalties or confiscating ODSs used in violation of the ban. Since the submission of the last progress report, no illegal production or consumption of CFC-11 has been found.

[11] The country has to submit a verification report of a random sample of at least 5 per cent of the manufacturing lines which had completed their conversion in the year to be verified, on the understanding that the total aggregated HCFC consumption of the random sample of the manufacturing lines represents at least 10 per cent of the sector consumption phased out in that year.

[12] Some of the research findings include an indication that HC technology is preferable for most large and some medium-sized enterprises, whereas water-based technology is best for SMEs, that manufacturing growth is to be expected, and that while enterprises will need to train workers on equipment operation and safety requirements, the ban will not have a substantial impact on employees.

[13] The Executive Committee requested the Government of China through the relevant implementing agency to report on the results of the monitoring efforts of local EEBs, including cases where CFC-11 had been detected, in future financial audit reports and, once all the remaining balances under the projects included in the financial audit had been disbursed and those projects had been completed, to continue such reporting under the annual progress reports of stage II of the PU foam sector plan of the HPMP.

Level of fund disbursement

55. As of October 2023, of the US $13,112,039 approved, US $12,312,039 had been disbursed by the World Bank to FECO, and US $12,204,344 (93 per cent of the total funding approved) had been disbursed by FECO to beneficiary enterprises, as shown in table 2. The balance of US $107,695 will be disbursed in 2024.

Table 2. Status of disbursements for stage II of the PU foam sector plan (US $)

Funding tranche	Funds approved	Disbursement from the World Bank to FECO		Disbursement from FECO to beneficiaries		Fund balance
		Amount	Rate (%)	Amount	Rate (%)	
First	7,045,027	7,045,027	100	7,045,027	100	0
Second	2,067,012	2,067,012	100	1,977,618	96	89,394
Third	4,000,000	3,200,000	80	3,181,699	80	18,301
Total	**13,112,039**	**12,312,039**	**94**	**12,204,344**	**93**	**107,695**

Implementation plan for the fourth tranche of stage II of the polyurethane foam sector plan

56. During the fourth tranche, FECO will complete the conversion of 12 beneficiary enterprises to either HC, HFO, or water-based technology, and start conversions at 10 additional enterprises and 19 systems houses and downstream users consuming an estimated 9,000 mt of HCFC-141b. To ensure that the 2023 compliance target is met, FECO will also continue to enforce quota permits for PU foam enterprises that consume more than 100 mt of HCFCs per year.

57. Technical assistance activities will include ISA's support to FECO and enterprises in the implementation of new projects; workshops and meetings to share knowledge and lessons learned with PU foam enterprises; and awareness building on alternative technologies in the sector through various media channels, aiming to mobilize more enterprises to participate in future conversion activities and to enhance public awareness on the HCFC phase-out. FECO will continue to assist MEE in enforcing the established policies and regulations on ODS management and to enhance the local EEBs' ODS monitoring and management capacity. A study to evaluate the economic, social, and environmental impacts of issuing the ban on the use of HCFC-141b as blowing agent in the entire PU foam sector is set to take place.

58. Table 3 presents the budget for activities included in the implementation plan of the fourth tranche.

Table 3. Budget for the fourth tranche of stage II of the PU foam sector plan in China (World Bank)

Activity	Budget (US $)
Conversion of PU foam enterprises to water-based, HFO, and HC technology	3,840,000
Technical assistance	885,000
Project monitoring, including:	
- Project staff – programme management, support, financial procurement, legal support	189,068
- Domestic travel	9,451
- Domestic meetings	7,297
- Consulting services	8,077
- Operating costs – daily operating expenses, support staff, office facilities and equipment	61,107
Subtotal for project monitoring	275,000
Total	**5,000,000**

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

Report on HCFC consumption

59. The consumption of HCFC-141b in the PU foam manufacturing sector in 2021 and 2022 amounted to 2,505.31 and 2,782.54 ODP tonnes, respectively, remaining below the 2,965.7 ODP tonnes of allowable consumption set out in the Agreement between the Government of China and the Executive Committee, as shown in table 4.

Table 4. HCFC-141b consumption and phase-out targets for the PU foam sector

PU foam sector		2014	2015	2016	2017	2018	2019	2020	2021	2022
Consumption*	mt	46,864	34,202	34,821	36,439	34,177	34,290	26,176	22,776	25,296
	ODP tonnes	5,155.0	3,762.0	3,830.3	4,008.3	3,759.4	3,771.9	2,879.4	2,505.3	2,782.5
Maximum allowable consumption**	mt	49,018	40,451	40,451	40,451	34,314	34,314	26,961	26,961	26,961
	ODP tonnes	5,392.2	4,449.6	4,449.6	4,449.6	3,774.5	3,774.5	2,965.7	2,965.7	2,965.7
Phase-out targets	mt	n/a	8,569	n/a	n/a	6,137	n/a	7,353	n/a	n/a
	ODP tonnes	n/a	942.6	n/a	n/a	675.1	n/a	808.8	n/a	n/a

* As per the country programme implementation report.
** As per the Agreement for stage I of the HPMP up to 2015 approved at the 67th meeting, and as per the Agreement for stage II from 2016 to 2019 approved at the 86th meeting.

60. HCFC consumption in the PU foam sector decreased between 2018 and 2020, due to *inter alia* conversions of PU foam enterprises to low-GWP alternatives under stages I and II of the HPMP. The decrease observed over the 2020--2021 period is attributed to industry activity slowdown caused by the COVID-19 pandemic. In 2022, consumption rose again, following the global economic recovery.

61. In 2023, China needs to reduce its current HCFC consumption by 1,704 ODP tonnes to reach the target of 1,078.4 ODP tonnes. Noting that the 12 ongoing conversions will only phase out 120 ODP tonnes, the Secretariat sought explanation on how additional phase-out will be achieved. The World Bank explained that reductions would mostly stem from the enforcement of existing policies (i.e., bans on the use of HCFC-141b in five subsectors) in combination with the reduced supply of HCFC-141b resulting from the implementation of activities under the HCFC production phase-out management plan. Two HCFC-141b producers have already closed down their production lines, and the 2023 production quota has further reduced the supply. With production closures, the price of HCFC-141b has increased by approximately 15 per cent in the last year.

62. Capacity building provided in key provinces will also help to further ensure sustained reductions. The MEE and local EEBs continue to monitor and supervise enterprises to ensure that HCFC-141b is only used in authorized applications, while FECO continues to inform the sector, directly and through ISA, of the remaining phase-out of HCFC-141b. Funded conversion projects have also served as an example for unfunded enterprises in the process of adopting low-GWP alternatives.

Status of progress

63. In response to the Secretariat's enquiry about delays in assisting SMEs through systems houses, the World Bank explained that time was needed to develop a robust and fair approach to maximizing phase-out while mitigating risks associated with providing pre-blended HC polyols to downstream enterprises that would not receive grants for safety equipment. Assistance to systems houses will launch in

October 2023; it is expected that by the time the tranche funding is released to China, several sub-project grants will be ready for signing.

64. Although the initial plan was to start with a pilot project encompassing five systems houses, it was later decided to begin with 10 contracts with the funding allocated under the fourth tranche. Each of the beneficiary systems houses is expected to have at least 20 SMEs signed up for technical assistance and trials with alternative pre-blended polyols, leading to the phase-out of at least 400 mt of HCFC-141b. The timeline for each sub-project is 12 to 18 months, including equipping the systems houses with selected technologies and presenting the end products to customers for trials and adoption.

65. In providing an update on the obstacles to project implementation due to COVID-19, the World Bank indicated that those were mainly related to FECO's and ISA's ability to visit enterprises to verify their consumption, gather baseline information, or close sub-projects. To ensure the smooth execution of projects and planned activities during the periods of restricted domestic travel, FECO and ISA held virtual meetings with beneficiaries and relevant stakeholders. The World Bank also reported that it had recently reinstated in-person missions after a period of providing implementation support virtually.

Project implementation and monitoring

66. As the lead implementing agency for the HPMP for China, UNDP provided a cumulative report on the project management unit (PMU) expenditures, in line with decision 81/46(b). The PMU expenditures related to stage II of the PU foam sector are summarized in table 5.

Table 5. PMU cumulative expenditures for stage II of the PU foam sector plan (2017-2022)

Item	Description	Cost (US $)
Sector-specific costs	Project staff	1,452,878
	Domestic travel	74,624
	International travel	0
	Domestic meetings	47,254
	International meetings	0
	Consulting services	53,600
Subtotal for sector-specific costs		**1,628,356**
Operational costs	Shared costs (support staff, computers, internet, printing, office operation and maintenance)	952,098
Total disbursement*		***2,580,454**

* Including US $671,159 funded by stage II of the HPMP and US $1,909,295 co-financed by the Government of China..

Gender policy implementation

67. In line with the Fund's gender mainstreaming policy (decisions 84/92 and 90/48(c)), the Government of China, through the PMU, continued to incorporate gender mainstreaming in its stage II activities. During the reporting period, FECO encouraged women's participation in all training activities, including project implementation workshops held at the 12 beneficiary enterprises, where about 50 per cent of the participants were women. In addition, 40 per cent of subproject focal points and consultants working on technical assistance activities are women. Under the fourth tranche, women will be encouraged to continue their participation in activities organized under the plan; data on the gender ratio of training and workshops attendees will continue to be collected; and future subproject completion reports will indicate gender distribution of the enterprises' work teams.

Sustainability of the HCFC phase-out and assessment of risks

68. In discussing the main risks for the sustained adoption of low-GWP technologies in the PU foam sector in China, the World Bank highlighted price sensitivity as the most important factor for manufacturers, followed by insulation value, stability, and shelf life for such applications as appliance manufacturing and

integral skin. In a recent visit, the World Bank noted that one foam manufacturer could procure HFO at a price as low as US $10/kg, and that the enterprise had also developed an approach to reduce evaporation. The World Bank stressed the need for the systems houses to disseminate this type of information among the enterprises, to show that HFO prices in the country were not as high as was widely believed, that concerns about low boiling point could be addressed, and that water-based foam could properly serve specific markets. The World Bank also reported that local HFC prices were still relatively high in the foam sector, and that HFCs were unlikely to become popular blowing agents for most enterprises.

Conclusion

69. The Government of China remains in compliance with the Montreal Protocol and its Agreement with the Executive Committee with regard to the PU foam sector plan. Implementation of the third tranche of stage II of the HPMP has resulted in 11 completed conversion projects and the associated phase-out of 1,189 mt (130.81 ODP tonnes) of HCFC-141b, additional progress achieved in the 12 ongoing conversion projects, issuance of a ban on the use of HCFC-141b as a blowing agent in the pipe insulation and solar water heater subsectors to enter into force on 1 December 2023, and completion of several technical assistance activities to support conversions to low-GWP alternatives. Funding from the fourth tranche is required to complete the conversions of 12 individual enterprises consuming 1,068 mt (117.44 ODP tonnes) of HCFC-141b, to initiate conversions at SMEs through systems houses, and to continue implementing technical assistance activities and policy and regulatory measures to ensure that HCFC consumption in the sector continues to reduce and remain below the maximum allowable levels stated in the Agreement.

RECOMMENDATION

70. The Executive Committee may wish to consider:

(a) Noting the progress report on the implementation of the third tranche of the polyurethane (PU) foam sector plan of stage II of the HCFC phase-out management plan (HPMP) for China; and

(b) Approving the fourth tranche of the PU foam sector plan of stage II of the HPMP for China, and the corresponding 2024 tranche implementation plan, in the amount of US $5,000,000, plus agency support costs of US $350,000 for the World Bank.

PROJECT EVALUATION SHEET – MULTI-YEAR PROJECTS

China

(I) PROJECT TITLE	AGENCY	MEETING APPROVED	CONTROL MEASURE
HCFC phase-out plan (stage II) ICR sector	UNDP	Approved: 77th Revised: 86th	67.5% phase-out by 2026

(II) LATEST ARTICLE 7 DATA (Annex C Group l)	Year: 2022	10,577.35 (ODP tonnes)

(III) LATEST COUNTRY PROGRAMME SECTORAL DATA (ODP tonnes)						Year: 2022
Chemical	Aerosol	Foam	Refrigeration		Solvent	Total sector consumption
			Manufacturing	Servicing		
HCFC-22		1,292.50	3,162.50	2,918.58		7,373.58
HCFC-123			10.80	8.23		19.03
HCFC-124				0.48		0.48
HCFC-141b		2,782.54			275.00	3,057.54
HCFC-142b		65.00	4.23	57.48		126.71

(IV) CONSUMPTION DATA (ODP tonnes)			
2009-2010 baseline:	19,269.00	Starting point for sustained aggregate reductions:	18,865.44
CONSUMPTION ELIGIBLE FOR FUNDING (ODP tonnes)			
Already approved:	12,161.02	Remaining:	6,704.42

(V) ENDORSED BUSINESS PLAN		2023	2024	2025	Total
UNDP	ODS phase-out (ODP tonnes)	162.16	0.00	153.23	315.40
	Funding (US $)	8,560,000	0	8,088,626	16,648,626

(VI) PROJECT DATA			2016	2017	2018-2019	2020*	2021	2022	2023	2024	2025	2026	Total
Montreal Protocol consumption limits (ODP tonnes)			17,342.1	17,342.1	17,342.1	12,524.9	12,524.9	12,524.9	12,524.9	12,524.9	6,262.4	6,262.4	n/a
Maximum allowable consumption (ODP tonnes)			2,162.5	2,162.5	2,042.4	1,609.9	1,609.9	1,609.9	1,369.6	1,369.6	780.9	780.9	n/a
Agreed funding (US $)**	UNDP	Project costs	13,368,756	20,000,000	0	2,095,775	9,000,000	0	8,000,000	0	7,559,464	8,134,246	68,158,241
		Support costs	935,813	1,400,000	0	146,704	630,000	0	560,000	0	529,162	569,397	4,771,076
Funds approved by ExCom (US $)		Project costs	13,368,756	20,000,000	0	2,095,775	9,000,000	0	0	0	0	0	44,464,531
		Support costs	935,813	1,400,000	0	146,704	630,000	0	0	0	0	0	3,112,517
Total funds requested for approval at this meeting (US $)		Project costs							8,000,000				8,000,000
		Support costs							560,000				560,000

* The third (2018) tranche was submitted to the 82nd, 83rd, and 84th meetings, and deferred for consideration at the 85th meeting (decisions 82/71(b), 83/55 and 84/69(a)).
** Total adjusted value of stage II of the HPMP for the ICR sector plan and the funding level of tranches between 2020 and 2026 were approved at the 86th meeting (decision 86/34).

Secretariat's recommendation:	Individual consideration

PROJECT DESCRIPTION

71. On behalf of the Government of China, UNDP as the designated implementing agency has submitted a request for funding for the fifth tranche of the industrial and commercial refrigeration and air-conditioning (ICR) sector plan of stage II of the HCFC phase-out management plan (HPMP), at the amount of US $8,000,000, plus agency support costs of US $560,000.[14] The submission includes the progress report on the implementation of the fourth tranche, the tranche implementation plan for 2024 to 2025, and verification reports in line with subparagraph 5(c) of the Agreement between the Government of China and the Executive Committee.

72. This submission is based on the revised extended plan of action for the ICR sector for the 2021-2026 period, at a total amount of US $32,693,710, plus agency support costs, approved by the Executive Committee at its 86th meeting. The adjusted total funding approved in principle for the entire stage II of the ICR sector plan is US $68,158,241, plus agency support costs (decisions 86/34 and 86/35).

73. The stage II extension (2020-2026) will reduce 15,225.28 metric tonnes (mt) (828.99 ODP tonnes) of HCFC consumption in order to achieve a 67.5 per cent reduction of the ICR sector baseline by 2025. Of the 15,225.28 mt, 1,980 mt will be phased out through the conversion of manufacturing lines to low-global-warming-potential (GWP) technologies; and 13,245.28 mt will be phased out through the conversion of compressors, policy and regulatory measures, technical assistance (TA) activities, and a reduction in foreign-owned enterprises.

Progress report on the implementation of the fourth tranche of stage II of the industrial and commercial refrigeration and air-conditioning sector plan

Enterprise-level activities

74. As of 31 July 2023, contracts were signed with 15 enterprises for the conversion of 22 manufacturing lines to phase out 3,105.98 mt of HCFC-22 after verification of the baseline consumption and capacity of these lines. The implementation of the conversion of the manufacturing lines is progressing and is being closely monitored according to the defined milestones.[15] For the conversion projects that have contracts signed under the first four tranches, 16 lines have completed national acceptance and phased out 2,248.14 mt of HCFC-22, and two lines are at advanced stages of production line conversions and are expected to have project acceptance in November 2023. After the approval of the fourth tranche at the 88th meeting in 2021, the contracts for conversion of four manufacturing lines have been signed and the enterprises are conducting project design; one enterprise has been identified for conversion and is awaiting verification of baseline consumption. Table 1 shows the progress in the conversion of manufacturing lines achieved to date.

Table 1. Progress in the conversions of manufacturing lines under the first four tranches of stage II

No.	Enterprise	Phase-out (mt)	No. of lines	Type of products	Alternative technology	Funding (US $)	Milestones achieved
4-1	Yantai Moon	590.23	1	Water chiller (heat pump)	R-290	9,319,613	Operationally and financially completed
4-2	Dunham-Bush	20.42	1	Heat pump water heater	HFC-32	282,762	National project acceptance in November 2019

[14] As per the letter of 22 September 2023 from the Ministry of Ecology and the Environment of China to UNDP.

[15] The milestones include: signing the conversion contract (30 per cent payment); completion of design and procurement contract (20 per cent payment); completion of prototype manufacture, conversion of lines and performance test (30 per cent payment); and trial production, training, and equipment disposal upon project acceptance (20 per cent payment).

No.	Enterprise	Phase-out (mt)	No. of lines	Type of products	Alternative technology	Funding (US $)	Milestones achieved
4-3	Nanjing TICA	91.58	1	Freezers, refrigeration and condensing units	NH_3/ CO_2	968,400	National project acceptance in March 2023
4-4	Nanjing TICA	32.52	1	Heat pump water heater	CO_2	547,038	National project acceptance in December 2021
4-5	TCL Zhong Shan	115.31	1	Unitary air-conditioning	HFC-32	1,020,456	National project acceptance in December 2021
4-6	Guangdong Jirong	21.13	1		HFC-32	292,769	National project acceptance in October 2019
Subtotal – 1st tranche		**871.19**	**6**			**12,431,038**	
2-1,2	Yantai Aowei	183.35	2	Freezers, refrigeration and condensing units	NH_3/ CO_2	2,730,088	Operationally and financially completed.
2-3	Zhejiang Guoxiang	42.18	1	Unitary air-conditioning	HFC-32	504,288	National project acceptance in September 2019
2-4,5	Haixin Shandong	190.57	2		HFC-32	1,772,583	National project acceptance in December 2021
2-6	Qingdao Haier	492.00	1		HFC-32	3,265,986	National project acceptance in August 2022
2-7	Dunham-Bush	112.20	1	Water chiller (heat pump)	R-513A	1,610,512	National project acceptance in October 2020
2-8	Dunan Environment	147.34	1		R-513A	2,030,774	National project acceptance in March 2023
2-9	Zhejiang Guoxiang	95.22	1		R-513A	1,407,457	National project acceptance in November 2021
2-10	Dalian Refrigeration	237.04	1		R-290	3,373,561	Completed production line conversion; project acceptance is expected in November 2023
2-11	Shandong Shenzhou	114.09	1	Freezers, refrigeration and condensing units	NH_3/ CO_2	1,633,116	Operationally and financially completed
Subtotal – 2nd tranche		**1,613.99**	**11**			**18,328,365**	
3-1	Dalian Refrigeration	72.24	1	Water chiller (heat pump)	R-290	1,231,414	Completed production line conversion; project acceptance is expected in November 2023
Subtotal – 3rd tranche		**72.24**	**1**			**1,231,414**	
4-1,2	Jinan Oufeite	334.89	2	Freezers and refrigeration and condensing units	NH_3/CO_2	3,858,356	Contract signed, started to carry out the project design
4-3,4	Jinan Dasen	213.67	2		NH_3/CO_2	2,667,108	
4-5	Dunhan Bush	-	1	Screw compressor	R-513A	1,200,000	Will carry out baseline verification in 2023
Subtotal – 4th tranche		**548.56**	**5**			**7,725,464**	
Total		**3,105.98**	**23**			**39,716,281**	

Verification of the converted lines

75. The completion of conversions at seven manufacturing lines during the fourth tranche has resulted in the phase-out of 1,039.71 mt of HCFC consumption. In accordance with subparagraph 5(c) of the

Agreement,[16] the verification of converted lines was conducted at Qingdao Haier and Shandong Shenzhou, which covers two production lines and 606.09 mt of HCFC-22 consumption. The verification covers 58 per cent of the total phase-out and 29 per cent of the total number of lines converted in 2021 and 2022. The verification confirmed that two production lines using HCFC-22 had converted to the use of ammonia/carbon dioxide (NH_3/CO_2) and HFC-32; that old equipment had been destroyed; and that the enterprises were committed to not using HCFC-22 in the converted lines. Both enterprises started producing units with the designed alternatives; Haier produced 113,000 units (capacity up to 20 kW) and Shenzhou produced 25 units (capacity 400-800 kW).

Technical assistance activities

76. Several TA activities have been undertaken to enable the smooth conversion of manufacturing lines at the enterprises. The progress is summarized as follows:

(a) The testing and evaluation of refrigeration systems in supermarkets has been completed. Refrigeration systems based on HCFC-22, CO_2 and R-404A were tested and evaluated and their performance and energy efficiency were analyzed. The final report contains the methods for testing and evaluation of commercial refrigeration systems, the analysis of the performance of refrigeration systems in supermarkets, and the advantages and disadvantages of CO_2 applications in the commercial refrigeration sector. The report was shared with the industries;

(b) The research on small- and medium-sized cold storage and compression-condensing units is progressing. Research on the evaluation methodology for energy performance and a comparative analysis on the characteristics of different refrigerants have been conducted. A draft standard for the energy efficiency limit and ratings of small- and medium-sized cold storage and condensing units has been developed for public consultation. Based on the feedback received, practical product testing was conducted to support the standard formulation. The draft standard was submitted to the Standards Committee for further review;

(c) The study on technical requirements, testing procedure and inspection specification for the safe use of flammable refrigerants has been completed. The relevant safety requirements for flammable refrigerants in the national standard (GB/T 9237-2017) were analyzed and the relevant restrictions and requirements at each stage were clarified. The experts worked with enterprises to resolve technical issues and provide solutions for the safe handling of flammable refrigerants. The study covered three types of typical products in the ICR sector: unit air-conditioner (involving HFC-32 refrigerant), cold water heat pump unit (involving HFC-32 and R-290 refrigerant) and heat pump water heater (involving HFC-32);

(d) The feasibility study and impact assessment on banning the use of HCFCs as refrigerants in the multi-link air conditioning (heat pump) subsector was planned in the fourth tranche. The objective of the ban is to create market conditions for low-GWP-based products produced on the converted lines to further support the sustainability of the phase-out. The TA includes plans to solicit views from industry stakeholders (enterprises, industry associations and other relevant parties) and conduct a comprehensive assessment on the social economic and environmental impact of the ban, and proposes technical and policy recommendations. A bidding process has been completed, and a contract was signed in May 2023. The survey is in progress;

[16] The country has to submit a verification report of a random sample of at least 5 per cent of the manufacturing lines which had completed their conversion in the year to be verified, on the understanding that the total aggregated HCFC consumption of the random sample of the manufacturing lines represents at least 10 per cent of the sector consumption phased out in that year.

(e) Development of a technical guide for adoption of alternative technologies to HCFCs in small- and medium-sized enterprises (SMEs) was planned to support the HCFC phase-out at SMEs in the ICR sector. An expert will be employed to prepare a guide for selecting and adopting alternative technologies suitable for SMEs. The expert will provide support to SMEs during project publicity, mobilization and implementation to guide them in understanding the national phase-out policy and mobilize their participation in HPMP implementation. The expert will also provide targeted TA to SMEs during the adoption of alternatives in stage II. The bidding for the TA was completed and a contract signed in May 2023. The work is in progress; and

(f) The assessment of ozone- and climate-friendly refrigeration technologies in the ICR sector was planned under the fourth tranche. The TA aims to assess the costs, performance and energy efficiency of the alternative technologies adopted in the ICR sector from 2010 to 2020 in order to further promote these technologies. The bidding process was completed, and a contract signed in May 2023. The work is in progress.

77. Two Ozone2Climate Technology Road Shows and Industry Roundtable Series activities were organized in August 2022 and April 2023 to raise awareness and promote low-GWP technologies. The road shows provide a platform for all stakeholders to demonstrate new technologies and products; exchange information on the technology development trends in the ICR industry; discuss policy and technological issues; and raise awareness on HCFC phase-out achievements and targets and the introduction of low-GWP technologies. More than 40 manufacturers exhibited their products, including low-GWP technologies based on CO_2, NH_3, HC, HFC-32, HFO and other zero-ODP, lower-GWP, energy-efficient alternatives and solutions. Representatives and experts, including international institutions, enterprises, and universities, shared the latest implementation policies, technology development and practical experience abroad and in China. This activity is funded by the enterprises and the Government.

Level of fund disbursement

78. As of October 2023, of the US $44,464,531 approved so far, 100 per cent had been transferred from UNDP to the Foreign Environmental Cooperation Centre (FECO), and US $33,168,379 had been disbursed to final beneficiaries (enterprises and for TA activities) by FECO or directly by UNDP, accounting for 74.6 per cent of the total funding approved, as shown in table 2.

Table 2. Status of disbursement of stage II of the ICR sector plan as of October 2023

Funding tranche	Funds approved	Disbursement from UNDP to FECO*		Disbursement to final beneficiaries**		Fund balance
	Amount (US $)	Amount (US $)	Rate (%)	Amount (US $)	Rate (%)	Amount (US $)
First	13,368,756	13,298,756	99.48	13,177,878	98.57	190,878
Second	20,000,000	19,775,000	98.88	17,073,330	85.37	2,926,670
Third	2,095,775	1,696,516	80.95	798,781	38.11	1,296,994
Fourth	9,000,000	7,180,000	79.78	2,118,389	23.54	6,881,611
Total	**44,464,531**	**41,950,272**	**94.35**	**33,168,379**	**74.60**	**11,296,152**

* The interest accrued from the funds held by FECO of US $103,708, US $97,468, US $99,480, and US $159,433 for the period of 2015 to 2021 was deducted from the approved funds before transfer.

** Includes disbursements to final beneficiaries by both UNDP and FECO.

Implementation plan for the fifth tranche of stage II of the industrial and commercial refrigeration and air-conditioning sector plan

79. The fifth tranche of the ICR sector plan in China has a total budget of US $8,000,000 and will be implemented from 2024 to 2025, with a breakdown as follows:

(a) Continuing the conversions in enterprises that have signed contracts in previous tranches and the conversions of an additional eight manufacturing lines in five enterprises to alternatives with an estimated phase-out of 683.60 mt of HCFC-22 (US $6,578,400);

(b) Revision of technical standards for refrigeration equipment (ice-making units for direct cooling ice rinks) and screw refrigerant compressors (GB/T 19410-2008) for the use of zero-ODP low-GWP alternatives in the ICR sector (US $100,000);

(c) Conducting technical research on alternative technologies and risk evaluation:

(i) Research on cascade systems using CO_2 as a second refrigerant (HFCs or HFOs as the first refrigerant) and providing technical support to SME manufacturers (US $100,000);

(ii) Research on the application of HFC-32 technology in multi-split air-conditioning units addressing issues related to mild flammability, charge size and safety measures (US $100,000);

(iii) Research on the improvement of product quality and efficiency for trans-critical CO_2 technology used in heat pumps and freezer units, considering the high pressure (more than 10 MPa) and requirements for materials and sealing of the system (US $130,000);

(d) Conducting a survey on market distribution of different products and technologies in the ICR sector in Guangdong province; and based on analyzing data and stakeholder consultations, providing policy recommendations to the provincial Governments on the transition of the ICR sector to green technologies, including updating green procurement guidelines, building codes, and cold chain infrastructure strategy. The TA will explore green finance tools and investment models that can support the sustainable transition of the ICR sector (US $70,000);

(e) Research on revision of the building and fire suppression standard to address the barriers to using flammable refrigerants (HFC-32) in building ventilation systems (US $50,000);

(f) Organizing two training workshops for 200 (30 women) participants from manufacturing enterprises on the established industry standards (safety and environment standards, and classification of refrigerants for heat pumps and refrigeration systems, including ducted air-conditioning, water chilling packages using vapor compression cycle, water chilling packages for household applications, and CO_2 compressors) to support the conversions of manufacturing lines to alternative technologies (HFC-32, NH_3, HFOs) (US $40,000);

(g) Conducting one technical exchange with other Article 5 countries on the adoption of low-GWP alternative technologies (US $30,000);

(h) Verification of milestones of manufacturing line conversions (US $180,000);

(i) Implementation support agency to assist FECO in supporting the enterprises to achieve their milestones (US $200,000); and

(j) Monitoring and management of project activities in the ICR sector (US $421,600) with the following breakdown: staff (US $263,800), consultancy (US $14,800), domestic travel (US $19,300), meetings (US $15,400), and office expenses (US $108,300).

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

Report on HCFC consumption

80. The consumption of HCFCs in the ICR sector in 2022 was 29,105 mt (1,582.53 ODP tonnes), which is below the allowable level of consumption in the Agreement between the Government of China and the Executive Committee, as shown in table 3.

Table 3. Reduction in HCFC consumption in the ICR sector

	2018	2019	2020	2021	2022
mt					
Maximum allowable consumption	37,135	37,135	29,603	29,603	29,603
Actual consumption in the ICR sector*	36,643	36,643	28,575	27,605	29,105
Reduction targets set in the HPMP	2,185	0	7,532	0	0
ODP tonnes					
Maximum allowable consumption	2,042.40	2,042.40	1,609.90	1,609.90	1,609.90
Actual consumption in the ICR sector*	1,996.91	1,996.91	1,554.43	1,500.03	1,582.53
Reduction targets set in the HPMP	120.10	0.00	432.50	0.00	0.00

* Based on estimated amounts, as actual amounts cannot be accurately verified.

81. The particularly low consumption in 2021 could be the result of reduced economic activity caused by the global COVID-19 pandemic, with the consumption increase in 2022 explained as economic recovery. It is expected that HCFC will continue to decrease with the implementation of the ICR sector plan and introduction of alternatives to HCFCs.

Technical issues

82. The Secretariat noted that the conversion of 16 manufacturing lines to alternative technologies (R-290, NH_3, CO_2, HFO, HFC-32) has been completed and enquired about the status of production with alternative technologies. UNDP reported that a total of 331,150 units based on alternative technologies have been produced on the 15 converted lines and the incremental operating costs (IOCs) have been disbursed to three enterprises based on the units manufactured with alternative technologies on four converted lines.

83. Discussion on the challenges and barriers for market adoption of the alternative technologies revealed that a lack of experience in using new technologies and perceived risk related to flammability, toxicity and high working pressure of the refrigeration equipment are the main barriers to wider adoption of the technology. The upstream and downstream supply chain of parts and components of the replacement technologies have not been fully developed at present. The increase of the manufacturing cost of components leads to the overall increase in cost of the unit. This is aggravated by additional incremental costs in training the client's operators and servicing team in installation, operation, maintenance, and servicing. It is particularly challenging for SMEs to adopt environmentally friendly alternatives in a competitive market with very narrow income margins, as they have to ensure sustainability of their businesses.

84. To address these challenges, the manufacturing enterprises are encouraged to carry out research and development to improve product safety, reliability and energy efficiency to enhance market competitiveness. Activities under the ICR sector plan will continue to promote the market adoption of alternative products through awareness-raising activities on the alternative technologies to increase their market acceptance by end users.

Completion of stage I of the industrial and commercial refrigeration and air-conditioning sector plan

85. At the 92nd meeting, the Executive Committee noted that the remaining balance of the IOCs of US $1,163,094, plus agency support costs of US $81,417 for UNDP, would be returned to the Multilateral Fund after the approval of the financial audit report at the 93rd meeting (decision 92/11).

86. Nevertheless, the Secretariat noted that the financial audit report presents the balances of stage I of the ICR sector plan in two currencies: US $1,893,426.36, or RMB 131,974.59, which do not correspond to each other.

87. The Secretariat is unable to conclude its review of balances to be returned within the limited time, and therefore suggests to defer the consideration of the matter to the 94th meeting to allow additional time for the Secretariat to work with UNDP and the Government to look into the issue, on the understanding that the Treasurer would withhold the amount of US $1,163,094 (balance reported to the 92nd meeting) from the fifth tranche to be approved at the 93rd meeting until the Executive Committee had considered the matter at the 94th meeting.

Project implementation and monitoring

88. UNDP, as the lead agency for stage II of the HPMP, provided a cumulative report on project management unit (PMU) expenditures in line with decision 81/46(b). Based on that report, the expenditures related to the PMU for stage II of the ICR sector plan implemented by UNDP are summarized in table 4.

Table 4. PMU cumulative expenditures for stage II of the ICR sector plan from 2017 to 2022

Item	Description	Cost (US $)
Sector-specific costs	Project staff	1,550,493
	Domestic travel	131,595
	International travel	4,000
	Domestic meetings	79,766
	International meetings	0
	Consulting service	91,611
Subtotal for sector-specific costs		**1,857,465**
Operational costs		1,583,511
Total disbursement*		**3,440,976**

* Additional expenditure from the Government of China (e.g., operational costs as well as in-kind) are not included in the table.

Gender policy implementation

89. In line with the gender mainstreaming policies of UNDP, the Executive Committee (through decisions 84/92 and 90/48(c)), and the Ministry of Ecology and Environment (MEE) related guidance, the implementation of stage II of the HPMP has taken into account gender mainstreaming and equity to the extent possible to encourage the full engagement of women in various steps such as planning, policy and decision-making, brainstorming and advisory, and monitoring and evaluation. In the fifth tranche, women will be encouraged to participate in all events and activities organized under stage II of the ICR sector plan, including meetings, trainings, workshops, capacity-building activities and outreach activities. All training centres will be further guided and advised to encourage female instructors/trainers to deliver trainings and encourage female technicians and students to join the training workshops. FECO/MEE will continue to collect sex-disaggregated data, where possible, such as the number of female participants in activities implemented under stage II, and report achievements under the fifth tranche. Outreach and training materials will also be developed to highlight the gender issues and promote gender equity when applicable.

Conclusion

90. The Secretariat notes that implementation of the fourth tranche of the ICR sector plan has been progressing. Conversions of 16 manufacturing lines have been completed, and 2,248.14 mt of HCFC-22 has been eliminated and replaced with low/zero-GWP (1,011.77 mt, 45 per cent), HFC-32 (881.61 mt, 29 per cent) and R-513A (112.20 mt, 16 per cent) technologies. The conversion of the remaining manufacturing lines is progressing. Several TA activities have been implemented, including research and technology studies to support market adoption of alternatives, the development/updates of technical guidelines and standards to meet safety regulations and to assist in the conversion of the manufacturing lines, and training and awareness-raising to promote alternatives. In view of the progress made and the overall funding disbursement of 75 per cent, the Secretariat recommends approval of the fifth tranche.

RECOMMENDATION

91. The Executive Committee may wish to consider:

(a) Noting the progress report on the implementation of the fourth tranche of the industrial and commercial refrigeration and air-conditioning (ICR) sector plan of stage II of the HCFC phase-out management plan (HPMP) for China;

(b) Requesting the Secretariat, with the support of UNDP and the Government of China, to prepare a report on the issue related to the difference between the disbursements reported in US dollars and RMB in the financial audit report and the balances to be returned in stage I of the ICR sector plan for consideration by the Executive Committee at the 94th meeting; and

(c) Approving the fifth tranche of the ICR sector plan of stage II of the HPMP for China, and the corresponding 2024-2025 tranche implementation plan, in the amount of US $8,000,000, plus agency support costs of US $560,000 for UNDP, on the understanding that the Treasurer would withhold the balance of stage I of the ICR sector plan reported to the 92nd meeting of US $1,163,094, pending the Executive Committee's consideration of the document referred to in subparagraph (b) above.

PROJECT EVALUATION SHEET – MULTI-YEAR PROJECTS

China

(I) PROJECT TITLE	AGENCY	MEETING APPROVED	CONTROL MEASURE
HCFC phase-out plan (stage II) solvent sector	UNDP	Approved: 76th Revised: 86th	100% phase-out by 2026

(II) LATEST ARTICLE 7 DATA (Annex C Group l)	Year: 2022	10,577.35 ODP tonnes

(III) LATEST COUNTRY PROGRAMME SECTORAL DATA (ODP tonnes)						Year: 2022
Chemical	Aerosol	Foam	Refrigeration		Solvent	Total sector consumption
			Manufacturing	Servicing		
HCFC-22		1,292.50	3,162.50	2,918.58		7,373.58
HCFC-123			10.80	8.23		19.03
HCFC-124				0.48		0.48
HCFC-141b		2,782.54			275.00	3,057.54
HCFC-142b		65.00	4.23	57.48		126.71

(IV) CONSUMPTION DATA (ODP tonnes)			
2009-2010 baseline:	19,269.00	Starting point for sustained aggregate reductions:	18,865.44
CONSUMPTION ELIGIBLE FOR FUNDING (ODP tonnes)			
Already approved:	12,161.02	Remaining:	6,704.42

(V) ENDORSED BUSINESS PLAN		2023	2024	2025	Total
UNDP	ODS phase-out (ODP tonnes)	35.6	0.0	9.3	44.9
	Funding (US $)	2,140,000	0	560,071	2,700,071

(VI) PROJECT DATA			2016	2017	2018 - 2019	2020*	2021	2022	2023	2024	2025	2026	Total
Montreal Protocol consumption limits (ODP tonnes)			16,978.9	16,978.9	15,048.1	11,772.0	11,772.0	11,772.0	8,618.0	8,618.0	5,063.5	4,513.5	n/a
Maximum allowable consumption (ODP tonnes)			455.2	455.2	395.4	321.2	321.2	321.2	148.3	148.3	55.0	0.0	n/a
Funding agreed in principle (US $)**	UNDP	Project costs	2,821,937	3,777,190	0	12,946,782	2,500,000	1,000,000	2,000,000	0	523,431	0	25,569,340
		Support costs	197,536	264,403	0	906,275	175,000	70,000	140,000	0	36,640	0	1,789,854
Funds approved by ExCom (US $)		Project costs	2,821,937	3,777,190	0	12,946,782	2,500,000	1,000,000	0	0	0	0	23,045,909
		Support costs	197,536	264,403	0	906,275	175,000	70,000	0	0	0	0	1,613,214
Total funds recommended for approval at this meeting (US $)		Project costs							2,000,000				2,000,000
		Support costs							140,000				140,000

* The third (2018) tranche was submitted to the 82nd, 83rd and 84th meetings, and deferred for consideration at the 85th meeting (decisions 82/71(b), 83/55 and 84/69(a)).

** Total adjusted value of stage II of the HPMP for the solvent sector plan and the funding level of tranches between 2020 and 2026 were approved at the 86th meeting (decision 86/34).

Secretariat's recommendation:	Individual consideration

PROJECT DESCRIPTION

92. On behalf of the Government of China, UNDP as the designated implementing agency has submitted a request for funding for the sixth tranche of the solvent sector plan of stage II of the HCFC phase-out management plan (HPMP), at the amount of US $2,000,000, plus agency support costs of US $140,000.[17] The submission includes a progress report on the implementation of the fifth tranche of the solvent sector plan, verification reports in line with subparagraph 5(c) of the Agreement between the Government of China and the Executive Committee, and the tranche implementation plan for 2024-2025.

93. This submission is based on the revised plan of action for the solvent sector for the period 2021-2026 at the total amount of US $6,023,431, plus agency support costs, approved by the Executive Committee at the 86th meeting. The value of the adjusted total funding approved in principle for stage II of the solvent sector plan is US $25,569,340, plus agency support costs (decisions 86/34 and 86/40).

94. The revised plan of action for 2021-2026 comprises policy and regulatory interventions to ensure the timely and sustainable phase-out of HCFCs; technical assistance to strengthen the capacity of industry and to promote the adoption of low-global-warming-potential (GWP) alternatives; and project management activities. It also includes investment activities to convert 18 small and medium-sized enterprises (SMEs) in the disposable medical devices (DMD) subsector and seven SMEs in the electronic degreasing subsector, with a verified HCFC baseline consumption of 372.19 metric tonnes (mt) or 40.94 ODP tonnes of HCFC-141b. The total funding allocated for these enterprises is US $2,014,421, at a cost-effectiveness level of US $9.86/kg, which is lower than that in the sector plan as originally approved (US $13.00/kg). All enterprises will be using low-GWP alternatives (e.g., KC-6, hydrocarbons or diluent, trans-1, 2-dichloroethylene and hydrofluoroether, water-based cleaning agent, modified alcohol, nano silicon carbonate, F-solvents, or naphthenic aromatics). Upon completion, stage II will phase out 455.2 ODP tonnes of HCFC-141b consumption in the solvent sector and will reduce greenhouse gas emissions by 2.98 million CO_2-equivalent tonnes.

Progress report on the implementation of the fifth tranche of stage II of the solvent sector plan

95. The agreement for the implementation of stage II of the solvent sector plan between the Foreign Environmental Cooperation Centre (FECO) and UNDP was signed in April 2017 based on the approval of stage II at the 77th meeting. The revised action plan of the solvent sector covering the 2022-2023 work plan was signed in April 2022 (for the fourth and fifth tranches).

Regulatory activities

96. FECO has continued to issue quota permits to solvent enterprises and as reported in the previous progress report, had issued a circular banning any new establishment, retrofitting, or expansion of facilities for production or use of HCFCs in application such as refrigerants, foam-blowing agents, solvents, or chemical process agents.

97. The ban on the use of HCFCs in the medical devices' subsector will be enforced as of 1 December 2023. This was implemented after extensive consultations with experts, enterprise representatives, and stakeholders based on the final report of a research study on the feasibility of imposing this ban, completed in 2022.

[17] As per the letter of 13 September 2022 from the Ministry of Ecology and the Environment of China to UNDP.

Investment activities

98. Out of the 49 solvent enterprises that signed contracts with FECO, the progress of implementation as of August 2023 is summarized below:

(a) From the first batch of 24 enterprises comprising 514 production lines and phasing out 1,176.2 mt (129.4 ODP tonnes) of HCFC-141b consumption, 22 received national acceptance; one had withdrawn from the project due to closure in 2020[18] and another had completed procurement and installation but subsequently withdrew from the project due to temporary closure in 2023.[19] This first batch represented 28 per cent of the reduction target of 455.2 ODP tonnes for stage II of the solvent sector plan; and

(b) The second batch of 25 eligible enterprises, 18 in the DMD subsector and seven in the metal and electronics subsectors, encompasses 347 production lines and comprises mostly SMEs with annual consumption of no more than 5 mt of HCFC-141b. Of these, 23 have completed conversion activities and two have completed procurement of equipment. These enterprises have a total verified consumption of 372.2 mt (40.9 ODP tonnes) of HCFC-141b. Five of the seven enterprises from the metal and electronics subsectors are using solvent-free alternatives thus will incur no incremental operating costs (IOCs) and all funding was invested in incremental capital costs.

99. A summary of progress in the implementation of the solvent sector plan is presented in table 1.

Table 1. Status of progress of enterprise conversions in the solvent sector

Status of implementation	No. of enterprises	HCFC-141b consumption*		Value of contracts (US $)	Estimated date of conversion
		mt	ODP tonnes		
First batch of enterprises	**24**	**1,176.2**	**129.4**	**20,040,546**	**n/a**
Equipment installed, completed verification, received national acceptance	22	1,031.4	113.5	17,657,765	Completed
Enterprise withdrawal due to closure	(2)	144.8	15.9	(2,382,781)	Funds to be reallocated and consumption considered phased out
Subtotal for the first batch	**22**	**1,176.2**	**129.4**	**17,657,765**	**n/a**
Second batch of enterprises	**25**	**372.2**	**40.9**	**2,000,907**	**n/a**
Production line conversion completed	23	303.6	33.4	1,324,501	31 March 2024
Procurement completed	2	68.6	7.5	676,406	31 March 2024
Subtotal for the second batch	**25**	**372.2**	**40.9**	**2,000,907**	**n/a**
Total	**47**	**1,548.8**	**170.3**	**19,658,672**	**n/a**

* Data for 2016 which is the year used as reference for HCFC consumption for stage II of the HPMP.

[18] One beneficiary (Dechang Beihai) withdrew its participation in the HPMP due to closure thereby eliminating the enterprise's consumption; thus, the overall phase-out of HCFC-141b remains unchanged. The contract value for this enterprise of US $1,846,784 will be reallocated to another beneficiary enterprise where possible. At the 91st meeting, it was erroneously reported that this funding was returned.

[19] FECO decided to terminate the contract with one beneficiary (Jiangsu Yile) due to a temporary shutdown of the factory. The enterprise was not required to return funds already disbursed, as the first payment of US $85,200 was used in converting the production line and the first milestone was met; the enterprise is no longer using HCFC-141b; and when it reopens it will need to comply with the HCFC ban for the DMD subsector. The remaining US $535,997 will be reallocated to another beneficiary enterprise where possible.

Verification of converted manufacturing lines

100. In accordance with subparagraph 5(c)[20] of the Agreement, UNDP commissioned the verification of the two enterprises that had completed their conversions in 2022. The two verification reports confirmed *inter alia* that the enterprises had a total of 49 converted lines with a total phase out of 276.73 mt (30.44 ODP tonnes)[21] (representing 100 per cent of the total HCFC-141b phased out in 2022). These two enterprises introduced HC-based solvents; have completely stopped using HCFC-141b; and destroyed the replaced baseline equipment, as confirmed by a public notary and the audit office. The payment of IOCs was made after confirmation that the production lines were operational for at least six months after the trial run was completed. The verification for the two enterprises submitted to this meeting was conducted in one province through in-person site visits by a local consultant commissioned by UNDP.

Technical assistance activities

101. The following technical assistance activities were implemented between 2022 and 2023:

(a) Assisted by the implementation support agency (ISA), FECO provided ongoing support to the second batch of 25 enterprises mostly comprised of SMEs which required technical support from FECO during project implementation, this included assisting four enterprises in testing new alternatives and revising their implementation plans; ISA also organized technical workshops to strengthen the capacities of the 25 enterprises;

(b) FECO initiated a procurement process, selected a bidder, and signed a contract in August 2023 with the Beijing University of Chemical Technology for the production of a technical application guideline for hydrocarbon and chlorinated solvent as degreasers based on terms of reference prepared by FECO;

(c) FECO renewed the contract with Beijing Daxin Accounting Firm to continue performance verifications for project beneficiaries; and

(d) In 2023, FECO issued a new selection notification through various channels for qualified HCFC-using enterprises in the metal, electronics, and solvent formulation subsectors to identify interested beneficiaries in order to reallocate the balance remaining due to terminated contracts from the first batch of enterprises.

Level of fund disbursement

102. As of September 2023, of the US $23,045,909 approved so far, US $21,940,435 had been disbursed by UNDP to FECO, and US $20,687,181 (90 per cent) by FECO to beneficiaries, as shown in table 2. The balance of US $2,358,728 will be disbursed in 2024.

Table 2. Status of disbursement for stage II of the solvent sector plan as of September 2022 (US $)

Description	Tranche 1	Tranche 2	Tranche 3	Tranche 4	Tranche 5	Total
Funds approved for UNDP	* 2,821,937	* 3,777,190	12,946,782	2,500,000	1,000,000	23,045,909

[20] The country has to submit a verification report of a random sample of at least 5 per cent of the manufacturing lines which had completed their conversion in the year to be verified, on the understanding that the total aggregated HCFC consumption of the random sample of the manufacturing lines represents at least 10 per cent of the sector consumption phased out in that year.

[21] UNDP based its verification ratio on the actual tonnage phased out from the five enterprises that received national acceptance from July 2022 to July 2023 (two in 2022 and three in 2023) comprising 114 production lines and 342.05 mt of HCFC-141b phased out; the verification ratio of the two enterprises selected (both completed in 2022), comprising 49 lines and 276.73 mt of HCFCs phased out, is therefore 43 per cent based on the converted manufacturing lines, and 81 per cent based on consumption phase-out.

Description		Tranche 1	Tranche 2	Tranche 3	Tranche 4	Tranche 5	Total
Disbursement from UNDP to FECO	**Total**	**2,796,937**	**3,741,089**	**12,944,409**	**1,966,000**	**492,000**	**21,940,435**
	Ratio (%)	99	99	100	79	49	95
Disbursement from FECO to beneficiaries	**Total**	**2,796,937**	**** 3,742,190**	**12,595,383**	**1,286,487**	**266,184**	**20,687,181**
	Ratio (%)	99	99	95	51	27	90
Fund balance		25,000	35,000	351,399	1,213,513	733,816	2,358,728

* A total of US $60,000 from the first two tranches was retained by UNDP to cover activities to be implemented by UNDP.
** Total disbursement under the second tranche is US $3,741,089 plus US $1,101 (interest accrued up to December 2016 and offset from the transfer for the second tranche, in line with decision 80/17), for a total of US $3,742,190.

Implementation plan for the sixth tranche of stage II of the solvent sector plan

103. The following activities will be implemented by UNDP until December 2025:

(a) *Policy actions:* FECO will continue to enforce quota management in the solvent sector, and collaborate with the local ecology and environment bureaus (EEBs) to strengthen the registration system for HCFC consumption and sales; and EEBs will conduct inspections to support the enforcement of the recent ban on the use of HCFCs in the DMD subsector, which will be in force as of 1 December 2023; EEBs and beneficiary enterprises will receive technical support from ISA as necessary for effective implementation of the ban (ongoing activities); research and a field study will be carried out for the ban on the use of HCFCs in the solvent sector in 2026 (US $150,000);

(b) *Ongoing enterprise-level activities:* the final payments from the first batch of enterprises will be made by the end of 2023, a workshop to discuss and exchange lessons learned during project implementation from these enterprises will be organized to facilitate the subsequent conversions in the subsector; performance verifications to receive national acceptance will be conducted for the 23 enterprises from the second batch that have completed their conversions; and conversion activities will continue for the last two enterprises from this batch; disbursements will be made to enterprises after milestones stipulated in the conversion contracts are achieved (ongoing activities);

(c) *New enterprise-level activities:* as of August 2023, FECO had received two applications from its recent selection notification for qualified HCFC-using enterprises in the metal, electronics and solvent formulation subsectors (one in the electronics subsector and the other in the solvent formulation subsector) for a third batch of projects, including two enterprises to be selected using fund balances from an earlier batch of projects, once baseline consumption verification for these and other potential applicants are completed, beneficiaries will be selected applying the agreed cost-effectiveness thresholds for these applications according to the original approved HPMP (US $1,425,200);

(d) *Technical assistance activities:* a supplemental service contract will be prepared for ISA to continue providing technical and management support for the third batch of projects; another supplemental contract will be issued with the accounting firm Beijing Daxin to conduct baseline consumption verification and performance verification for the third batch of projects; a study tour is planned relating to new alternatives technologies that have emerged in order to disseminate this information to relevant industries; training activities will be carried out aimed at helping SMEs to implement conversions and publicizing the alternatives and phase-out target (US $314,800); and

(e) *Project management* (US $110,000): project management costs will include US $35,426 for project staff, US $11,885 for travel, consultations and meetings and US $62,689 for operational costs and support staff.

Table 3. Budget for the sixth tranche of stage II of the solvent sector plan in China (UNDP)

Item	Budget (US $)
Policy actions	150,000
A third batch of enterprise level activities/conversions	1,425,200
Technical assistance including ISA's support, supervision, and verification	314,800
Project monitoring, including:	
- Project and support staff	35,426
- Domestic travel	5,217
- Domestic meetings	3,068
- Consulting services	3,600
- Operating costs: office operation, facilities and equipment, computer, phone, other	62,689
Project monitoring subtotal	110,000
Total	**2,000,000**

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

Report on HCFC consumption

104. Consumption of HCFCs in the solvent sector in 2022 was reported at 2,500 mt (275 ODP tonnes), which is below the maximum allowable consumption established in the Agreement between the Government of China and the Executive Committee, as shown in table 4.

Table 4. Consumption of HCFCs in the solvent sector

Description		2018	2019	2020	2021	2022
Consumption *	mt	3,438.00	3,539.10	2,800.00	2,500.00	2,500.00
	ODP tonnes	375.12	385.98	308.00	275.00	275.00
Maximum allowable consumption **	mt	3,624.5	3,624.5	2,944.91	2,944.91	2,944.91
	ODP tonnes	395.4	395.4	321.2	321.2	321.2
Phase-out targets	mt	548.2	n/a	679.60	n/a	n/a
	ODP tonnes	59.8	n/a	74.16	n/a	n/a

* As per the country programme implementation report.
** As per the Agreement revised at the 86th meeting for stage II from 2016-2021.

105. Reductions in consumption since 2018 have been achieved through the conversions of solvent enterprises; strict implementation of production, domestic sales and consumption quotas required for manufacturing enterprises consuming over 100 mt of HCFCs; mandatory registration of enterprises; and the involvement of EEBs in supervision and monitoring in the subsector. Stage I of the HPMP for the solvent sector phased out 599 mt (65.90 ODP tonnes) of HCFC-141b; and completion of the conversions of the first batch of enterprises in stage II also contributed to the reduction in HCFC-141b consumption. Through the technical assistance component, the Government continues to strengthen the industry's technical capacity to adopt low-GWP alternatives and ensure that further reductions are achieved and sustained. While the consumption reported for 2022 is the same as that for 2021, UNDP indicated that this still reflected progress in implementing the conversion projects in the solvent sector, and that further reductions were expected when the ban on the use of HCFC-141b for the DMD subsector entered into force by 1 December 2023. The ban will support the Government of China to meet further reductions of

126.7 ODP tonnes from the 2022 consumption of 275 ODP tonnes to achieve the 2023 target of 148.3 ODP tonnes in the solvent sector.

Status of progress

106. In clarifying when the technical guidelines on the use of hydrocarbon and chlorinated solvent as degreasers would be completed, UNDP indicated that this should be ready by the end of 2024. These will be shared with the related enterprises and industries through various channels to encourage their use as they are becoming the main alternative for the solvent sector. These guidelines will be a critical reference for enterprises especially for SMEs when making decisions on alternatives to use, given the limited funding in the solvent sector. The technical guidelines will be a source of independent, non-biased information based on real experiences which can support line conversions where FECO is not guiding them.

107. With regard to the reallocation of funds from the two enterprises that had withdrawn from the first batch of projects, UNDP explained that as reported, FECO had initiated a call for qualifying HCFC-using enterprises in the metal, electronics and solvent formulation subsectors to apply as potential beneficiaries of a third batch of enterprise conversion projects, which would be funded in part from the balances from the first batch.

108. The Secretariat also sought further information regarding the ban on the use of HCFC-141b for the DMD sector, such as how it would be implemented and the responsibility for its enforcement. UNDP explained that the local EEBs would supervise enterprises in their administrative regions and closely monitor the enforcement. Penalties will be imposed on enterprises that are found in non-compliance with the ban according to the regulation on the management of ozone-depleting substances (ODSs). UNDP also confirmed that FECO was currently studying the enforcement of a ban to support the total phase-out in the solvent sector in 2026 and noted that the recently agreed recommended list of alternatives to ODSs that can be used in various sectors including the solvent sector would also contribute to the phase-out in this sector.

Project implementation and monitoring

109. As the lead implementing agency for the HPMP in China, UNDP provided a cumulative report on the project management unit (PMU) expenditures, in line with decision 81/46(b). The PMU expenditures related to stage II of the solvent sector plan are summarized in table 5.

Table 5. PMU cumulative expenditures for stage II of the solvent sector plan in China (2017-2022)

Item	Description	Cost (US $)
Sector-specific costs	Project staff	362,719
	Domestic travel	53,415
	International travel	0
	Domestic meetings	31,415
	International meetings	0
	Consulting service	36,857
Subtotal for sector-specific costs		**484,406**
Operational costs	Shared costs (support staff, computers, internet, printing, office operation and maintenance)	641,860
Total disbursement		**1,126,266**

Gender policy implementation

110. In line with the Multilateral Fund operational policy on gender mainstreaming (decisions 84/92 and 90/48(c)), the implementation of stage II of the solvent sector plan will continue to take into account gender mainstreaming activities. Engagement of women will be sought and encouraged in all project stages, including planning, policy and decision making, monitoring and evaluation. Gender-disaggregated data will

be collected from training and workshops. Capacity-building activities will take into consideration gender-sensitive approaches during the technical assistance activities, including highlighting gender issues in outreach and training materials, promoting gender equity when applicable, and discussing gender issues during the thematic workshops to share experiences and lessons learned on gender mainstreaming.

Sustainability of the HCFC phase-out and assessment of risks

111. The sustainability of the HCFC phase-out in the solvent sector has been considered throughout the implementation of the project. The selected technologies for the solvent sector (HC solvent etc.) have proven to be suitable as demonstrated in the conversion results. Training and technical assistance were provided to enterprises participating in the project and will also be extended to SMEs to support their conversions in the future. FECO continues to enforce the quota system and registration management in the solvent sector and to support local EEBs through enhancing their capacity on managing the registration system for HCFC consumption and sales. Local EEBs also ensure the enforcement of relevant bans at local level including the upcoming ban on using HCFCs in the medical devices subsector which will come into force in December 2023.

Conclusion

112. The Government of China remains in compliance with the Montreal Protocol and its Agreement with the Executive Committee with regard to the solvent sector plan, including the consumption target agreed for 2022. Significant progress achieved in the implementation of stage II of the HPMP so far includes the full conversion of 22 enterprises with an associated phase-out of 1,176.2 mt (129.4 ODP tonnes) of HCFC-141b. An additional 25 enterprises are expected to complete their conversions by March 2024, with an associated phase out of 372.2 mt (40.9 ODP tonnes). The findings of the verification of enterprises submitted to this meeting have been positive and noted that the enterprises have fully converted and are operating using the agreed alternatives. Over 27 per cent of the funds approved for the fifth tranche have been disbursed to the beneficiary enterprises. The sixth tranche will include the identification of a third batch of enterprises which will ensure that the solvent sector phase-out plan meets its target reductions.

RECOMMENDATION

113. The Executive Committee may wish to consider:

(a) Noting the progress report on the implementation of the fifth tranche of the solvent sector plan of stage II of the HCFC phase-out management plan (HPMP) for China; and

(b) Approving the sixth tranche of the solvent sector plan of stage II of the HPMP for China, and the corresponding 2024-2025 tranche implementation plan, in the amount of US $2,000,000, plus agency support costs of US $140,000 for UNDP.

PROJECT EVALUATION SHEET – MULTI-YEAR PROJECTS

China

(I) PROJECT TITLE	AGENCY	MEETING APPROVED	CONTROL MEASURE
HCFC phase-out plan (stage II) refrigeration servicing and enabling programme	UNEP (lead), Germany and Japan	Approved: 76th Revised: 86th	n/a

(II) LATEST ARTICLE 7 DATA (Annex C Group l)	Year: 2022	10,577.35 (ODP tonnes)

(III) LATEST COUNTRY PROGRAMME SECTORAL DATA (ODP tonnes)						Year: 2022
Chemical	Aerosol	Foam	Refrigeration		Solvent	Total sector consumption
			Manufacturing	Servicing		
HCFC-22		1,292.50	3,162.50	2,918.58		7,373.58
HCFC-123			10.80	8.23		19.03
HCFC-124				0.48		0.48
HCFC-141b		2,782.54			275.00	3,057.54
HCFC-142b		65.00	4.23	57.48		126.71

(IV) CONSUMPTION DATA (ODP tonnes)			
2009 - 2010 baseline:	19,269.00	Starting point for sustained aggregate reductions:	18,865.44
CONSUMPTION ELIGIBLE FOR FUNDING (ODP tonnes)			
Already approved:	12,161.02	Remaining:	6,704.42

(V) ENDORSED BUSINESS PLAN		2023	2024	2025	Total
UNEP	ODS phase-out (ODP tonnes)	51.77	77.66	31.06	160.49
	Funding (US $)	2,219,467	3,329,200	1,331,680	6,880,347
Germany	ODS phase-out (ODP tonnes)	0.0	0.0	0.0	0.0
	Funding (US $)	0	0	0	0
Japan	ODS phase-out (ODP tonnes)	0.0	0.0	0.0	0.0
	Funding (US $)	0	0	0	0

(VI) PROJECT DATA			2016	2017	2018	2019*	2020	2021	2022	2023	2024	2025	2026	Total
Montreal Protocol consumption limits (ODP tonnes)			17,342.1	17,342.1	17,342.1	17,342.1	12,524.9	12,524.9	12,524.9	12,524.9	12,524.9	6,262.4	6,262.4	n/a
Maximum allowable consumption (ODP tonnes)**			16,978.9	16,978.9	15,048.1	15,048.1	11,772.0	11,772.0	11,772.0	8,618.0	8,618.0	5,063.5	5,063.5	n/a
Funding agreed in principle (US $)	UNEP	Project costs	3,299,132	2,570,000	0	1,000,000	0	1,160,000	1,780,000	2,000,000	3,000,000	1,200,000	2,517,105	18,526,237
		Support costs	364,651	284,061	0	120,000	0	127,291	195,325	219,467	329,200	131,680	276,211	2,047,886
	Germany	Project costs	300,000	0	0	0	0	600,000	220,000	0	0	0	0	1,120,000
		Support costs	36,000	0	0	0	0	71,122	26,078	0	0	0	0	133,200
	Japan	Project costs	80,000	80,000	0	0	0	240,000	0	0	0	0	0	400,000
		Support costs	10,400	10,400	0	0	0	31,200	0	0	0	0	0	52,000
Funds approved by ExCom (US $)		Project costs	3,679,132	0	2,650,000	1,000,000	0	2,000,000	2,000,000	0	0	0	0	11,329,132
		Support costs	411,051	0	294,461	120,000	0	229,613	221,403	0	0	0	0	1,276,528
Total funds recommended for approval at this meeting (US $)		Project costs								2,000,000				2,000,000
		Support costs								219,467				219,467

* The third (2018) tranche was submitted at the 82nd meeting at a value of US $3,850,000, plus agency support costs of US $431,831, and deferred for consideration at the 84th meeting (decisions 82/71(b) and 83/55).

** The total maximum allowable consumption of Annex C, Group I substances for the 2021 to 2026 period, the total adjusted value of stage II of the HPMP for the sector, and the funding level of tranches between 2020 and 2026 were approved at the 86th meeting (decision 86/34).

Secretariat's recommendation:	Individual consideration

PROJECT DESCRIPTION

114. On behalf of the Government of China, UNEP as the lead implementing agency has submitted a request for funding for the sixth tranche of the refrigeration and air-conditioning servicing sector and the national enabling programme[22] of stage II of the HCFC phase-out management plan (HPMP), in the amount of US $2,000,000, plus agency support costs of US $219,467 for UNEP only.[23] The submission includes a progress report on the implementation of the fifth tranche of the refrigeration servicing sector and the tranche implementation plan for 2023-2024.

115. This submission is based on the revised plan of action for the refrigeration servicing sector for the period 2021-2026 at the total amount of US $12,717,105, plus agency support costs, as approved by the Executive Committee at the 86th meeting. The value of the adjusted total funding approved in principle for stage II of the refrigeration servicing sector is US $20,046,237, plus agency support costs (decisions 86/34 and 86/37).

116. Stage II of the refrigeration servicing sector plan comprises a component related to phase-out activities in the sector and an enabling component to build capacity at the national and local levels, strengthen the communication and coordination mechanisms of relevant departments associated with the HPMP implementation, ensure continuous implementation of policies and regulations on controlled substances, and improve the monitoring and reporting of imports and exports of controlled substances in order to reduce the risks of the illegal trade of ozone-depleting substances (ODSs).

117. The policy studies, revision of standards and codes, technician training and certification, and awareness and outreach activities included in the refrigeration servicing sector plan, also support the phase-out in the room air-conditioning and heat pump water heaters (RAC) and the industrial and commercial refrigeration and air-conditioning (ICR) manufacturing sectors.

Progress report on implementation of the fifth tranche of stage II of the refrigeration servicing sector plan

118. As of September 2023, the following activities were implemented:

(a) The project cooperation agreement (PCA) for the fifth tranche in the amount of US $1,546,300 covering the funding tranche of UNEP, was signed in July 2023 between UNEP and the Foreign Environmental Cooperation Centre (FECO) and the first installment under this PCA was transferred from UNEP to FECO in August 2023;

(b) A recommended list of ODS alternatives was issued by the Ministry of Ecology and the Environment (MEE) and the Ministry of Industry and Information Technology, which includes 23 ozone friendly and low-GWP refrigerants, blowing agents and solvents. Three codes[24] that were published during the previous tranche were introduced through an in-person workshop for a total of 500 technicians and an online workshop for 5,000 technicians. FECO developed the terms of reference for the development of five new codes and standards, including technical specifications for the servicing and maintenance of cold storage systems, water chillers, multi-split air conditioners, and refrigeration and air-conditioning equipment for industrial and commercial applications; and for equipment with flammable refrigerants;

[22] The full name of the refrigeration and air-conditioning servicing sector and the national enabling programme is abbreviated to "refrigeration servicing sector" throughout the present document.

[23] As per the letter of 22 September 2023 from the Ministry of Ecology and the Environment of China to UNEP.

[24] For the servicing and maintenance of heat pumps with focus on refrigerant emissions; technical standards and specifications for tools and equipment and space requirements used in the training of servicing technicians; and operational specifications for detecting refrigerant leakage and for collecting and recording data during the servicing and maintenance of refrigeration equipment.

(c) Technical specifications for ODS recycling and requirements for ODS destruction, a study on developing a certification system for handling recovered ODS refrigerants and a guide for enterprises on environmentally sound recovery of refrigerants were all completed and submitted to the MEE. The Government of Germany worked with the China Household Electrical Appliances Association (CHEAA) to initiate the revision of two standards on transportation, installation, and servicing of room air conditioners using flammable refrigerants;

(d) A meeting on ODS enforcement at the local and provincial levels was held with 84 participants from the ecology and environment bureaus (EEBs) and from law enforcement. Another law enforcement training was held on the national monitoring platform for ODS and inspection practices for a total of 54 participants; local EEBs carried out training for 950 personnel from the provincial, city and county levels which included presentations from national ozone unit (NOU) officers on compliance with the Montreal Protocol. FECO/MEE signed a contract for the next phase of the capacity building project for local EEBs with Guangdong Solid Waste and Chemicals Environment Centre in July 2023;

(e) An online training on ODS import and export (I/E) management was attended by 2,000 customs officers and the training manual was updated; 90 national customs police officers from anti-smuggling bureaus were trained in combatting illegal ODS trade; an online workshop and an in-person workshop were held for a total of 430 participants from ODS I/E enterprises on control measures, policies, and regulations. Two study projects on national trade and I/E policies and control were initiated;

(f) Another 772 refrigeration and air-conditioning technicians including 150 women were trained through the vocational training system for a total of 6,885 service technicians (including 904 women) which completes the training targets of the 15 training centres and final reports were submitted. The final two training sessions on cold storage maintenance and operation of equipment based on ammonia/carbon dioxide were conducted for a total of 326 trainees (including 17 women) since 2021; and a handbook for cold storage maintenance and equipment operation was published and distributed;

(g) The fifth and final manufacturer delivered training to 350 technicians on the after-sales system for R-290 RAC servicing. In total the five manufacturers have trained 21,282 technicians on R-290 RAC servicing;

(h) The Chinese Association of Refrigeration (CRAA) and four manufacturers signed contracts to participate in the commercial refrigeration after-sales programme;[25] the second draft of good servicing practices in the cold chain subsector was completed; the implementing partner for a survey project in the cold chain sector has been selected and the project initiated;

(i) The second batch of pilot cities (Tianjin and Hangzhou in Zhejiang Province) finalized their work plans and launched activities including meeting the local refrigeration and air-conditioning technician association, conducting a survey of refrigeration and air-conditioning subsectors, and organizing a meeting with servicing enterprises to discuss HCFC management measures; two seminars were organized to share lessons learned from the first batch of pilot cities (Shandong, Henan, and Shenzhen);

(j) An international workshop on alternatives to HCFC-22 in room air-conditioning and lessons learned from the implementation of stage II of the HPMP was organized with more

[25] Over 20,000 technicians were trained during 2019-2022 through four other manufacturers under previous tranches.

than 100 participants in person and more online. A guidebook on HCFC management was developed and distributed to 100 supermarkets, and a meeting was organized to update information on the sector; and

(k) Promotional activities were carried out via social media and the OzonAction in China website, 300 copies of bilingual brochures on progress in the implementation of the Montreal Protocol were printed; thematic souvenirs with the message of ozone layer protection were distributed; the 12th annual Ozone2Climate industry roundtable and roadshow with more than 1,000 in-person participants and more than 5,000 virtual participants was organized; and 200 people participated in the World Ozone Day celebration for 2023.

Level of fund disbursement

119. As of August 2023, of the US $11,329,132 approved so far, US $7,939,192 (70 per cent) had been disbursed by FECO to beneficiaries, as shown in table 1. The balance of US $3,389,940 will be disbursed in 2024.

Table 1. Status of disbursement for stage II of the refrigeration servicing sector plan (US $)

Description		Tranche 1	Tranche 2	Tranche 3	Tranche 4	Tranche 5	Total
Funds approved	UNEP	3,299,132	2,570,000	1,000,000	1,160,000	1,780,000	9,809,132
	Japan	80,000	80,000	0	240,000	0	400,000
	Germany	300,000	0	0	600,000	220,000	1,120,000
	Total	**3,679,132**	**2,650,000**	**1,000,000**	**2,000,000**	**2,000,000**	**11,329,132**
Disbursement from implementing agencies to FECO	UNEP	3,289,000	* 2,640,000	925,000	*1,350,000	500,000	8,784,000
	Japan	80,000		0		0	
	Germany	300,000	0	0	51,000	0	351,000
	Total	**3,669,000**	**2,640,000**	**925,000**	**1,401,000**	**500,000**	**9,135,000**
	Ratio (%)	100	100	93	70	25	81
Disbursement from FECO to beneficiaries	**Total**	**3,658,514**	**2,419,652**	**916,338**	**544,143**	**400,545**	**7,939,192**
	Ratio (%)	99	91	92	27	20	70
Fund balance		20,618	230,348	83,662	1,455,857	1,599,455	3,389,940

* Comprising both UNEP and Japan funding components.

Implementation plan for the sixth tranche of stage II of the refrigeration servicing sector plan

120. The following activities will be implemented in 2023-2024:

(a) Development of five codes and standards, including technical specifications for the servicing and maintenance of cold storage systems, water chillers, multi-split air conditioners, and refrigeration and air-conditioning equipment for industrial and commercial applications; and for equipment with flammable refrigerants (UNEP) (funds from the previous tranche);

(b) Policy studies on HCFC management in the servicing sector and on HCFC filing management support for local EEBs to be submitted to MEE in 2024 (UNEP) (US $250,000); completion of the survey project in the cold chain sector for which a local partner has been selected; recruitment of experts from relevant sectors to provide technical support for the continued study on policies and regulations in accordance with the needs for the implementation of the Montreal Protocol (UNEP) (US $30,000 and funds from previous tranches); completion of the revision of two standards for the transportation, installation and servicing of room air conditioners using flammable refrigerants (Government of Germany) (funds from previous tranches);

(c) Training on ODS enforcement at the provincial and municipal levels for 240 manager level staff from local EEBs and 200 law enforcement officers (UNEP) (US $150,000 and funds from the previous tranche); local capacity building on Montreal Protocol compliance for six EEBs and preparation of EEB capacity building project for the remaining five selected provinces/cities; and an annual coordination meeting on implementation of the HPMP for relevant stakeholders (UNEP) (US $420,000 and funds from the previous tranche); two overseas training tours one on the Montreal Protocol implementation and ODS management in other countries and another to exchange experiences on ODS recovery and reuse (UNEP) (US $100,000 and funds from the previous tranche);

(d) Two training workshops for 150 customs and law enforcement officers, one training for 60 Commercial Department officers, and two trainings for 200 participants from relevant enterprises on the Montreal Protocol control requirements and the preparation of a draft training manual; certification of the ODS I/E paperless management approval system; continuation of policy research, outreach and training, and law enforcement inspections by customs and anti-smuggling bureaus (UNEP) (US $170,000 and funds from the previous tranche); research on the relationship between national trade policies and ODS control (UNEP) (US $50,000 and funds from the previous tranche); support to at least 10 NOU officers to participate in international workshops or regional network meetings; and an overseas training workshop to strengthen cooperation in I/E management of controlled substances with relevant countries (UNEP) (US $320,000 and funds from the previous tranche);

(e) Continuation of the second batch of the pilot cities (Tianjin and Hangzhou in Zhejiang Province), including strengthening of the filing and data management system; promoting good practices through training and outreach; and demonstration of refrigerant management, recycling, and reuse (UNEP) (funds from the previous tranche);

(f) Training of 400 technicians through the vocational system and training for 400 trainers and technicians on good servicing practices for alternative refrigerants; and one international training workshop on good servicing practices for regional countries (UNEP) (funds from the previous tranche);

(g) Training of 1,000 technicians by the CRAA and selected manufacturers for the commercial refrigeration after-sales programme to support the use of alternative technologies in commercial refrigeration (Government of Germany) (funds from previous tranches); and training of 400 technicians through manufacturer-owned servicing workshops focusing on small and medium-sized enterprises on skills required for the installation and servicing of R-290-based RAC or HFC-32 and other low-GWP alternatives in the ICR sector (UNEP) (funds from the previous tranche);

(h) Outreach to supermarkets, distribution of guidance handbooks on HCFCs, update of training materials and training of 200 technicians in the supermarket subsector on good practices and alternative technologies; a European study tour on alternative technologies in supermarkets (Government of Germany) (funds from previous tranches);

(i) Awareness-raising activities including celebration of the World Ozone Day; design, production, and dissemination of outreach materials; maintenance and updates of the OzoneAction in China website (UNEP) (US $125,000); and organization of the Ozone2Climate roadshow and roundtable events and an online exhibition for Ozone2Climate technology (UNEP) (US $215,000); and

(j) Project management and monitoring for UNEP (US $170,000), comprising the cost of staff (US $128,884), travel (US $17,877), and meetings and consultations (US $23,239).

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

HCFC consumption

121. In 2022, consumption of HCFCs in the servicing sector was 54,382.78 metric tonnes (mt) or 2,984.77 ODP tonnes, as shown in table 2.[26]

Table 2. HCFC consumption in the refrigeration servicing sector (2018-2022 country programme data)

HCFC	2018	2019	2020	2021	2022	Average*
mt						
HCFC-22	59,821.81	58,005.55	53,450.32	51,720.55	53,065.05	64,466.58
HCFC-123	437.57	404.58	358.18	406.30	411.69	113.75
HCFC-124	(5.32)	37.71	(23.20)	(31.65)	21.73	139.56
HCFC-142b	276.97	909.55	584.36	2011.60	884.31	5,338.58
Total (mt)	**60,531.03**	**59,357.39**	**54,369.66**	**54,106.80**	**54,382.78**	**70,058.47**
ODP tonnes						
HCFC-22	3,290.20	3,190.31	2,939.77	2,844.63	2,918.58	3,545.68
HCFC-123	8.75	8.09	7.16	8.13	8.23	2.30
HCFC-124	(0.12)	0.75	(0.51)	(0.70)	0.48	3.05
HCFC-142b	18.00	59.12	37.98	130.75	57.48	347.03
Total (ODP tonnes)	**3,316.83**	**3,258.27**	**2,984.40**	**2,982.81**	**2,984.77**	**3,898.06**

* Average consumption in 2009 and 2010.

122. The Government of China continues to enforce a strict licensing and quota management system for HCFC production and consumption and is committed to meeting the phase-out target for stage II of the refrigeration servicing sector while supporting the concomitant phase-out in the RAC and ICR manufacturing sectors. While the consumption of HCFC-22 for the servicing sector increased by about 3 per cent in 2022, it is expected that this consumption will decrease as activities in the RAC and ICR manufacturing sectors further advance in implementation.

123. The continuation of technician training activities to improve technical knowledge and skills in the areas of RAC installation and servicing, has resulted in reduced rates of equipment failure, leakage, and refrigerant recharge and a higher rate of refrigerant recovery and reuse and contributed to the overall reduction in the consumption of HCFC-22 in the sector.

124. In addition, the continued cooperation between FECO and the manufacturers to train technicians through the after-sales programme is effectively promoting good installation and servicing practices supporting the uptake of R-290 in the RAC sector and other alternative technologies in the ICR sector.

Status of progress

125. The Secretariat noted that there were some activities that had not progressed as planned and requested an update on the cold chain survey and study which had been approved as part of the fourth tranche, and those activities implemented under the Government of Germany component, including training activities in the supermarket subsector and the after-sales training on the use of R-290 technology in the ICR sector. UNEP explained that the cold chain survey had been completed and the report was being

[26] No maximum allowable consumption of HCFCs has been specified for the refrigeration servicing sector in the Agreement between the Government of China and the Executive Committee.

finalized. Regarding the supermarket subsector training activities, those supermarkets that had received training were delaying the implementation of the agreed actions due to economic pressures in the subsector, and the workplan had to be further adjusted. A guidance document on refrigerant management for supermarkets is under development, which will be used in further trainings for the subsector. An updated workplan for the trainings is under preparation in collaboration with the China Chain Store Franchise Association and other experts and will be completed by the end of 2023.

126. Clarification was also sought on the impact of policy recommendations arising from the three completed pilot city projects and the authority responsible for monitoring their implementation. UNEP explained that the policy recommendations reflected the experiences of the pilot cities during the implementation of Montreal Protocol related activities, and these were submitted to the MEE to support national decision-making related to local EEBs' actions to support compliance with the Montreal Protocol. It is expected that the MEE as the higher-level authority will monitor the local EEBs for implementation of the necessary measures at the local level; FECO/MEE will continue to provide daily support to the EEBs with regard to ODS management. The results from the three pilot projects support the enabling component objective to build the capacity of these offices to enforce policies related to ozone protection at the local level.

127. With regard to the completed training on ammonia-based cold storage maintenance and operation and its sustainability, UNEP noted that one main output of this activity was the training handbook which would be used as a resource for technicians. The activity raised awareness with cold storage enterprises on the need to train their technicians which could result in further trainings implemented by the enterprises themselves and push demand for servicing ammonia-based equipment.

128. Regarding training for the ICR servicing sector through the manufacturers' after-sales programme, the Secretariat queried on the activities implemented during the fifth tranche as the trainings reported appeared to be part of the plan from the fourth tranche. UNEP confirmed that the completed trainings were from the fourth tranche, and that those planned for the fifth tranche were still under preparation and were expected to commence before the end of the year. The Secretariat encouraged UNEP to collaborate with FECO closely to ensure that these trainings were implemented as soon as possible.

Project implementation and monitoring

129. In line with decision 81/46(b), UNEP as the lead implementing agency for the refrigeration servicing sector of stage II of the HPMP provided a cumulative report on the project management unit (PMU) expenditures, as summarized in table 3.

Table 3. PMU cumulative expenditures in the refrigeration servicing sector plan of stage II of the HPMP

Item	Description	Cost (US $)
Sector-specific costs	Project staff	260,452
	Domestic travel	25,789
	International travel	4,309
	Domestic meeting	20,382
	International meetings	0
	Consulting service	20,579
Subtotal for sector-specific costs		**331,511**
Operations costs	Shared costs (support staff, computers, Internet, printing, office operations and maintenance)	314,645
Total disbursements (2017-2022)		**646,156**

130. UNEP confirmed that there was no overlap in the funding provided for the institutional strengthening project and the awareness and outreach activities being implemented under the refrigeration servicing sector plan.

Gender policy implementation

131. In line with the Multilateral Fund operational policy on gender mainstreaming (decisions 84/92 and 90/48(c)), during the tranche implementation the PMU will continue to encourage women to participate in the activities organized such as meetings, trainings, workshops, capacity building and outreach activities. The PMU will also continue to collect sex-disaggregated data from these activities. Outreach and training materials will be developed to highlight gender issues and promote gender equity, when applicable. Under the fifth tranche, all refrigeration and air-conditioning training centres were requested to provide equitable opportunities for female technicians and to review training logistics and materials to ensure training sessions were gender sensitive. The reporting shows that 13 per cent of the trainees were women.

Sustainability of the HCFC phase-out and assessment of risks

132. The sustainability of the activities in the servicing sector and its enabling programme depends largely on the timely completion of the training and capacity building activities to support the investment activities in the RAC and ICR sectors. UNEP and the Governments of Japan and Germany will work closely with the Government of China to ensure that the agreements are maintained with the CHEAA, the CRAA, and the China Association of Staff and Workers Education and Vocational Training, who are the main partners in the enabling component and to ensure that training programmes developed continue to contribute to the reduction of consumption and emissions in the refrigeration servicing sector, and will support the refrigeration servicing sector for the safe use of the new generation of refrigerants. Through the pilot cities project the capacity of local EEBs has increased thus ensuring sustainable implementation at the local level.

Conclusion

133. The Government of China remains in compliance with the Montreal Protocol and its Agreement with the Executive Committee with regard to the refrigeration servicing sector. Progress has been made in the activities for the sector and its enabling component and the overall disbursement rate is at 70 per cent; consumption of 2,984.77 ODP tonnes of HCFCs in the refrigeration servicing sector in 2022 confirms that the Government has maintained its commitment to reduce HCFC consumption for the refrigeration servicing sector by 734 ODP tonnes in 2020 (i.e., from the 2015 consumption of 3,734 ODP tonnes, to the 2020 target consumption for the refrigeration servicing sector of 3,000 ODP tonnes). The reduction that has been achieved so far will be sustained through the enforcement of the quota management system for HCFC production and consumption, and the training programmes and technical assistance activities in the refrigeration servicing sector under implementation.

RECOMMENDATION

134. The Executive Committee may wish to consider:

(a) Noting the progress report on the implementation of the fifth tranche of the refrigeration and air-conditioning servicing sector plan and the national enabling programme of stage II of the HCFC phase-out management plan (HPMP) for China; and

(b) Approving the sixth tranche of the refrigeration and air-conditioning servicing sector plan and the national enabling programme of stage II of the HPMP for China, and the corresponding 2023-2024 tranche implementation plan, in the amount of US $2,000,000, plus agency support costs of US $219,467 for UNEP.

PROJECT EVALUATION SHEET – NON-MULTI-YEAR PROJECT

CHINA

PROJECT TITLE	BILATERAL/IMPLEMENTING AGENCY
(a) Demonstration project of replacing HFC-134a with R-744 in the field of electric vehicles	UNIDO

PROJECT OBJECTIVE

The pilot project aims to support one enterprise producing small passenger vehicles and one bus manufacturer in the design and production preparation of R-744-based air-conditioning systems, and in the production of small quantities of some vehicle models. At the same time, the project will support the establishment of energy-efficiency standards and labelling systems for automotive air conditioners in electric vehicles, promoting energy savings in their development. The pilot project will reduce energy consumption by 4.55 million kWh during the vehicles' life cycle.

NATIONAL COORDINATING AGENCY	Foreign Economic Cooperation Centre (FECO) and the Ministry of Ecology and the Environment (MEE)

LATEST ARTICLE 7 DATA (Annex F)	**Year:** 2022	370,903 mt	666,490,182 CO_2-eq tonnes

Particulars	Dongfeng Motor Group Co. and Zhengzhou Yutong Bus Co., Ltd.	
	500 electric cars and 50 electric buses	HFC-134a, R-407C, and R-410A
HFC used by the MAC sector in 2022	mt	Estimated 175,000
	CO_2-eq tonnes	Not available
HFC to be phased out:	mt	n/a (demonstration)
	CO_2-eq tonnes	n/a (demonstration)
HFC alternatives to be phased in:	mt	n/a (demonstration)
	CO_2-eq tonnes	n/a (demonstration)
Project duration (months):		36
Initial amount requested (US $):		2,040,000
Final project costs (US $):		
Capital cost:		365,000
Contingency (10%):		36,500
Operating cost:		396,000
Capacity building cost:		574,000
Total project cost:		**1,371,500**
Local ownership (%):		100
Export component (%):		0
Requested grant (US $):		1,371,500
Implementing agency support costs (US $):		96,005
Total cost of project to Multilateral Fund (US $):		1,467,505
Energy efficiency savings (US $/kWh):		0.38
Status of counterpart funding (Y/N):		Y
Project monitoring milestones included (Y/N):		Y
Minimum energy performance standards available for the relevant sector (Y/N):		N

SECRETARIAT'S RECOMMENDATION	Individual consideration

PROJECT DESCRIPTION

Background

135. On behalf of the Government of China, UNIDO has submitted, in line with decision 91/65, a request for a pilot project to maintain and/or enhance the energy efficiency of replacement technologies and equipment in the context of HFC phase-down down, in the amount of US $2,004,000, plus agency support cost of US $140,280, as originally submitted.

Energy-efficiency pilot project

Ratification of Kigali Amendment and status of preparation of the Kigali HFC implementation plan

136. The Government of China ratified the Kigali Amendment on 17 June 2021. As a group 1 country, China is committed to freeze the production and consumption of HFCs at its baseline level in 2024. As of date, the Government of China has not yet submitted the preparation project for its Kigali HFC implementation plan (KIP) to reach its HFC phase-down targets.

Project objective

137. This pilot project aims to support one enterprise producing small passenger vehicles and one bus manufacturer in the design of R-744-based air-conditioning (AC) systems, the manufacturing of 500 passenger cars and 50 buses using these systems, and their testing in identified areas of the country. The participating enterprises are Dongfeng Motor Group Co. (Dongfeng Company) for car manufacturing and Zhengzhou Yutong Bus Co. Ltd. (Yutong Bus) for bus manufacturing.

138. Furthermore, the project will support the establishment of energy-efficiency standards and a labelling system for mobile air-conditioning (MAC) installations used in electric vehicles (EVs), thus promoting energy savings in the development of automotive air conditioners.

HFC consumption in the mobile air-conditioning sector

139. The MAC sector is one of the key industries using HFC refrigerants; it is also one of the industries that will drive conversion to refrigerants with lower global-warming potential (GWP) in the coming years. As the world's largest MAC manufacturer, China has over a thousand automobile production lines, including more than 10 bus manufacturers and over a hundred enterprises producing small passenger vehicles.

140. The Government of China considers the MAC sector as one of the priority areas for HFC management and control. The dominant refrigerants used in the MAC sector in China are HFC-134a for passenger vehicles, R-407C or R-410A for electric buses, R-404A for refrigerated trucks, and HFO-1234yf for certain exported automobiles. Alternative refrigerants being considered in the industry are HFO-1234yf, R-744 (i.e., carbon dioxide/CO_2), HFC-152a, and R-290.

141. The consumption of HFC-134a in the country's MAC sector in 2022 exceeded 35,000 metric tonnes (mt), or 50 million CO_2-equivalent (CO_2-eq) tonnes, accounting for close to 10 per cent of total HFC consumption in the country in 2022 expressed in mt.

142. The sales of EVs have grown rapidly in recent years, exceeding 30 per cent of the Chinese automotive market so far and expected to continue growing. Global EV sales leapt by 95 per cent between 2020 and 2021, with 6.31 million vehicles sold in 2021, including 3.52 million (i.e., 56 per cent of global output) units equipped with HFC-134a-based MAC installations that were produced in China. The rise in EV use will lead to a significant increase in refrigerant consumption in the automotive industry, as EVs use from 1.5 to two times more refrigerant than fuel-based vehicles.

143. There is an urgent need to develop alternatives to phase out HFC-134a in the MAC sector, including the rapidly growing EV market. Internationally, HFO-1234yf has been mainly used to replace HFC-134a in fuel-based vehicles, with the industry accumulating rich experience in executing this type of conversions. In the case of EVs, however, alternative refrigerants such as R-744 are being considered.

144. The national Energy Efficiency Grade Standards are currently used to evaluate and classify electrical appliances and electronic products produced and sold in China. As of 1 January 2022, the country has implemented energy-efficiency labels and grade standards in multiple fields, including home appliances, lighting, office equipment, and industrial equipment. While a relevant standard has been developed for fuel-based vehicles; as of now there are no energy-efficiency standards for EV MAC systems, whose performance currently depends on enterprise-level testing processes.

145. Converting from the use of HFC-134a to R-744 in MAC manufacturing will result in reduced greenhouse gas emissions due to the elimination of fluorinated refrigerants and improvements in terms of energy efficiency. By supporting product development of R-744-based air conditioners for passenger cars and buses and demonstrating their application in certain regions, the proposed project will enable the automotive industry to quickly shift to energy-efficient and low-carbon alternative technologies.

146. The present 36-month pilot project to replace HFC-based refrigerants by R-744 is expected to result in a gradual decrease of carbon emissions from MAC systems over the 2027-2036 period. According to the analysis of the research of China's MAC HFC replacement policy, it is predicted that the automotive industry will gradually phase out HFCs refrigerants, starting from 2027.

Enterprise background and HFC consumption

Dongfeng Company

147. Dongfeng Company (Dongfeng) is one of the major enterprises in the Chinese automotive industry. Its predecessor was the Second Automobile Manufacturing Factory, founded in 1969, with headquarters in Wuhan, Hubei Province. Dongfeng has comprehensive manufacturing lines that produce a full range of commercial vehicles, passenger cars, and EVs, as well as producing components for other manufacturers and offering a full range of services to end users. The enterprise has established global cooperation with more than 10 international vehicle and component enterprises, and its products are sold to more than 100 countries worldwide.

148. Dongfeng Parts Group is Dongfeng's subsidiary responsible for the research and development of key automotive components, and there is a dedicated production line for AC heat exchanger components in Wuhan.

149. Dongfeng's vehicle production and HFC-134a consumption are shown in table 1.

Table 1. Vehicle production and HFC-134a consumption at Dongfeng in 2020-2022

Vehicle model	Average charge (kg)	Annual output (units)			Refrigerant use (mt)		
		2020	2021	2022	2020	2021	2022
Xuanyi	0.55	50,000	30,000	35,000	27.50	16.50	19.25
Xuanyi max	0.55	0	35,000	55,000	0.00	19.25	30.25
Jiku	0.65	0	0	30,000	0.00	0.00	19.50
AX7	0.65	30,000	40,000	60,000	30.00	26.00	39.00
E70	0.60	30,000	45,000	70,000	18.00	27.00	42.00
Lantu free	1.20	25,000	20,000	50,000	30.00	24.00	60.00
Total		**135,000**	**170,000**	**300,000**	**105.50**	**112.75**	**210.00**

Yutong Bus

150. Yutong Bus is a large, modern, Chinese-owned enterprise incorporating research and development, manufacturing, and sales of buses. Its Zhengzhou (Henan Province) factory produces over 325 complete vehicles per day, and is currently the largest single factory for large and medium-sized passenger cars in the world.

151. Zhengzhou Kelin Automotive Air-Conditioning Co., Ltd., a subsidiary of Yutong Bus, manufactures MAC assemblies and related components at an annual production capacity of 50,000 sets of air conditioners. The enterprise's large, state-level MAC experimental centre is fully committed to AC product development.

152. Yutong Bus production and refrigerant consumption are shown in Table 2.

Table 2. Bus production and refrigerant use at Yutong Bus in 2022-2022

Vehicle model	Refrigerant	Average charge (kg)	Annual output (units)			Refrigerant use (mt)		
			2020	2021	2022	2020	2021	2022
E-Bus1	R-407C	6.4	9,651	8,515	5,810	61.80	54.50	37.20
E-Bus2	R-410A	6.5	253	1,263	3,027	1.60	8.20	19.70
Total			**9,904**	**9,778**	**8,837**	**63.40**	**62.70**	**56.90**

Technology choice for the project

153. Given its thermodynamic properties and performance verified in experimental models, R-744 has great potential for EV heat pump heating. Its use in EV heating mode can greatly improve energy efficiency during winter; however, when running in trans-critical operation state for cooling, R-744 control technology is more complex, with system pressure nearly six times higher than in conventional systems. For most enterprises, the research and development investment on this technology is high, resulting in higher costs of AC systems and limited adoption of the technology so far. In the absence of support, the technology cannot achieve economies of scale that are necessary for its proliferation.

Proposed activities

154. The pilot project will implement the following activities:

(a) Modification of the production process to implement the conversion, with modifications to and replacement of the existing processes, including model redesign, technology transfer fee if redesign is outsourced, new refrigerant charging machine for R-744 systems, refrigerant transfer systems, installation of gas-detecting and ventilation systems, new leak detectors, refrigerant storage, training, and safety inspections (US $704,000);

(b) Provision of additional operating costs calculated based on the differences in refrigerant prices, materials, and equipment components (US $ 500,000);

(c) Creation of industry energy-efficiency standards and labelling system (at a total cost of US $1,200,000, with US $400,000 co-financed by the beneficiary enterprise, and funding requested at US $800,000), including:

(i) Drafting of the energy-efficiency testing and grading standards, energy-efficiency labelling systems, and refrigerant-leakage limits and detection methods for MAC systems;

(ii) Construction of an energy-efficiency testing laboratory and a refrigerant-leakage testing laboratory for MAC systems;

(iii) Technical assistance (TA), including design of a manual for refrigerant systems used in MAC; safety requirements; automobile high-efficiency refrigeration and air-conditioning (RAC) product design and production training; assistance to enterprises in developing highly energy-efficient MAC systems; and research report on a TA case of low-GWP refrigerant energy-efficiency improvement for MAC systems; and

(iv) Strengthening the energy-efficiency capacities of EVs and promoting related developments in China, with activities taking place at industrial level to build energy-efficiency standards, establish a reward-and-punishment mechanism, and build international connections to unify energy-efficiency standards with those of other countries and share knowledge on standards and technologies.

Total cost of the pilot project

155. The project promotes the production of 500 small passenger cars and 50 buses equipped with R-744-based AC systems. The total grant requested is US $2,004,000. The funds requested consist of additional capital costs of US $704,000, additional operating costs of US $500,000, and capacity-building costs of US $800,000.

Additional capital costs

156. The additional capital costs of developing R-744-based MAC systems, modifying the manufacturing lines, factory adaptation, and after-sales service improvement for small passenger cars and buses are presented in tables 3 and 4, respectively, including information on funding requested from the Multilateral Fund (MLF) and co-financing by the enterprises.

Table 3. Additional capital costs of Dongfeng for small passenger cars (US $)

Item	Description	Qty	Unit cost	Total	Funded by Dongfeng	Cost to MLF
Experimental verification fees						
1	System design cost	1	100,000	100,000	100,000	0
2	AC system experiment cost	1	200,000	200,000	200,000	0
Subtotal				**300,000**	**300,000**	**0**
Production / Modifications to the manufacturing line						
3	Model redesign or alternatively the technology transfer fee	2	100,000	200,000	100,000	100,000
4	New refrigerant charging equipment	1	400,000	400,000	300,000	100,000
5	Refrigerant transfer system	1	20,000	20,000	0	20,000
6	Refrigerant storage	1	20,000	20,000	0	20,000
Subtotal				**640,000**	**400,000**	**240,000**
Plant safety						
7	Ventilation and exhaust system	1	100,000	100,000	50,000	50,000
8	Gas sensors, alarm, monitoring system	1	30,000	30,000	30,000	0
9	Safety audit/inspection/certification	1	30,000	30,000	0	30,000
Subtotal				**160,000**	**80,000**	**80,000**
Car repair shop maintenance equipment update						
10	Charging equipment	20	5,000	100,000	50,000	50,000
Subtotal				**100,000**	**50,000**	**50,000**
	Total			**1,200,000**	**830,000**	**370,000**
	Contingencies (10 %)					37,000
	Total additional capital costs					**407,000**

Table 4. Additional capital costs of Yutong Bus for buses (US $)

Item	Description	Qty	Unit cost	Total	Funded by Yutong	Cost to MLF
Experimental verification fees						
1	System design cost	1	100,000	100,000	100,000	0
2	AC system experiment cost	1	150,000	150,000	150,000	0
Subtotal				**250,000**	**250,000**	**0**
Production / Modifications to the manufacturing line						
3	Tube-expanding machine mould	1	400,000	400,000	300,000	100,000
4	Pipe-bending machine mould	1	100,000	100,000	50,000	50,000
5	New refrigerant charging equipment	1	20,000	20,000	20,000	0
Subtotal				**520,000**	**370,000**	**150,000**
Plant safety						
6	Ventilation and exhaust system	1	100,000	100,000	50,000	50,000
7	Gas sensors, alarm, monitoring system	1	30,000	30,000	0	30,000
8	Safety audit/inspection/certification	1	30,000	30,000	0	30,000
Subtotal				**160,000**	**50,000**	**110,000**
Bus repair shop maintenance equipment update						
9	Filling equipment	4	5,000	20,000	10,000	10,000
Subtotal				**20,000**	**10,000**	**10,000**
	Total			**700,000**	**430,000**	270,000
	Contingencies (10 %)					27,000
	Total additional capital costs					**297,000**

Additional operating costs

157. Additional operating cost calculation details for the pilot project to produce 500 small passenger cars and 50 buses equipped with R-744-based AC systems are shown in tables 5 and 6, respectively.

Table 5. Additional operating costs for the manufacturing of small passenger cars (US $)

Unit	Unit cost of baseline HFC-134a	Unit cost of CO_2	Additional cost per unit
Compressor	171	257	86
Heat exchanger	23	29	6
Air-conditioner assembly	93	107	14
Refrigeration pipe	50	93	43
Refrigerant-regulating valve	50	86	36
Sensor	34	57	23
Gas-liquid separator	11	21	10
Refrigerant HFC-134a/CO_2	17	0	-17
Sum per unit			200
Vehicles produced			500
Additional costs per year			**100,000**

158. For buses, it was difficult to evaluate the cost increase of the R-744-based MAC systems due to the lack of mass production. Based on information available from industry experts, the cost increase for a single vehicle was estimated at US $8,000. According to the pilot project plan, conducting a trial assembly of 50 buses will entail an overall cost increase of US $400,000.

Table 6. Additional operating costs for the manufacturing of buses (US $)

Additional cost per bus	Number of produced buses	Total additional costs
8,000	50	400,000

Capacity-building costs

159. The submission includes a component to provide capacity building and equipment support to the standard-testing institutions in the automotive sector. This includes developing MAC energy-efficiency testing standards and a labelling system for EVs, upgrading energy-efficiency testing facilities including their refrigerant-leakage limits and leak-detection systems, training for technical personnel on designing and manufacturing energy-efficient MAC systems, and preparation of a technical report on low-GWP energy-efficient MAC systems. China's Automotive Technology and Research Center (CATARC) and the Standardization Administration (SAPRC) would be fully involved in the development of standards and testing procedures, as well as awareness building and technical information outreach on R-744-based refrigerant use in MAC systems. Table 7 shows the details of the capacity-building costs, as submitted.

Table 7. Costs of creating industry energy-efficiency standards and labelling systems (US $)

Content		Total	Beneficiary co-funded	Cost to MLF
Standards for MAC systems	Energy-efficiency testing and upgrading standard	100,000	100,000	0
	Energy-efficiency labelling system	100,000	100,000	0
	Refrigerant leakage limit and detection method	100,000	100,000	0
Laboratory construction	MAC energy-efficiency testing laboratory	300,000	100,000	200,000
	MAC refrigerant-leakage testing laboratory	200,000	0	200,000
TA	Automobile high-efficiency RAC product design and production training	100,000	0	100,000
	Assistance to enterprises in developing highly energy-efficient MAC systems	100,000	0	100,000
	Report on a TA case of low-GWP refrigerant energy-efficiency improvement in a MAC system	200,000	0	200,000
Total capacity-building costs		**1,200,000**	**400,000**	**800,000**

160. The summary of the overall project costs, as submitted, is given in table 8.

Table 8. Summary of the total project costs (US $)

Components	Estimated costs			
	Additional capital costs	Additional operating costs	Capacity-building costs	Total
Dongfeng	407,000	100,000	0	507,000
Yutong Bus	297,000	400,000	0	697,000
Industry body	0	0	800,000	800,000
Total	**704,000**	**500,000**	**800,000**	**2,004,000**

Cost-effectiveness

161. With the launch of 50 buses and 500 passenger cars using R-744 technology combined with the energy-saving calculation of the single vehicle life cycle, the vehicles produced in this pilot project will reduce energy consumption by 4.55 million kWh during their life cycle (3.7 million kWh for the bus project and 0.85 million kWh for the passenger car project).

162. The total grant requested for this pilot project is US$ 2,004,000, at an overall cost-effectiveness, US $0.44/kWh, measured in US $ funding per kWh saved. The project will be implemented over a period of 36 months.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

Relation to stage I of the Kigali HFC implementation plan and sustainability of HFC reductions

163. China has ratified Kigali Amendment in 2021; however, they have not requested for funding for preparation of stage I of the KIP as of date. Upon request for additional information relating to how this project and broadly the MAC sector would be addressed in the KIP, UNIDO informed that as per the current plan, the Government of China is planning to include a component to address HFC-134a in the MAC sector in stage I of the KIP; and the current project would help in promoting low-GWP alternatives for the MAC sector.

Regulations for minimum energy performance standards for mobile air-conditioning systems

164. The Secretariat requested clarification on whether there were minimum energy performance standards (MEPS) for MAC systems in China, noting that decision 91/65 b(iv)(a) indicates that for projects in the manufacturing sector, the country should have in place MEPS and a mechanism to monitor and assess their implementation. UNIDO explained that currently, there were no MEPS under the national regulations relating to the automotive sector in China, and that part of the project's objective was to assist in the development of a standard. The MAC standards development and finalisation would be undertaken in six phases over a period of four years that includes drafting of the standard by CATARC, approval by SAPRC, and finalisation upon consultations with the industry. The project components will assist the Government in establishing these standards that would help the industry adopt energy-efficient MAC systems based on low-GWP refrigerants. UNIDO also explained that the quantification of energy efficiency of MAC systems in EVs would help the manufacturers upgrade their systems to reduce energy consumption in EV MAC systems and to guide consumers in understanding how to use MAC systems in EVs for optimum performance.

Adoption of R-744-based mobile air-conditioning systems and information-sharing on the project

165. The Secretariat requested clarifications on whether R-744 based MAC systems would be scaled up, noting that there are proven alternative technologies available. UNIDO explained that the Government will guide enterprises in the MAC sector on technology selection, component manufacturing and R-744-based MAC system assembly, through training, discussions, a handbook, and a technical report. R-744-based MAC is also expected to be promoted during the implementation of the KIP, which would set more strict limitations on HFC production and consumption in the country and conduct extensive outreach programmes on the use of this technology in the growing EV markets. The enterprises participating in this project are confident that R-744-based MAC would work in different operating conditions and would be adopted in the country.

166. On information sharing on this project, UNIDO explained that upon completion of the project, a detailed report on R-744 technology performance would be prepared and disseminated to all enterprises in the MAC sector; the results of the project would also be disseminated to other Article 5 countries through regional network meetings, annual technical workshops and other outreach processes to promote adoption of this technology. Information collected through this project would also be used for advising regulatory authorities in China to help the Government fulfill its HFC phase-out obligations under the Montreal Protocol. The Secretariat considers that detailed dissemination of information with the industry and other stakeholders, and the implementation of standards for MAC coupled with regulatory measures under KIPs to promote low-GWP refrigerants in MAC systems will facilitate the adoption of R-744-based MAC systems by the industry.

Proposed and revised costs

167. The Secretariat had extensive consultations on the cost components relating to this project noting that this project is being implemented as a demonstration project; therefore, by the end of the project the manufacturing lines assisted will not stop using HFC, but at the same time, the level of support required to enable production at a pilot scale would be lower than a full conversion. In assessing the items needed for the project and their cost, the Secretariat also took into consideration the additional capital and operating cost of those items required to ensure improvements in energy efficiency for this demonstration project. Based on these consultations, UNIDO agreed to the following adjustments also shown in table 9 below:

(a) Car manufacturing at Dongfeng: Reduction in cost of equipment for manufacturing, on a pilot scale, cars with R-744-based MAC systems and equipment support for servicing and reduction in number of cars tested from 500 to 400 (reduction from US $507,500 to US $307,000);

(b) Bus manufacturing at Yutong Bus: Reduction in cost of equipment for manufacturing, on a pilot scale, buses with R-744-based MAC systems and equipment support for servicing and reduction in number of buses tested from 50 to 40 (reduction from US $697,000 to US $490,500); and

(c) Industry standards development and testing support: Reduction in costs relating to establishment of testing facilities for R-744-based MAC systems, training and capacity building for design and development and manufacturing (reduction from US $800,000 to US $574,000).

Table 9. Agreed costs of the demonstration project for conversion to R-744-based MAC systems

Description	Proposed cost (US $)	Agreed cost (US $)
Additional capital costs (Dongfeng)	407,000	231,000
Additional operating costs (Dongfeng)	100,500	76,000
Subtotal (Dongfeng)	**507,500**	**307,000**
Additional capital costs (Yutong Bus)	297,000	170,500
Additional operating costs (Yutong Bus)	400,000	320,000
Subtotal (Yutong Bus)	**697,000**	**490,500**
Capacity-building costs	800,000	574,000
Total costs	**2,004,500**	**1,371,500**

168. The Secretariat notes that in the absence of the cost guidelines for HFC phase-out, this project has been reviewed on a case-by-case basis. It is acknowledged that there is a large level of uncertainty in some of the costs, including the additional operating costs estimated. Based on the information available at the time of review, the Secretariat considers that the agreed costs are the best estimate of the overall costs of the conversion; however, these estimates might change, according to the specific characteristics of participating enterprises, as more information becomes available. The Secretariat considers that approval of the project at the levels proposed above would not constitute a precedent.

Energy-efficiency considerations

169. The estimated energy-efficiency impact from the project as submitted and as agreed is presented in table 10.

Table 10. Estimated energy-efficiency impact from the project as submitted and as agreed

Type of vehicle	Annual savings per vehicle (kWh)	Life-cycle savings per vehicle(kWh)	Number of vehicles	Total savings (million kWh)
As submitted				
Passenger cars	113	1,695	500	0.85
Buses	5,690	73,967	50	3.70
Total project savings				**4.55**
As agreed				
Passenger cars	113	1,695	400	0.68
Buses	5,690	73,967	40	2.96
Total project savings				**3.64**

170. Based on the agreed cost of US $1,371,500 and the total energy savings obtained of 3.64 million kWh by the 400 vehicles and 40 buses produced, the overall cost-effectiveness of this pilot project, measured in US $ per kWh saved, is US $0.38/kWh.

Coordination of energy-efficiency activities funded outside the Multilateral Fund

171. Noting that the Climate and Clean Air Coalition (CCAC) is currently considering a proposal submitted by UNIDO entitled "Pilot projects of R-744 and R-290 refrigerant substitution technology for EVs", the Secretariat enquired for clarification these projects relate to each other. UNIDO explained that out of the six outputs proposed under the CCAC project, one consisting of research and testing of R-744-based AC systems, is directly related to the present project. Because of this, funding for system design and AC system experiments in Dongfeng and Yutong (items 1 and 2 in tables 3 and 4) are not being requested under the Multilateral Fund project.

172. The remaining outputs from the CCAC project include the development of standards on safety related to R-744-based technology in China, two outputs related to R-290-based technology in India, training in the servicing sector in India and China, and training to national ozone units in South Asia to disseminate findings and promote low-GWP technologies in the region.

173. UNIDO informed the Secretariat that as of now, China has not received any other funding for MAC projects from other sources; if any other source of funding becomes available, the activities will be designed and implemented in a way that will not result in duplication of project activities.

Sustainability of the pilot project and assessment of risks

174. This project would result in development of R-744-based MACs for cars and buses and a better understanding of the performance of R-744-based technology in MAC sector. The project would also result in development of MAC technical standards for energy efficiency in electric cars which is an important parameter for energy efficient operation of electric vehicles. The Government would ensure that the product technical performance information and other aspects including servicing related experiences gained based on testing of the equipment in different operating conditions, would be shared widely with the industry; training and technical support for different car manufacturers' technical personnel and other stakeholders would also be provided as a part of this project. This will encourage the industry in having a better understanding of the technology and thus, reduce the barriers related to understanding of the technology.

175. The adoption of this technology by the MAC industry would depend upon the results of this project and specific enterprise-level assessment relating to adopting this technology. The Government would also promote the adoption of natural-refrigerant-based, low-GWP technologies in the MAC sector. This is expected to result in adoption of this technology by certain automotive industrial players.

RECOMMENDATION

176. 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 China, in the amount of US $1,371,500, plus agency support costs of US $96,005 for UNIDO, noting:

(a) That the Government of China has committed to the conditions referred to in decision 91/65(b)(iv)b. to b(iv)d.; and

(b) That the project would be completed no later than December 2026, and a detailed project report would be submitted to the Executive Committee within six months of the date of completion of the project.

Annex I

BACKGROUND OF STAGE II OF THE HCFC PHASE-OUT MANAGEMENT PLAN FOR CHINA (76th to 83rd MEETINGS)

76th meeting

1. At its 76th meeting, the Executive Committee approved in principle:

   (a) The solvent sector plan for the period 2016 to 2026, for the complete phase-out of all HCFCs in that sector, in the amount of US $44.8 million, plus agency support costs; and

   (b) The refrigeration servicing sector and enabling programme component for the period 2016 to 2020, to reduce HCFC consumption by 734.0 ODP tonnes in that sector, in the amount of US $20.29 million, plus agency support costs.

77th meeting

2. At its 77th meeting, the Executive Committee approved in principle stage II of the HCFC phase-out management plan (HPMP) for China for the period 2016 to 2026 in the amount of US $500,100,000, plus agency support costs, to reduce HCFC consumption by 37.6 per cent of the baseline by 2020. Stage II included the following sector plans:

   (a) The industrial and commercial refrigeration and air-conditioning (ICR) sector plan to reduce HCFC consumption in the sector by 33 per cent by 2020;

   (b) The room air-conditioning manufacturing and heat pump water heaters (RAC) sector plan to reduce HCFC consumption in the sector by 45 per cent by 2020;

   (c) The polyurethane (PU) rigid foam sector and the extruded polystyrene (XPS) foam sector plans to achieve the total phase-out of HCFCs in these sectors by 2026; and

   (d) The refrigeration and air-conditioning servicing sector and the national enabling programme and the solvent sector plans, approved at the 76th meeting, were components of stage II of the HPMP.

79th meeting

3. At its 79th meeting, the Executive Committee approved the Agreement between the Government of China and the Executive Committee for the implementation of stage II of the HPMP, and set the agency support costs for UNDP, UNIDO, and the World Bank at 6.5 per cent, on the understanding that the agency support costs could be reconsidered at the 81st meeting, and maintained the level of agency support costs for the bilateral agencies and UNEP in place under the current administrative cost regime.

80th and 81st meetings

4. At the 80th and 81st meetings, the Executive Committee approved the second tranches for all except the PU foam sector plans.

82nd meeting

5. At the 82nd meeting, on behalf of the Government of China, UNDP, UNEP, UNIDO, the World Bank, and the Governments of Germany and Japan submitted requests amounting to US $29,199,492 for

the second tranche of the PU foam sector plan (US $10,600,000), and the third tranches of the XPS foam (US $8,000,000), ICR (US $12,000,000), solvent (US $5,549,492), and refrigeration servicing (US $3,850,000) sector plans of stage II of the HPMP.[1] The submission included an independent verification of HCFC production and consumption in 2017 (submitted by the World Bank); annual implementation reports covering the activities undertaken so far, and annual implementation plans for the activities to be implemented in 2018-2019.

6. After reviewing the documents associated with the third tranche requests for the XPS foam, ICR, solvent and refrigeration servicing sector plans, the Secretariat concluded that all of them had merits to warrant their submission for consideration at the 82nd meeting. However, this was not the case for the second tranche of the PU foam sector plan, as no disbursements from the first tranche had taken place at the time of submission.

7. In discussing the tranche requests, several Committee members expressed serious concern at approving additional funding at that meeting given the unexplained emissions of trichlorofluoromethane (CFC-11) that were reported in East Asia. Pursuant to decision XXX/3 regarding these unexpected emissions, more information had been requested on their cause, and it was suggested that the funding request be deferred until a subsequent meeting when more information was available. At the time, the Foreign Environmental Cooperation Centre (FECO) still held over US $100 million that had not yet been disbursed to beneficiary enterprises; thus, it was considered that deferring the funding requests should have no significant effect. It was important to demonstrate to the international community that the Multilateral Fund took the issue of the illegal emission of CFC-11 seriously, but any decision to defer the funding should be without prejudice to any further actions to be taken by the Government of China.

8. Other members said that care needed to be taken, and that any decision to defer the funding requested should not put into jeopardy the 2020 reduction target for China. It was asked whether all funds had already been transferred to FECO or whether some of them remained with the implementing agencies, and what the effect on them might be if the present request for funding was deferred. The ongoing investigations into the cause of the emissions of CFC-11 meant that the Executive Committee needed to be cautious when reaching conclusions. It could take several years for all the relevant information to be assembled, and it was important to have clarity on what information was required and a timeline for assembling it.

9. Subsequent to deliberations on the issue in the contact group, the Committee decided (decision 82/71):

(a) To request the Government of China, through the relevant implementing agency, to submit at the 83rd meeting:

(i) A review of the current monitoring, reporting, verification and enforcement systems in line with its Agreements with the Executive Committee on the country's HPMP and HCFC production phase-out management plan, including information on the organizational structure and capacity at the national and local levels that demonstrated how the long-term sustainability of the phase-out of HCFCs in the consumption and production sectors was being ensured and on the efforts to address any illegal trade in those substances; and

(ii) A progress report regarding actions taken with a view to strengthening of legislation on ozone-depleting substances (ODSs) and implementation thereof in China; and

[1] The request for the third tranche of the RAC sector plan (US $18,000,000) was not submitted because the level of disbursement of funds approved for the second tranche had not reached 20 per cent.

(b) To consider the requests for funding for the subsequent tranches of stage II at the 83rd meeting.

83rd meeting

10. In response to decision 82/71, UNDP submitted, on behalf of the Government of China, the report on the current monitoring, reporting, verification and enforcement systems and the progress report regarding actions taken with a view to strengthening of legislation on ODSs.[2] In addition, UNDP, UNEP, UNIDO, the World Bank and the Governments of Germany and Japan re-submitted requests for third tranches of the XPS foam, ICR, solvent and refrigeration servicing sector plans and for second tranche of the PU foam sector plan associated with stage II of the HPMP for China.

11. After reviewing the re-submission of the sector plans and associated documents, the Secretariat concluded that all of them merited consideration at the 83rd meeting, except the request for the second tranche of the PU foam sector plan, which did not meet the disbursement requirements; accordingly, this tranche request was not submitted.

12. In discussing the tranche requests, one Executive Committee member said that in light of the matter of the substantial increase in CFC-11 emissions from China, her delegation had concerns about the sustainability of reductions in ODS achieved using funding from the Fund, and was unable, at the present time, to support project funding for China; she further noted that there may need to be restitution for the environmental harm caused by the unexpected emissions. Another representative supported that stance, stating that until the matter had been clarified, his country was unable to approve new tranches for the HPMP, as that would undermine the credibility of the Montreal Protocol.

13. Following the discussion, the Executive Committee deferred, to the 84th meeting, consideration of the revision of the Agreement for stage II of the HPMP for China and the requests for the third tranches of the XPS foam, ICR, refrigeration servicing, and solvent sector plans under stage II of the HPMP (decision 83/55).

[2] UNEP/OzL.Pro/ExCom/83/11/Add.1

Annex II

FINANCIAL REPORT OF THE PROJECT MANAGEMENT UNIT ASSOCIATED WITH THE SECTOR PLANS OF STAGE I AND STAGE II OF THE HCFC PHASE-OUT MANAGEMENT PLAN AND HCFC PRODUCTION PHASE-OUT MANAGEMENT PLAN FOR CHINA

Stage I: cumulative project management unit (PMU) expenditure as of 31 December 2022 (US $)

Item	Sectors *						
	Production	**RAC**	**PU foam**	**XPS foam**	**ICR**	**Solvent**	**Servicing**
Sector costs							**11,571,730**
Project staff	1,768,942	1,963,171	1,590,980	1,199,717	1,785,395	235,859	260,452
Domestic travel	199,305	195,238	209,875	161,437	213,301	13,589	25,789
International travel	24,000	20,000	18,653	16,000	20,000	4,000	4,309
Domestic meeting **	176,004	153,384	170,391	130,008	172,133	12,000	20,382
International meetings	0	0	0	0	0	0	0
Consulting service ***	159,479	152,607	167,581	128,880	167,416	10,874	20,579
Subtotal sector costs	2,327,730	2,484,400	2,157,480	1,636,042	2,358,245	276,322	331,511
Share costs							**12,737,178**
Supporting staff ****							6,774,796
Computer, Internet, phone, printing, etc.							1,613,684
Office operation and maintenance, utilities							4,348,698
Total	**4,889,411**	**4,953,494**	**4,749,869**	**3,622,688**	**4,996,308**	**450,982**	**646,156**

Note: Total cumulative expenditure of the PMU in the implementation of stage I of the HPMP/HPPMP in 2011-2022 was US $24,308,908, comprising US $19,354,647 from the HPPMP and HPMP sector plans and US $4,954,234 from other individual projects or the Foreign Environmental Cooperation Centre's own budget. Expenditures for institutional strengthening and co-financing by the Government of China (about US $4.01 million in 2011-2022) are not included.

* PU = polyurethane; XPS = extruded polystyrene; RAC = room air-conditioning manufacturing and heat pump water heaters; ICR = industrial and commercial refrigeration and air-conditioning.

** Costs for venue, equipment rental and others.

*** Consulting institutions and experts hired for project evaluation, financial and technical verifications, technical review, bidding evaluations, technical support, etc.; contractual staff hired to help with high workload or special events, such as meetings, exhibitions and workshops, as well as translation-related costs.

**** Costs associated with the apportioned supporting staff in the financial division, contract management, general affairs, and other relevant divisions.

Stage II: Cumulative PMU expenditure as of 31 December 2022 (US $)

Item	Sectors*						
	Production	**RAC**	**PU foam**	**XPS foam**	**ICR**	**Solvent**	**Servicing**
Sector costs							**9,767,387**
Project staff	1,960,217	1,508,038	1,452,878	1,162,190	1,550,493	362,719	362,718
Domestic travel	118,434	59,679	74,624	113,174	131,595	53,415	50,313
International travel	13,305	0	0	3,821	4,000	0	0
Domestic meeting**	69,026	36,541	47,254	68,814	79,766	31,415	30,235
International meetings	0	0	0	0	0	0	0
Consulting service***	83,038	44,315	53,600	78,136	91,611	36,857	35,166
Subtotal for sector costs	2,244,020	1,648,573	1,628,356	1,426,135	1,857,465	484,406	478,432
Share costs							**7,484,476**
Supporting staff****							4,747,290
Computer, internet, phone, printing, etc.							783,612
Office operation and maintenance, utilities							1,953,574
Total	**3,748,942**	**2,510,004**	**2,580,454**	**2,749,227**	**3,440,976**	**1,126,266**	**1,095,994**

Note: Total cumulative expenditure of the PMU in the implementation of stage II of the HPMP in 2017-2022 was US $17,251,863, comprising US $7,906,724 from the HPMP sector plans and US $9,345,139 temporarily covered by the Foreign Environmental Cooperation Centre's budget, to be reimbursed by the implementing agencies from PMU costs for future tranches. Expenditures for institutional strengthening and co-financing by the Government of China are not included.

* PU = polyurethane; XPS = extruded polystyrene; RAC = room air-conditioning manufacturing and heat pump water heaters; ICR = industrial and commercial refrigeration and air-conditioning.

** Costs for venue, equipment rental and others.

*** Consulting institutions and experts hired for project evaluation, financial and technical verifications, technical review, bidding evaluations, technical support, etc.; contractual staff hired to help with high workload or special events, such as meetings, exhibitions and workshops, as well as translation-related costs.

**** Costs associated with the apportioned supporting staff in the financial division, contract management, general affairs, and other relevant divisions.