



**United Nations  
Environment  
Programme**

Distr.  
GENERAL

UNEP/OzL.Pro/ExCom/93/93  
4 December 2023

ORIGINAL: ENGLISH



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 of the provisional agenda<sup>1</sup>

**PROJECT PROPOSALS: VIET NAM**

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

Phase-out

- HCFC phase-out management plan (stage III, first tranche) World Bank

Phase-down

- Kigali HFC implementation plan (stage I, first tranche) World Bank and UNEP

<sup>1</sup> UNEP/OzL.Pro/ExCom/93/1

Pre-session documents of the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol are without prejudice to any decision that the Executive Committee might take following issuance of the document.

**PROJECT EVALUATION SHEET – MULTI-YEAR PROJECTS**

**Viet Nam**

(I) PROJECT TITLE	AGENCY
HCFC phase-out plan (stage III)	World Bank (lead)

(II) LATEST ARTICLE 7 DATA (Annex C Group I)	Year: 2022	139.02 ODP tonnes
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(III) LATEST COUNTRY PROGRAMME SECTORAL DATA (ODP tonnes)								Year: 2022	
Chemical	Aerosol	Foam	Fire-fighting	Refrigeration		Solvent	Process agent	Lab use	Total sector consumption
				Manufacturing	Servicing				
HCFC-22				2.75*	135.94*				138.69
HCFC-123				16.34					16.34
HCFC-141b in imported pre-blended polyol		10.61							10.61

\* At the time of finalization of the present document, the Government was revising the country programme data to reflect the distribution between consumption in the refrigeration manufacturing and servicing sectors as shown.

(IV) CONSUMPTION DATA (ODP tonnes)			
2009-2010 baseline:	221.20	Starting point for sustained aggregate reductions:	385.77
CONSUMPTION ELIGIBLE FOR FUNDING			
Already approved:	280.40	Remaining:	105.37

(V) ENDORSED BUSINESS PLAN		2023	2024	2025	Total
World Bank	ODS phase-out (ODP tonnes)	0.00	11.46	22.92	34.38
	Funding (US \$)	0	1,070,000	2,140,000	3,210,000

(VI) PROJECT DATA			2023-2024	2025	2026-2028	2029	2030	Total
Montreal Protocol consumption limits (ODP tonnes)			143.78	71.89	71.89	71.89	0	n/a
Maximum allowable consumption (ODP tonnes)			143.78	71.89	71.89	71.89	0	n/a
Project costs requested in principle (US \$)	World Bank	Project costs	3,227,127	0	4,610,182	1,383,055	0	9,220,364
		Support costs	225,899	0	322,712	96,814	0	645,425
Total project costs recommended in principle (US \$)			3,227,127	0	4,610,182	1,383,055	0	9,220,364
Total support costs recommended in principle (US \$)			225,899	0	322,712	96,814	0	645,425
Total funds recommended in principle (US \$)			3,453,026	0	4,932,894	1,479,869	0	9,865,789

(VII) Request for approval of funding for the first tranche (2023)		
Implementing agency	Funds recommended (US \$)	Support costs (US \$)
World Bank	3,227,127	225,899
Total	3,227,127	225,899

<b>Secretariat's recommendation:</b>	Individual consideration – all technical and cost issues resolved
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## PROJECT DESCRIPTION

### Background

1. On behalf of the Government of Viet Nam, the World Bank as the designated implementing agency has submitted a request for stage III of the HCFC phase-out management plan (HPMP), at the amount of US \$9,220,364, plus agency support costs of US \$645,425, as originally submitted.<sup>2</sup> The implementation of stage III of the HPMP will phase out the remaining consumption of HCFCs by 2030.

2. The first tranche of stage III of the HPMP being requested at this meeting amounts to US \$2,305,091, plus agency support costs of US \$161,356 for the World Bank, as originally submitted.

### Status of implementation of stage II of the HCFC phase-out management plan

3. Stage II of the HPMP for Viet Nam was originally approved at the 76<sup>th</sup> meeting<sup>3</sup> and revised at the 91<sup>st</sup> meeting<sup>4</sup> to phase out 137.20 ODP tonnes of HCFCs used in the refrigeration and air-conditioning (RAC) servicing and manufacturing sectors and the foam sector, and to meet the 35 per cent reduction from the baseline by 2020, at a total cost of US \$7,208,300, plus agency support costs. Stage II of the HPMP will be completed by December 2023, as stipulated in the Agreement between the Government of Viet Nam and the Executive Committee.

### Report on HCFC consumption

4. The Government of Viet Nam reported a consumption of 139.02 ODP tonnes of HCFC in 2022, which is 37 per cent below the HCFC baseline for compliance. The 2018-2022 HCFC consumption is shown in table 1.

**Table 1. HCFC consumption in Viet Nam (2018-2022 Article 7 data)**

HCFC	2018	2019	2020	2021	2022	Baseline
<b>Metric tonnes (mt)</b>						
HCFC-22	3,516.23	3,558.55	2,585.02	2,574.95	2,521.68	3,039.00
HCFC-123	16.34	16.34	0.00	8.17	16.34	8.00
HCFC-141b	0.00	0.00	0.00	0.00	0.00	490.00
HCFC-225	26.87	21.46	0.00	0.00	0.00	0.00
<b>Sub-total (mt)</b>	<b>3,559.44</b>	<b>3,596.36</b>	<b>2,585.02</b>	<b>2,583.12</b>	<b>2,538.02</b>	<b>3,537.00</b>
HCFC-141b in imported pre-blended polyols*	1,145.50	687.29	147.66	87.50	96.46	1,496.36**
<b>ODP tonnes</b>						
HCFC-22	193.39	195.72	142.18	141.62	138.69	167.15
HCFC-123	0.33	0.33	0.00	0.16	0.33	0.16
HCFC-141b	0.00	0.00	0.00	0.00	0.00	53.90
HCFC-225	1.88	1.50	0.00	0.00	0.00	0.00
<b>Sub-total (ODP tonnes)</b>	<b>195.60</b>	<b>197.55</b>	<b>142.18</b>	<b>141.79</b>	<b>139.02</b>	<b>221.21</b>
HCFC-141b in imported pre-blended polyols*	126.00	75.60	16.24	9.63	10.61	164.56**

\* Country programme (CP) data.

\*\* Average consumption between 2007 and 2009.

<sup>2</sup> As per the letter of 25 August 2023 from the Ministry of Natural Resources and Environment of Viet Nam to the World Bank.

<sup>3</sup> Decision 76/42

<sup>4</sup> Decision 91/57(a)(iii)

5. HCFC consumption in Viet Nam consists predominately of HCFC-22, which was used almost exclusively to service RAC equipment; a small amount (approximately 2 per cent in 2022) was used in the manufacturing of industrial refrigeration equipment.<sup>5</sup> Small amounts of HCFC-123 are consumed intermittently to service chillers. The use of HCFC-225 for solvent applications was phased out in 2019, and HCFC-141b has not been consumed since 2015, in line with the 1 January 2015 ban on HCFC-141b. Imports of HCFC-141b contained in imported pre-blended polyols initially increased following that ban, and then decreased substantially as foam manufacturers decided to convert to alternatives, most likely water-based pre-blended polyols, and given conversions supported under stage II of the HPMP; in line with the 1 January 2023 ban, imports of HCFC-141b contained in pre-blended polyols have ceased.

*Country programme implementation report*

6. The Government of Viet Nam reported HCFC sector consumption data under the 2022 CP implementation report that is consistent with the data reported under Article 7 of the Montreal Protocol.

Status of progress and disbursement

7. Since approval of the fourth and final tranche of stage II, the following activities were implemented:

- (a) Two training workshops for 136 customs officers were held on controlling and monitoring HCFC imports and exports in September and October 2023; a total of 350 customs officers were trained under stage II;
- (b) Technical guidance to facilitate the sustainable introduction of low-global-warming-potential (GWP) alternatives and raise awareness on low-GWP technology and the HCFC phase-out was completed; and the evaluation of technology effectiveness was completed at four converted enterprises, with the remaining technical assistance (TA) underway;
- (c) Under the TA implemented by the Government of Japan, training for air-conditioning (AC) manufacturers, the RAC association, the Viet Nam standards agency, and other relevant agencies on the safe use of HFC-32, as well as the follow-up practical training, was completed;
- (d) Under stage II, a total of 99 workshops were held and 3,188 technicians and 188 vocational trainers trained on good servicing practices and the safe handling of flammable refrigerants;
- (e) Delivery of 45 tool kits for selected vocational training schools and 200 tool kits for servicing shops was completed by 14 November 2023;
- (f) Conversion of two AC manufacturing enterprises to HFC-32 was completed; conversion of two refrigeration manufacturing enterprises to ammonia was completed, with conversion of the four small- and medium-sized enterprises (SMEs) to low-GWP alternatives expected to be completed by December; conversion of two of the five foam manufacturing enterprises to cyclopentane or pre-blended cyclopentane is in progress and expected by the end of November; and the blending house is transferring TA and hydrofluoroolefin (HFO) pre-blended polyol to approximately 20 SMEs for trials;
- (g) An online database of trained technicians, trainers and customs officers was developed and is awaiting approval to integrate into the Department of Climate Change (DCC) portal; a

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<sup>5</sup> In addition, approximately 1 per cent of the country's HCFC-22 consumption is used to charge commercial central air conditioners that are imported without refrigerant and charged at the site of installation.

certification and assessment standard for the training of technicians was drafted and is under consideration by the Directorate of Vocational Education and Training; an awareness workshop was held in September 2023 for enterprises, Government agencies, importers, media and other stakeholders on HCFC technology conversions supported by the HPMP and the establishment of HFO capabilities at the blending house; a workshop on training results for 100 stakeholders was organized in June 2023; and a workshop on lessons learned was conducted in September 2023; and

- (h) The project management unit (PMU) supported consultants to conduct annual verification of consumption and financial audits; upgraded administrative software; and supported project staff to review quotas, assist enterprises to implement their subprojects, monitor the implementation of project activities, conduct annual financial audits of the project expenditures, develop project implementation and financial reports, and coordinate reporting; expenditures for stage II as of November 2023 were US \$570,217, including staff salaries (US \$446,734), office equipment and software (US \$24,892), financial audits (US \$19,385), meetings (US \$4,968), and operational costs (US \$74,238).

#### *Level of fund disbursement*

8. As of October 2023, US \$4,544,325 of the US \$7,208,300 approved for stage II (63 per cent) had been disbursed; remaining disbursements will be completed by 30 April 2024.

#### **Stage III of the HCFC phase-out management plan**

##### Remaining consumption eligible for funding

9. After deducting 280.40 ODP tonnes of HCFCs associated with stages I and II of the HPMP, the remaining consumption eligible for funding in stage III amounts to 105.37 ODP tonnes of HCFC-22.

##### Sector distribution of HCFCs

10. HCFC-22 is used to service chillers, central AC, room AC, and industrial and large commercial refrigeration systems. In 2022, HCFC-22 represented 39 per cent of the refrigerants used in the servicing sector, followed by HFC-134, R-410A, HFC-32, and R-404A.

11. Of the approximately 20,750 technicians and 4,250 workshops/contractors in the RAC servicing sector, about 15,000 technicians in 4,000 service shops service residential AC. These service shops include both large-scale and small- and medium-scale shops. Large-scale workshops are normally certified or authorized workshops providing installation and services directly to the original equipment manufacturers and distributors, and typically employ about eight technicians that receive short training courses from manufacturers and distributors; those training courses focus more on marketing information of various products offered by manufacturers and distributors than proper installation and servicing practices. Small- and medium-scale service shops typically have between one and five technicians, most of whom only have on-the-job training without any formal technical education. The servicing of other subsectors is described in paragraphs 62 to 65 of the present document.

##### Phase-out strategy

12. Stage III of the HPMP will focus on strengthening the regulatory framework and implementing regulations to reduce the import of controlled substances and HCFC-based equipment, increasing the capacity of customs, and further strengthening the capacity of the residential AC servicing sector.

*Legal framework and customs*

13. The legal framework will be supported during stage III through policy and regulatory action to manage import quotas and sector-specific bans. The country has an effective HCFC licensing and quota system that will continue to be implemented in stage III of the HPMP, and the policy framework will be strengthened to ensure consumption of HCFCs is reduced as scheduled, including through the implementation of a ban on HCFC-225 imports (as of 1 January 2025) and on new installations and imports of HCFC-based equipment (as of 31 December 2029). In addition, equipment and training will be provided to increase the capacity of customs and enforcement officers, importers, and customs brokers to manage the import of controlled substances. Training for customs and enforcement officers on the management of imports will cover information on the ozone layer and Montreal Protocol, inspection techniques, use of refrigerant identifiers, risk profiling, the safe handling of refrigerant cylinders, Harmonized System (HS) codes, reporting and declaration, handling unauthorized shipments, and accessing information for cross-checks. Training for importers and customs brokers will focus on the declaration and reporting of refrigerants and RAC equipment, and cover licensing requirements, HS codes, the implications of misdeclaration, and the safe handling of refrigerant cylinders. The cost of those activities amounts to US \$745,000 as follows:

- (a) Customs and enforcement officers: Organization of 35 two-day workshops to train 1,050 customs and enforcement officers at major customs check points on the safe handling, identification, and reporting of controlled substances (US \$350,000);
- (b) Importers and customs brokers: Organization of two annual one-day workshops, including training materials and a manual, to train 300 importers and customs brokers on the declaration and reporting of refrigerants and RAC equipment and the safe handling of refrigerant cylinders (US \$35,000);
- (c) Strengthening customs operations: Two study tours on integrated approaches to monitoring the trade of controlled substances, such as the use of product codes, development of risk profiling to screen shipments, and post-clearance audits to strengthen monitoring and reporting (US \$60,000); and
- (d) Equipment support: Distribution of 50 refrigerant identifiers to major customs check points to enforce controlled substance trade protocols and to DCC for inspections in the domestic market (US \$300,000).

*Residential air-conditioning servicing*

14. Strengthening the capacity of the servicing sector under stage III will focus on the servicing of residential AC equipment, given the remaining HCFC-22 residential AC equipment bank in the country and prevalence of technicians that service residential AC units, and because of the need to ensure the safety of HFC-32-based residential AC equipment that was introduced in part through stage II implementation. As further described in paragraphs 69 to 106 of the present document, stage I of the Kigali HFC implementation plan (KIP) will complement the HPMP by focusing on strengthening the capacity of the servicing sector in other applications where the use of HFC is dominant, including commercial and industrial refrigeration systems, commercial AC and chillers, domestic refrigeration and mobile AC.

15. Strengthening the residential AC servicing sector will be implemented through training, assessment, and equipment support, building on capacity-building under stage II with a focus on increased outreach, and training to technicians in the informal sector. Training will cover good servicing practices, including managing refrigerants to reduce HCFC emissions, the safe handling of flammable refrigerants, maintaining energy efficiency through good servicing practices, and recovery and recycling, with a

refresher training for lecturers to stay up to date with current knowledge and practices. The cost of activities amounts to US \$6,931,600 and includes:

- (a) Residential AC servicing training and assessment (US \$2,950,000): Support to training centres through the development of standardized residential AC servicing training modules (US \$10,000); organization of two train-the-trainer workshops at each of 12 select training centres (one initial and one refresher) (US \$8,000) and 363 workshops to train 7,260 technicians on good AC servicing practices, the safe handling of flammable refrigerants, and energy efficiency in servicing (US \$1,452,000); development of an assessment standard for certification in good servicing practices and organization of two assessment training workshops (US \$18,000); 363 workshops to assess and certify 7,260 technicians on residential AC servicing practices (US \$1,452,000); and revision of occupational standards and training curriculum to include flammable refrigerants, and the transport, recycle, reclamation and handling of controlled substances (US \$10,000); and
- (b) Residential AC servicing equipment procurement (US \$3,981,600): Training sets (e.g., leak detector; pressure gauge; refrigerant recovery machine; refrigerant-containing tank; vacuum pump; AC unit; tool set of torque wrench, flaring, and tubing cutter; refrigerant scale; anemometer) for 12 training centres (10 sets each) (US \$684,000) and 12 assessment centres (10 sets each) (US \$684,000); and equipment and tools (e.g., vacuum pump; tool set of torque wrench, flaring, and tubing cutter) for 7,260 certified servicing technicians (US \$2,613,600).

#### *Technical assistance*

16. TA will be provided in the form of sector and impact studies, stakeholder outreach, and monitoring and evaluation. The cost of activities for the TA component is US \$595,000 and includes:

- (a) Study on opportunities for recovery and recycling to meet post-2030 HCFC servicing demand: Gather information on the remaining stock of HCFC-based equipment in room AC, industrial refrigeration (including in fisheries and seafood processing), and for chillers, and undertake an analysis of the expected remaining lifetime of such equipment and potential quantities of HCFCs that could be recovered; assess the business case for collecting and purifying recovered HCFCs, including by estimating the costs of collection, transport, recovery, and disposal, as well as purity standards, processes, and costs, including relative to international purity standards; and develop recommendations for policies and incentives that could help facilitate the recovery, recycling and resale of HCFCs (US \$250,000);
- (b) Policy impact assessment: Study to support the implementation of the ban on new installations and imports of HCFC-based refrigeration and chiller equipment by considering availability of alternative technologies, assessing costs and benefits, and evaluating environmental, economic, and social impacts of the ban. The study will include a focus on the fisheries and seafood industry, and will also include an assessment of mechanisms to address the import of second-hand components (US \$50,000);
- (c) Monitoring and evaluation framework: A framework will be developed to manage and assess the effectiveness of the capacity-building activities of the servicing sector, and will include gathering feedback through surveys and developing a report containing lessons learned and recommendations for improvement (US \$55,000); and
- (d) Stakeholder outreach: To phase out remaining consumption and inform stakeholders, technicians, and end-users of information not covered in other areas of the HPMP, and of

upcoming reduction regulations and phase-out, a number of awareness-raising activities will be undertaken. Communication will be through outreach materials and the media and will cover the HCFC phase-out, upcoming regulations and changes to policy, and information on emerging alternative technologies and their availability and related safety considerations, and include: a project launch workshop; outreach to assemblers and end-users of HCFC-based equipment that use second-hand components; educating end-users on the benefits of purchasing and using climate-friendly and energy-efficient equipment; guidance to owners of HCFC-123-based chillers in buildings, and their maintenance teams, on the advantages of using recovered refrigerant or replacing existing equipment with more efficient, low-GWP systems; information on the safe handling of flammable technologies disseminated to technicians and relevant stakeholders not directly reached through training; and a final stakeholder workshop at project end (US \$240,000).

*Project implementation and monitoring*

17. The system established under stages I and II of the HPMP will continue into stage III, with the PMU, under DCC, working with the national ozone unit and the World Bank to monitor activities, report on progress, and work with stakeholders to phase out HCFCs. The cost of those activities amounts to US \$948,764, and includes staff (US \$663,000), travel (US \$71,764), operating expenses (US \$120,000), verification of HCFC consumption (US \$40,000), and miscellaneous expenses (US \$54,000).

*Gender policy implementation*

18. The system from stage II of the HPMP of collecting gender-related data and incorporating basic monitoring measures on gender balance will continue into stage III. While it is recognized that the servicing sector currently has low female representation, efforts will be made to showcase women in the industry to increase female involvement, including as instructors, policymakers, service shop owners, and technicians. Public outreach material will include a balanced portrayal of gender, and the hiring of short-term consultants will encourage female applicants in line with the country’s gender policy.

Total cost of stage III of the HCFC phase-out management plan

19. The total cost of stage III of the HPMP for Viet Nam has been estimated at US \$9,220,364 (plus agency support costs), as originally submitted, for achieving a 67.5 per cent reduction from its HCFC baseline consumption by 2025 and a 100 per cent reduction by 2030. The proposed activities, associated phase-out, and cost breakdown are summarized in table 2.

**Table 2. Total cost of stage III of the HPMP for Viet Nam as submitted**

Activity	Phase out (mt)	Cost (US \$)
Legal framework and customs	155.21	745,000
Residential AC servicing	1,444.08	6,931,600
TA	123.96	595,000
PMU	197.66	948,764
<b>Total</b>	<b>1,920.91</b>	<b>9,220,364</b>

Implementation plan for the first tranche of stage III of the HCFC phase-out management plan

20. The first funding tranche of stage III of the HPMP, in the total amount of US \$2,305,091, will be implemented between January 2024 and December 2025 and include the following activities: increasing capacity of importers and customs brokers, AC servicing sector training and equipment procurement, TA including awareness-raising, and project monitoring. The following is a breakdown of the specific activities:



- (a) Importers and customs brokers: Organize one one-day workshop, including updated training materials, to train 20 importers and customs brokers on the declaration and reporting of refrigerants and RAC equipment and the safe handling of ODS cylinders (US \$110,000);
- (b) Residential AC servicing training and assessment: Develop standardized residential AC servicing training modules; develop assessment standard for certification on good servicing practices; organize one train-the-trainer workshop at each of 12 select training centres; and revise occupational standards and training curriculum to include good residential AC servicing practices (US \$36,000);
- (c) Residential AC servicing equipment procurement: Develop specifications of training kits and servicing tools for the training centres and technicians; transfer funds for organization of 96 workshops for approximately 1,920 technicians; and procure and distribute training kits to 12 training centres and 12 assessment centres (US \$1,752,000);
- (d) Policy impact assessment: Begin study for the ban on new installations and imports of HCFC-based refrigeration and chiller equipment by considering availability of alternative technologies, assessing costs and benefits, and evaluating environmental, economic, and social impacts of the ban; and assess the impact and hold consultations on HCFC-225 applications (US \$76,016);
- (e) Hold the project launch workshop and begin stakeholder consultations on phase-out needs; initiate development of the framework to manage and assess the effectiveness of the capacity-building activities of the servicing sector, including gathering feedback through surveys and developing a report containing lessons learned and recommendations for improvement; and verification of HCFC consumption (US \$60,000); and
- (f) The PMU will monitor activities, report on progress, and work with stakeholders to phase out HCFCs. The cost of those activities amounts to US \$271,075, and includes staff (US \$202,583), travel (US \$12,000), operating expenses (US \$40,000), verification of HCFC consumption (US \$10,000), and miscellaneous expenses (US \$6,492).

## **SECRETARIAT'S COMMENTS AND RECOMMENDATION**

### **COMMENTS**

21. The Secretariat reviewed stage III of the HPMP in light of stages I and II, the policies and guidelines of the Multilateral Fund, including the criteria for funding HCFC phase-out in the consumption sector for stage II of HPMPs (decision 74/50), and the 2023–2025 business plan of the Multilateral Fund.

#### Overarching strategy

22. The Government of Viet Nam proposes to meet the 100 per cent reduction of its HCFC baseline consumption by 2030, and to maintain a maximum annual consumption of HCFCs in the period of 2030 to 2040 at a level consistent with Article 5, paragraph 8 ter(e)(i) of the Montreal Protocol.<sup>6</sup> Regarding the latter, one challenge identified in the project submission for the country to meet its servicing demand in 2030–2040. In particular, based on a modeling analysis, the World Bank estimated that the servicing demand in that period could exceed the level permissible under the Montreal Protocol by approximately a

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<sup>6</sup> HCFC consumption may exceed zero in any year so long as the sum of its calculated levels of consumption over the ten-year period from 1 January 2030 to 1 January 2040, divided by 10, does not exceed 2.5 per cent of the HCFC baseline.

factor of three absent interventions. While the Secretariat considered that the stage III proposal includes meaningful activities, policies, and regulations to help ensure the country remains in compliance with its HPMP targets, the Secretariat inquired whether the country had considered establishing a limited number of reclamation centres to help meet the 2030–2040 demand through recovered or reclaimed HCFCs.

23. While past experience under the Multilateral Fund points to challenges to the successful operation of a reclamation scheme, stage III envisioned the implementation of policy and regulatory measures that could help ensure the successful implementation of a pilot reclamation scheme in one or two major urban centres. Such centre or centres, which could be established in the latter part of the HPMP, could help address the expected HCFC demand in 2030–2040; work in an integrated manner with the KIP by also providing reclamation of HFCs; and help address concerns about refrigerant purity, which was identified as an obstacle to the use of recovered or reclaimed refrigerants given concerns about potential liability associated with refrigerants that do not meet applicable purity specifications. As the Government considered it was premature to decide whether to establish a pilot reclamation centre, and that undertaking the study on expected demand of HCFCs and analysis of market opportunities for recovery and recycling would inform that decision, it was agreed that the Government would have flexibility to use a limited amount of funding to establish one or two reclamation centres after having undertaken the study.

24. In line with decision 86/51, to allow for consideration of the final tranche of its HPMP, the Government of Viet Nam agreed to submit a detailed description of the regulatory and policy framework in place to implement measures to ensure that HCFC consumption is in compliance with paragraph 8 ter(e)(i) of Article 5 of the Montreal Protocol for the period 2030–2040, and, if Viet Nam intends to have consumption during the period 2030–2040, in line with paragraph 8 ter(e)(i) of Article 5 of the Montreal Protocol, proposed modifications to its Agreement with the Executive Committee covering the period beyond 2030.

#### Legal framework

25. In January 2022 the country promulgated a decree and a circular on greenhouse gas emission reduction and ozone layer protection that inter alia stipulate that servicing technicians undertaking installation, operation, and maintenance of ODS- and HFC-based equipment shall have the appropriate degree or certificates, or be certified; present guidelines for the use of HCFCs and HFCs; and set forth parameters for the collection, transportation, recycling, reuse and disposal of controlled substances by certain organizations.<sup>7</sup> Those parameters inter alia include a requirement to report on the use of controlled substances; to reuse controlled substances after collection if possible and, if not, to dispose of the controlled substances in accordance with regulations on hazardous waste; regulatory measures to prevent venting of HCFCs and HFCs during installation, servicing and decommissioning of RAC equipment, with fines imposed when entities release or dispose controlled substances into the environment; a code of practice for RAC technicians; and a regulation requiring recovery of HCFCs and HFCs from containers and equipment at their end-of-life. Those measures will be an important component of a plan for the collection, transport and disposal of controlled substances and will enhance the sustainability of the HCFC phase-out.

26. The country will ban HCFC-225 imports as of 1 January 2025 and new installations and imports of HCFC-based equipment as of 31 December 2029. Regarding the latter, the Secretariat enquired whether an earlier timeline for the ban on new installations and imports of HCFC-based equipment might be possible given inter alia the uptake of non-HCFC-based RAC equipment in the market, noting that an earlier ban would help minimize the servicing demand in 2030–2040. The World Bank noted that the implementation of a ban does not rest solely with one agency; rather, the development of a ban requires a comprehensive

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<sup>7</sup> Organizations producing, importing, or exporting controlled substances or equipment and products containing controlled substances; organizations possessing equipment containing controlled substances such as air conditioners with a nominal cooling capacity of more than 26.5 kW (90,000 BTU/hr) and the total rated cooling capacity of more than 586 kW (2,000,000 BTU/hr), and industrial refrigeration equipment with electrical capacity of more than 40 kW; and organizations collecting, recycling, reusing and disposing of controlled substances.

regulatory process. Accordingly, a single, comprehensive ban that addressed the range of HCFC-based products and equipment was preferable to implementing numerous bans whose timelines depended inter alia on the status of uptake of low-GWP technologies. Moreover, activities to raise awareness of the upcoming ban, and outreach to consumers and end-users, will help minimize the import and installation of HCFC-based equipment.

27. One challenge identified in the submission was that, notwithstanding that the Government prevents import of used RAC components, there reportedly continues to be some assembly using second-hand components in the industrial refrigeration and cooling sectors where such components enter the country illicitly as “scrap metal.” The policy impact assessment that will be undertaken will examine this potential loophole and recommend possible solutions, with a focus on the fisheries and seafood industry. In addition, it was agreed to include this issue in the customs training.

#### Technical and cost-related issues

##### *HCFC consumption*

28. The Secretariat sought to better understand why consumption of HCFC-22 for servicing was not decreasing, noting the implementation of activities to strengthen servicing practices in the servicing sector under stage II, and the increased retirement of HCFC-22-based RAC equipment given the uptake of non-HCFC RAC equipment in the market (e.g., HFC-32 in room AC and HFCs in many commercial refrigeration applications). The World Bank noted that almost all HCFC-22-based manufacturing had been phased out, and that Viet Nam’s economy appears to be transitioning to a net importer of products that use controlled substances; accordingly, the proportion of the country’s consumption in servicing was expected to increase. Moreover, it appears that end-users of refrigeration equipment, particularly in the fisheries and seafood industry, may be seeking to reduce costs by keeping old HCFC-based equipment longer than in other countries and topping up such equipment rather than addressing leakages; given the high use of HCFC-22 in the fisheries and seafood industry, TA under the HPMP includes specific activities to address those sectors.

##### *Residential air-conditioning servicing*

29. Stage III includes meaningful activities and measures to help encourage the use of certified technicians, including in the informal sector. To comply with the regulation that all technicians handling HCFCs and other refrigerants are certified, the Government will develop standards for technician training and assessment, which will not only allow the certification of technicians that attend training programmes at vocational schools, but also recognize skills of technicians that have not been formally trained through assessment and subsequent certification. Similarly, the 3,188 technicians trained but not certified under stage II would not have to repeat their training but could instead directly undergo the competency-based test and receive certification under stage III. Stakeholder engagement and technical support will include an activity targeting end-users and consumers on the benefits of using certified technicians; it may also include development of a mobile application to help consumers find certified technicians. Technician training and certification will also include recovery, reuse and safely storing unwanted HCFCs, which will help ensure there is a sufficient supply of recovered HCFCs to service remaining equipment in 2030 and beyond.

##### *Servicing demand in the 2030–2040 period*

30. While eligible under the HPMP, the study on opportunities for recovery and recycling to meet post-2030 HCFC servicing demand appeared to be narrowly focused on HCFCs and, therefore, the Secretariat enquired whether the Government had considered broadening the scope of the study to

controlled substances, in line with decision 90/49(b).<sup>8</sup> The World Bank clarified that while the Government was open to broadening the scope of the study, there was an urgent need to better understand the HCFC servicing demand in the 2030–2040 period. Moreover, equipment using HCFCs was more limited and in some cases in different applications than was the case for HFCs, so different expertise and a separate analysis may be needed to broaden the scope to HFCs. Accordingly, the Secretariat encouraged the Government to consider submitting a project for the preparation of a national inventory of banks of used or unwanted controlled substances and a plan for the collection, transport and disposal of such substances, including consideration of recycling, reclamation and cost-effective destruction under decision 91/66, noting that such a project should not duplicate activities undertaken under the HPMP.<sup>9</sup>

### *PMU*

31. As submitted, the PMU accounted for a higher proportion of the project funding than other similar projects. Noting that the Government had associated reductions of the country's remaining HCFC consumption eligible for funding with the PMU, and in line with the considerations for the servicing sector specified in paragraph 8 of the draft Agreement between the country and the Executive Committee, it was agreed that the country would have flexibility to allocate funding from the PMU to the servicing sector to address specific needs that might arise during implementation.

### Total project cost

32. Stage III of the HPMP will phase-out 2,521.68 mt (138.69 ODP tonnes) of HCFC-22 and 16.34 mt (0.33 ODP tonnes) of HCFC-123, the country's 2022 average consumption for those substances, at a total cost of US \$9,220,364, resulting in a cost-effectiveness of US \$3.63/kg.

33. The draft Agreement, as submitted, included tranches in 2023, 2025, 2027, and 2029. In contrast, the KIP submitted to the present meeting included tranches in 2023, 2026 and 2029. Accordingly, the Secretariat suggested that the Government consider revising the tranche distribution of the HPMP to align with that of the KIP so as to minimize the country's reporting and administrative burdens. On that basis, the tranche distribution of the HPMP was revised by increasing the first tranche and delaying the second tranche to 2026; on an exceptional basis, the last tranche was retained in 2029 so as to allow the joint submission of tranches under the KIP and the HPMP. As subsequent tranches would be submitted to the first meeting of the year, should the verification report not be ready in time for such a submission, the Secretariat noted that transfer of any approved funds would be in line with decision 72/19(b).

34. The revised funding for the first tranche amounts to US \$3,227,127 based on the longer duration of the tranche and the following activities:

- (a) Organize three one-day workshops, including updated training materials, to train 60 importers and customs brokers on the declaration and reporting of refrigerants and RAC equipment and the safe handling of ODS cylinders, a study tour on integrated approaches to monitoring the trade of controlled substances, and 15 workshops to train 450 customs officers (US \$202,500);
- (b) Develop standardized residential AC servicing training modules; develop assessment standard for certification on good servicing practices; organize one train-the-trainer

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<sup>8</sup> Decision 90/49(b) provides flexibility for Article 5 countries to include in inter alia servicing sector plans under HPMPs, activities related to the environmentally sound management of used or unwanted controlled substances, including disposal, taking into account paragraphs 19 to 24 of document UNEP/OzL.Pro/ExCom/89/9 and lessons learned from previous ODS disposal projects, including in relation to the integration with hazardous waste rules and regulations.

<sup>9</sup> The World Bank included such a project in its work programme amendments for 2023 (document UNEP/OzL.Pro/ExCom/93/38).

workshop at each of 12 select training centres; and revise occupational standards and training curriculum to include good residential AC servicing practices (US \$46,000);

- (c) Develop specifications of training kits and servicing tools for the training centres and technicians; transfer funds for organization of 96 workshops for approximately 1,920 technicians; procure and distribute training kits to 12 training centres and 12 assessment centres; and procure tools for the first batch of technicians that will be trained and certified (US \$2,466,783);
- (d) Begin study for the ban on new installations and imports of HCFC-based refrigeration and chiller equipment by considering availability of alternative technologies, assessing costs and benefits, and evaluating environmental, economic, and social impacts of the ban; assess the impact and hold consultations on HCFC-225 applications (US \$98,000);
- (e) Hold the project launch workshop and begin stakeholder consultations on phase-out needs; initiate development of the framework to manage and assess the effectiveness of the capacity-building activities of the servicing sector, including gathering feedback through surveys and developing a report containing lessons learned and recommendations for improvement; and verification of HCFC consumption (US \$75,000); and
- (f) The PMU will monitor activities, report on progress, and work with stakeholders to phase out HCFCs. The cost of those activities amounts to US \$338,844, and includes staff (US \$262,000), travel for monitoring and meetings (US \$20,504), operating expenses (US \$50,000), and miscellaneous expenses (US \$6,340).

#### Impact on the climate

35. The activities proposed in the servicing sector, which include better containment of refrigerants through training and provision of equipment, will reduce the amount of HCFC-22 used for RAC servicing. Each kilogram of HCFC-22 not emitted due to better refrigeration practices results in the savings of approximately 1.8 CO<sub>2</sub>-equivalent tonnes. The activities planned by Viet Nam, including its efforts to promote low-GWP alternatives, as well as refrigerant recovery and reuse, indicate that the implementation of the HPMP will reduce the emission of refrigerants into the atmosphere, resulting in climate benefits.

#### Sustainability of the HCFC phase-out and assessment of risks

36. Stage III of the HPMP includes meaningful activities that will enhance the sustainability of the HCFC phase-out, including training and certifying technicians, strengthening the capacity of customs, strengthening the regulatory framework, and technical and policy assistance. As with many other Article 5 countries, outreach, training and (ideally) certification of technicians in the informal sector is a challenge. Stage III includes specific activities and measures designed to create demand for trained and certified technicians and to enable the participation of technicians in the informal sector in training and certification. The country has already implemented a ban on HCFC-141b pure and pre-blended, and on the import and manufacture of HCFC-22-based residential AC equipment, and will soon ban imports of HCFC-225. While an earlier ban on the import and assembly of HCFC-based RAC equipment would help minimize further additions to the installed bank of equipment that would need subsequent servicing, outreach and awareness-raising activities, combined with the uptake in the market of non-HCFC-based RAC equipment, suggest that any such additions to the installed bank are likely to be relatively small. The Government proposed activities designed to prevent the illicit import of second-hand HCFC-based components.

37. Stage II faced considerable delays given the time needed to sign the grant agreement between the Government and the World Bank. To mitigate the risk of a delay to both the stage III of the HPMP and the KIP, a single grant agreement will be used, and the documentation for that agreement was already being

prepared by a consultant so that, upon approval of the projects by the Executive Committee, the agreement can be finalized and signed expeditiously.

#### 2023–2025 draft business plan of the Multilateral Fund

38. The World Bank is requesting US \$9,220,364, plus agency support costs, for the implementation of stage III of the HPMP for Viet Nam. The total requested value of US \$3,453,026, including agency support costs, for the period of 2023–2025 is US \$243,026 above the amount in the business plan.

#### Draft Agreement

39. A draft Agreement between the Government of Viet Nam and the Executive Committee for stage III of the HPMP is contained in annex I to the present document.

### **RECOMMENDATION**

40. The Executive Committee may wish to consider:

- (a) Approving, in principle, stage III of the HCFC phase out management plan (HPMP) for Viet Nam for the period from 2023 to 2030 for the complete phase out of HCFC consumption, in the amount of US \$9,220,364, plus agency support costs of US \$645,425 for the World Bank, on the understanding that no more funding from the Multilateral Fund will be provided for the phase out of HCFCs;
- (b) Noting the commitment of the Government of Viet Nam:
  - (i) To completely phase out HCFCs by 1 January 2030, and that HCFCs will not be imported after that date, except for those allowed for a servicing tail between 2030 and 2040, where required, consistent with the provisions of the Montreal Protocol;
  - (ii) To ban the import of HCFC-225 by 1 January 2025, and ban new installations and imports of HCFC-based equipment by 31 December 2029;
- (c) Deducting 105.37 ODP tonnes of HCFCs from the remaining HCFC consumption eligible for funding;
- (d) Approving the draft Agreement between the Government of Viet Nam and the Executive Committee for the reduction in consumption of HCFCs, in accordance with stage III of the HPMP, contained in annex I to the present document;
- (e) That, to allow for consideration of the final tranche of its HPMP, the Government of Viet Nam should submit:
  - (i) A detailed description of the regulatory and policy framework in place to implement measures to ensure that HCFC consumption was in compliance with paragraph 8 ter(e)(i) of Article 5 of the Montreal Protocol for the period 2030-2040;
  - (ii) If Viet Nam were intending to have consumption during the period 2030–2040, in line with paragraph 8 ter(e)(i) of Article 5 of the Montreal Protocol, proposed modifications to its Agreement with the Executive Committee covering the period beyond 2030; and

- (f) Approving the first tranche of stage III of the HPMP for Viet Nam, and the corresponding tranche implementation plan, in the amount of US \$3,227,127, plus agency support costs of US \$225,899 for the World Bank.

**PROJECT EVALUATION SHEET – MULTI-YEAR PROJECTS**

**Viet Nam**

<b>(I) PROJECT TITLE</b>	<b>AGENCY</b>
Kigali HFC implementation plan (stage I)	World Bank (lead), UNEP

<b>(II) LATEST ARTICLE 7 DATA (Annex F)</b>	Year: 2022	5,604.66 mt	10,727,091 CO <sub>2</sub> -eq tonnes
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<b>(III) LATEST ARTICLE 7 DATA BY SUBSTANCE (Annex F) (CO<sub>2</sub>-eq tonnes)*</b>			
<b>HFC</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>
HFC-23	13,409	23,532	8,140
HFC-32	685,274	769,601	585,471
HFC-125	17,500	29,050	16,800
HFC-134a	3,470,760	2,473,071	3,085,482
HFC-143a	45	24,138	0
HFC-152a	298	0	0
HFC-227ea	210,234	389,169	711,594
HFC-236fa	0	98	0
HFC-245fa	0	2,359	5,305
HFC-365mfc	0	1,906	5,718
R-404A	1,493,149	1,941,467	2,776,856
R-407C	321,918	568,874	210,769
R-410A	3,620,884	3,295,056	2,884,862
R-417A	23	5,314	2,111
R-448A	2,036	626	47,394
R-449A	15	0	0
R-467A	408	6,794	0
R-507A	225,344	233,840	385,907
R-508B	0	272	681
R-513A	0	437	0
<b>Total</b>	<b>10,061,296</b>	<b>9,765,603</b>	<b>10,727,091</b>

\* At the time of finalization of the present document, the Government was revising its country programme data.

<b>(IV) AVERAGE 2020-2022 HFC CONSUMPTION IN SERVICING</b>	3,973.25 mt	7,122,171 CO <sub>2</sub> -eq tonnes
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<b>(V) CONSUMPTION DATA (CO<sub>2</sub>-eq tonnes)</b>			
Baseline: average 2020-2022 HFC consumption plus 65% of HCFC baseline	13,991,360	Starting point for sustained aggregate reductions	TBD
<b>CONSUMPTION ELIGIBLE FOR FUNDING</b>			
Already approved	0	Remaining	TBD

<b>(VI) ENDORSED BUSINESS PLAN</b>		<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>Total</b>
World Bank	HFC phase-down (CO <sub>2</sub> -eq tonnes)	n/a	0	0	n/a
	Funding (US \$)	1,605,000	0	0	1,605,000
UNEP	HFC phase-down (CO <sub>2</sub> -eq tonnes)	0	0	0	0
	Funding (US \$)	381,529	0	0	381,529



<b>(VII) PROJECT DATA</b>			<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>	<b>2028</b>	<b>2029</b>	<b>Total</b>
Consumption (CO <sub>2</sub> -eq tonnes)	Montreal Protocol limits		n/a	13,991,360	13,991,360	13,991,360	13,991,360	13,991,360	12,592,224	n/a
	Maximum allowable		n/a	13,991,360	13,991,360	13,991,360	13,991,360	13,991,360	12,592,224	n/a
Amounts requested in principle (US \$)	World Bank	Project costs	1,557,792	0	0	1,513,187	0	0	522,204	3,593,183
		Support costs	109,045	0	0	105,923	0	0	36,554	251,522
	UNEP	Project costs	461,696	0	0	440,301	0	0	155,983	1,057,980
		Support costs	55,150	0	0	52,595	0	0	18,633	126,378
Amounts recommended in principle (US \$)	Total project costs		2,019,488	0	0	1,953,488	0	0	678,187	4,651,163
	Total support costs		164,195	0	0	158,518	0	0	55,187	377,900
	Total funds		2,183,683	0	0	2,112,006	0	0	733,374	5,029,063

<b>(VIII) Request for approval of funding for the first tranche (2023)</b>		
<b>Implementing agency</b>	<b>Funds recommended (US \$)</b>	<b>Support costs (US \$)</b>
World Bank	1,557,792	109,045
UNEP	461,696	55,150
<b>Total</b>	<b>2,019,488</b>	<b>164,195</b>

<b>Secretariat's recommendation:</b>	Individual consideration
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## PROJECT DESCRIPTION

41. On behalf of the Government of Viet Nam, the World Bank as the lead implementing agency has submitted a request for stage I of the Kigali HFC implementation plan (KIP), at a total cost of US \$5,543,417, consisting of US \$3,942,411, plus agency support costs of US \$275,968 for the World Bank and US \$1,172,600, plus agency support costs of US \$152,438 for UNEP, as originally submitted.<sup>10</sup>

42. The implementation of stage I of the KIP will assist Viet Nam in meeting the target of 10 per cent reduction from its HFC baseline consumption by 1 January 2029.

43. The first tranche of stage I of the KIP being requested at this meeting amounts to US \$2,214,518, consisting of US \$1,574,302, plus agency support costs of US \$110,201 for the World Bank and US \$469,040, plus agency support costs of US \$60,975 for UNEP, as originally submitted, for the period of December 2023 to December 2026.

### Background

44. Viet Nam ratified all amendments to the Montreal Protocol, including the Kigali Amendment on 27 September 2019. Viet Nam has an HCFC consumption baseline of 221.21 ODP tonnes, or 3,537.00 metric tonnes (mt), and is set to completely phase out consumption of HCFCs by 1 January 2030.<sup>11</sup>

### Status of implementation of the HCFC phase-out management plan

45. Stage I of the HCFC phase-out management plan (HPMP) for Viet Nam was originally approved at the 63<sup>rd</sup> meeting<sup>12</sup> and revised at the 76<sup>th</sup> meeting<sup>13</sup> to meet the 10 per cent reduction from the baseline by 2015, resulting in the phase-out of 143.20 ODP tonnes of HCFCs, at a total cost of US \$9,125,020, plus agency support costs.

46. Stage II of the HPMP for Viet Nam was originally approved at the 76<sup>th</sup> meeting<sup>14</sup> and revised at the 84<sup>th</sup> meeting<sup>15</sup> and 91<sup>st</sup> meeting<sup>16</sup> to reduce HCFC consumption by 35 per cent of the baseline by 2020, at a total cost of US \$7,208,300, plus agency support costs. Stage II of the HPMP will be completed by December 2023 as stipulated in the Agreement between the Government of Viet Nam and the Executive Committee.

### Status of implementation of HFC-related activities

47. At its 80<sup>th</sup> meeting, the Executive Committee approved a request from UNIDO for enabling activities for HFC phase-down in the amount of US \$250,000, plus agency support costs of US \$17,500, to be funded from the additional voluntary contributions of non-Article 5 countries.<sup>17</sup> The enabling activities were implemented from 2018 to 2019 to facilitate and support early ratification of the Kigali Amendment and country-specific activities and strategies to prepare for HFC phase-down, and consisted of

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<sup>10</sup> As per the letter of 25 August 2023 from the Ministry of Natural Resources and Environment of Viet Nam to the World Bank.

<sup>11</sup> Except for those HCFCs allowed for a servicing tail between 2030 and 2040, where required, consistent with the provisions of the Montreal Protocol.

<sup>12</sup> Decision 63/58

<sup>13</sup> Decision 76/49(b)(iii)

<sup>14</sup> Decision 76/42

<sup>15</sup> Decision 84/82

<sup>16</sup> Decision 91/57(a)(iii)

<sup>17</sup> Decision 80/50

recommendations for HFC data reporting and verification, capacity-building and awareness-raising related to the Kigali Amendment, institutional arrangements, and capacity-building for energy efficiency.

### Stage I of the Kigali HFC implementation plan

#### Policy, regulatory and institutional frameworks

48. The Ministry of Natural Resources and Environment (MONRE) has put into place a national programme that regulates and monitors importers, traders and consumers of controlled substances; enforces national policies; and sensitizes the population of Viet Nam on its international obligations under the Montreal Protocol. A dedicated national ozone unit (NOU) within the Department of Climate Change (DCC) under MONRE is tasked to manage Viet Nam's Montreal Protocol obligations. The NOU leads the Government's sustained efforts to phase out HCFCs and phase down HFCs in the country. The General Department of Viet Nam Customs is responsible for controlling the import and export of controlled substances and providing and sharing customs information of controlled substances and goods containing controlled substances under their management.

49. As further described in paragraph 25 of the present document, the country promulgated a decree and a circular on greenhouse gas emission reduction and ozone layer protection in January 2022 that inter alia set forth the roadmap for managing the phase-out and phase-down of ODS and HFCs in accordance with Viet Nam's obligations under the Montreal Protocol. The country has an enforceable HFC licensing system.

#### HFC consumption

50. Viet Nam only imports HFCs for use in the refrigeration and air-conditioning (RAC) servicing, RAC manufacturing, foam, and firefighting sectors. In 2022, Viet Nam consumed HFC-134a (28.8 per cent of total HFC consumption in CO<sub>2</sub>-equivalent tonnes), R-410A (26.9 per cent), R-404A (25.9 per cent), HFC-227ea (6.6 per cent), and other HFCs (13.0 per cent). Table 3 presents the country's HFC consumption as reported under Article 7 to the Ozone Secretariat.

**Table 3. HFC consumption in Viet Nam (2019–2022 Article 7 data)**

HFC	GWP*	2019	2020	2021	2022	Share of HFC consumption in 2022 (%)
<b>mt</b>						
HFC-23	14,800	4.28	0.91	1.59	0.55	0.0
HFC-32	675	893.59	1,015.22	1,140.15	867.36	15.5
HFC-125	3,500	2.59	5.00	8.30	4.80	0.1
HFC-134a	1,430	1,442.60	2,427.11	1,729.42	2,157.68	38.5
HFC-143a	4,470	0.00	0.01	5.40	0.00	0.0
HFC-152a	124	0.30	2.40	0.00	0.00	0.0
HFC-227ea	3,220	4.00	65.29	120.86	220.99	3.9
HFC-236fa	9,810	0.00	0.00	0.01	0.00	0.0
HFC-245fa	1,030	0.00	0.00	2.29	5.15	0.1
HFC-365mfc	794	0.05	0.00	2.40	7.20	0.1
R-404A	3,922	194.03	380.75	495.07	708.09	12.6
R-407C	1,774	77.84	181.48	320.70	118.82	2.1
R-410A	2,088	1,102.96	1,734.56	1,578.47	1,381.97	24.7
R-417A	2,346	0.00	0.01	2.27	0.90	0.0
R-448A	1,386	0.00	1.47	0.45	34.20	0.6
R-449A	1,396	0.00	0.011	0.00	0.00	0.0
R-467A	1,359	0.00	0.30	5.00	0.00	0.0
R-507A	3,985	16.71	56.55	58.68	96.84	1.7

HFC	GWP*	2019	2020	2021	2022	Share of HFC consumption in 2022 (%)
R-508B	6,808	0.00	0.00	0.04	0.10	0.0
R-513A	629	0.00	0.00	0.70	0.00	0.0
<b>Total (mt)</b>		<b>3,738.94</b>	<b>5,871.05</b>	<b>5,471.79</b>	<b>5,604.66</b>	<b>100.0</b>
<b>CO<sub>2</sub>-eq tonnes</b>						
HFC-23	14,800	63,344	13,409	23,532	8,140	0.1
HFC-32	675	603,174	685,274	769,601	585,471	5.5
HFC-125	3,500	9,065	17,500	29,050	16,800	0.2
HFC-134a	1,430	2,062,911	3,470,760	2,473,071	3,085,482	28.8
HFC-143a	4,470	0	45	24,138	0	0.0
HFC-152a	124	37	298	0	0	0.0
HFC-227ea	3,220	12,880	210,234	389,169	711,594	6.6
HFC-236fa	9,810	0	0	98	0	0.0
HFC-245fa	1,030	0	0	2,359	5,305	0.0
HFC-365mfc	794	37	0	1,906	5,718	0.1
R-404A	3,922	760,908	1,493,149	1,941,467	2,776,856	25.9
R-407C	1,774	138,076	321,918	568,874	210,769	2.0
R-410A	2,088	2,302,429	3,620,884	3,295,056	2,884,862	26.9
R-417A	2,346	0	23	5,314	2,111	0.0
R-448A	1,386	0	2,036	626	47,394	0.4
R-449A	1,396	0	15	0	0	0.0
R-467A	1,359	0	408	6,794	0	0.0
R-507A	3,985	66,589	225,344	233,840	385,907	3.6
R-508B	6,808	0	0	272	681	0.0
R-513A	629	0	0	437	0	0.0
<b>Total (CO<sub>2</sub>-eq tonnes)</b>		<b>6,019,450</b>	<b>10,061,296</b>	<b>9,765,603</b>	<b>10,727,091</b>	<b>100.0</b>

\* Global warming potential

51. While Viet Nam reported consumption of 20 HFCs and HFC blends, its consumption in CO<sub>2</sub>-eq tonnes is dominated by six HFCs and HFC blends: HFC-134a, R-410A, R-404A, HFC-227ea, HFC-32, and R-507A. Consumption in 2020 grew considerably given the HCFC phase-out; since then, consumption has remained fairly steady, likely due to the influence of the COVID-19 pandemic and supply chain disruption, though this trend varies by substance. While consumption of R-410A and HFC-32, which are principally used in residential air-conditioning (AC), decreased between 2020-2022, consumption of R-404A and R-507A increased due to increased demand in the commercial refrigeration sector. Consumption of HFC-134a decreased in 2021 and partly recovered in 2022. Consumption of HFC-227a increased steadily given increased demand in the firefighting sector.

#### *Country programme implementation report*

52. During the course of the review of the stage I proposal, the Government revised the data it had reported under Article 7 of the Montreal Protocol to be in line with the data in table 3 and the detailed surveys undertaken during the course of preparing the stage I KIP proposal. At the time of finalization of the present document, the Government was in the process of revising the HFC sector use and consumption data under its 2020, 2021, and 2022 country programme implementation reports to be consistent with the consumption data reported under Article 7 of the Montreal Protocol for those years, and the sectoral uses identified in the stage I proposal.

#### HFC distribution by sector

53. Approximately 69 per cent of HFCs in the country are consumed to service RAC equipment, with the remaining consumed in manufacturing RAC equipment and polyurethane foam, in firefighting, and in solvents and aerosols. In servicing, HFCs are mainly consumed in refrigeration (25.2 per cent in mt and

35.6 per cent in CO<sub>2</sub>-eq tonnes), followed by central AC and chillers (19.0 per cent in mt and 16.8 per cent in CO<sub>2</sub>-eq tonnes), residential AC and heat pumps (18.5 per cent in mt and 11.2 per cent in CO<sub>2</sub>-eq tonnes), mobile AC (7.0 per cent in mt and 5.2 per cent in CO<sub>2</sub>-eq tonnes), and firefighting (0.01 per cent in mt and 0.02 per cent in CO<sub>2</sub>-eq tonnes), as shown in table 4. HFC consumption in the firefighting sector is small but growing rapidly. HFCs are used in solvent and aerosol applications at a very small scale. HFC consumption in new installations of chillers and central AC equipment is the highest of all manufacturing sectors, at 11.4 per cent of the country's total consumption in mt and 10.6 per cent in CO<sub>2</sub>-eq tonnes.

**Table 4. Estimated sectoral distribution of HFC consumption in Viet Nam (2022)<sup>18</sup>**

Sector	Consumption				Most commonly consumed HFCs
	mt	Share (%)	CO <sub>2</sub> -eq tonnes	Share (%)	
<b>Servicing</b>					
Residential AC and heat pumps	1,035.27	18.5	1,205,899	11.2	HFC-32, R-410A
Central AC and chillers	1,063.91	19.0	1,803,930	16.8	HFC-134a, R-407C, R-410A
Mobile AC	390.27	7.0	558,528	5.2	HFC-134a, R-407C
Refrigeration	1,410.04	25.2	3,821,272	35.6	HFC-134a, HFC-23, R-404A, R-407C, R-410A, R-507A, others
Firefighting	0.58	0.0	2,281	0.0	HFC-125, HFC-227ea
<b>Total (servicing)</b>	<b>3,900.07</b>	<b>69.6</b>	<b>7,391,910</b>	<b>68.9</b>	
<b>Manufacturing</b>					
Residential AC and heat pumps	272.18	4.9	272,435	2.5	HFC-32, HFC-134a, R-410A
Central AC and chillers*	637.51	11.4	1,132,610	10.6	HFC-134a, R-407C, R-410A
Mobile AC	166.07	3.0	237,539	2.2	HFC-134a, R-407C
Refrigeration	390.67	7.0	954,141	8.9	HFC-134a, R-404A, R-407C, R-410A, R-507A
Firefighting*	225.23	4.0	726,515	6.8	HFC-125, HFC-227ea
Foam	5.15	0.1	5,305	0.0	HFC-245fa
Solvent and aerosol	7.78	0.1	6,638	0.1	HFC-125, HFC-134a, HFC-365mfc, R-404A
<b>Total (manufacturing)</b>	<b>1,704.59</b>	<b>30.4</b>	<b>3,335,183</b>	<b>31.1</b>	
<b>Total (all sectors)</b>	<b>5,604.66</b>	<b>100.0</b>	<b>10,727,093</b>	<b>100.0</b>	

\* Assembly and installation.

### *Manufacturing sectors*

#### *Residential AC and heat pumps*

54. Market trends for split-type AC in Viet Nam has shifted from R-410A to HFC-32. HFC-32 is the main HFC used in the manufacturing of small (< 60,000 BTU/hr) split-type AC units while R-410A is still used in the manufacturing of larger (> 60,000 BTU/hr) units. A manufacturer was using small amounts of R-417A and HFC-134a to manufacture water heaters for domestic pools and expects to discontinue the use of R-417A. The country has a large market for residential AC; however, sales dropped due to the COVID-19 pandemic. Only two enterprises are currently manufacturing residential AC units.

<sup>18</sup> More detailed information on HFC manufacturing consumption is provided in annex II to the present document; and further information on HFC servicing consumption is provided in paragraphs 61 to 65 and table 5 below.

### Central AC and chillers

55. This subsector includes commercial AC such as multi-split variable flow refrigerant (VRF) units, and air- and water-cooled chillers. Due to growth in the commercial, tourism, and hospitality sectors, the commercial AC market in Viet Nam is experiencing high growth with an annual average of 1,400 chillers and 12,000 central AC units installed between 2018 and 2021. All chillers and central AC in the country are imported. Large centrifugal chillers and screw chillers mainly consume HFC-134a, whereas VRF system and small- to medium-capacity chillers using scroll compressors consume R-410A; smaller amounts of HFC blends such as R-407C are also used in chillers.

### Mobile air-conditioning

56. The Viet Nam automotive industry is the fourth largest in Southeast Asia. All motor vehicles manufactured in the country are fitted with HFC-134a-based mobile air-conditioning (MAC) units, except for a small number of buses and passenger trains that use R-407C.

### Refrigeration

57. HFC consumption in refrigeration manufacturing is mainly in the commercial and industrial sector, which experienced steady growth since 2018; HFC-134a and R-404A are the main refrigerants used in this sector, with use of R-507A rapidly increasing. Large commercial refrigeration equipment uses HFC-134a, R-404A, and R-507-A in commercial display units and centralized refrigeration systems (such as in supermarkets). In domestic refrigeration, HFC-134a was primary consumed, though use of R-600a is increasing rapidly; approximately 45 per cent of refrigerant used in 2021 was HFC-134a and the remaining R-600a. Refrigerants used for self-contained commercial refrigeration are primarily R-600a, R-290 and HFC-134a, with some R-404A and R-407C used as well. Demand for refrigerated and frozen transport, which consume HFC-134a and R-404A, is also growing rapidly due to economic development, with one manufacturer of refrigerated trucks and several smaller enterprises manufacturing custom-made refrigerated boxes.

### Firefighting

58. All fire suppression systems using HFCs are imported into Viet Nam by more than 20 system providers after the designs are approved by the Fire Protection Agency under the Ministry of Public Safety. There are no manufacturers of portable fire extinguishers in the country. The installation of HFC-23-based systems ceased in 2019. Since then, almost all systems have been HFC-227ea-based; a small quantity of HFC-125-based systems were also installed.

### Foam

59. Uses of HFCs in foam manufacturing processes is limited in Viet Nam due to the high cost of HFC-based foam formulations as compared to water and cyclopentane options. There is one enterprise using HFC-245fa as a blowing agent in water heater products; that enterprise was not assisted under the HPMP.

### Aerosols and solvents

60. One pharmaceutical enterprise reported the use of HFC-134a during drug production and research. Another enterprise reported use of HFC-134a and R-404A as a cleaning agent for metal cleaning and circuit boards. HFC-365mfc is also reportedly used as an electronic component cleaner.

*Refrigeration and air-conditioning servicing sector*

61. There are approximately 20,750 technicians and 4,250 workshops consuming HFCs in Viet Nam. HFCs are used to service residential, commercial and industrial air conditioners, chillers, refrigeration equipment (including domestic refrigerators, stand-alone commercial refrigeration units, industrial and large commercial refrigeration equipment, and transport refrigeration) and MAC. As shown in table 5, HFC-32, HFC-134a, R-407C, R-404A, R-410A, and R-507A represent 99 per cent of total HFCs used for servicing. HFC-134a is being used for servicing across many sectors, including domestic and commercial refrigeration, mobile AC, and chillers. HFC-32 and R-410A are mainly used to service AC equipment, while R-404A and R-507A are for commercial and industrial refrigeration. HFC-23 is used to service ultra-low temperature refrigeration equipment (most likely vaccine storage) and possibly to service refrigeration equipment used for food processing.

**Table 5. HFC consumption in servicing in Viet Nam from 2018 to 2022**

HFC	2018	2019	2020	2021	2022
<b>mt</b>					
HFC-23	0.25	0.47	0.91	1.59	0.55
HFC-32	435.22	631.49	780.72	848.15	658.03
HFC-125	0.20	0.23	0.43	0.48	0.34
HFC-134a	711.64	852.26	1,584.26	1,184.23	1,464.62
HFC-143a	0.00	0.00	0.01	5.40	0.00
HFC-227ea	0.02	0.03	0.03	0.18	0.21
R-404A	98.03	129.30	307.12	406.11	576.01
R-407C	36.62	58.18	156.28	299.48	106.64
R-410A	534.01	646.78	1,122.28	1,233.49	987.04
R-417A	0.00	0.00	0.01	2.18	0.90
R-448A	0.00	0.00	1.47	0.45	34.20
R-449A	0.00	0.00	0.01	0.00	0.00
R-467A	0.00	0.00	0.30	5.00	0.00
R-507A	2.82	6.58	35.10	43.29	71.44
R-508B	0.00	0.00	0.00	0.04	0.10
R-513A	0.00	0.00	0.00	0.70	0.00
<b>Total (mt)</b>	<b>1,818.82</b>	<b>2,325.33</b>	<b>3,988.92</b>	<b>4,030.76</b>	<b>3,900.07</b>
<b>Total (CO<sub>2</sub>-eq tonnes)</b>	<b>2,891,334</b>	<b>3,639,510</b>	<b>6,774,264</b>	<b>7,200,331</b>	<b>7,391,918</b>

62. Servicing of residential AC, commercial AC and chillers, and MAC are carried out by separate groups of service shops and technicians, though there are a few service shops that service both residential ACs, domestic refrigerators and, to a more limited extent, stand-alone commercial refrigeration units. The servicing of residential AC is described in paragraph 11 of the present document. Commercial AC units and chillers are normally serviced and installed by service teams of the manufacturers of the products or contractors. These service teams normally comprise several technicians with one or two technicians having some formal technical education and training by the original equipment manufacturers, while the rest of the service teams have limited formal training. The number of technicians working in this market segment is approximately 2,000, employed by about 200-300 contractors.

63. It is estimated that there are more than 10,000 MAC service technicians employed by more than 3,000 MAC service shops. About half of the service shops are dedicated to repairing MAC systems and employ one or two technicians with on-the-job training and without any formal technical education. The other half are car service shops where MAC repair is only part of the shops business. Most technicians in those shops have formal technical education related to engine and electrical repair from technical vocational schools, but not MAC repair.

64. Servicing of domestic and stand-alone commercial refrigerators is generally performed by small service shops with one or two technicians with no formal technical education except for stand-alone

commercial refrigeration units installed in convenience stores and supermarkets, which are serviced by larger service shops. Since HFC consumption to service such equipment is limited, it is not a priority subsector in stage I.

65. Industrial and large commercial refrigeration systems include cold storage and food processing equipment. It is estimated that there are more than 500 contractors employing 5-10 technicians across the country installing, maintaining and repairing such equipment. Some technicians in this subsector are involved in the design of new systems and have formal engineering education; installation and repair are done by technicians with less technical education. Since seafood and food processing industries contribute significantly to Viet Nam’s economy and restrictions of importing countries of Vietnamese products are stringent, the Government of Viet Nam places high priority for conversion and proper maintenance to cooling equipment in order to access export markets.

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

*Overarching strategy*

66. The Government of Viet Nam’s strategic vision for Kigali Amendment implementation is to balance actions required for meeting its obligations under the Montreal Protocol and national commitments on climate with actions that promote and sustain economic growth and development of key industrial sectors by prioritizing reductions in sectors that use high-GWP HFCs while allowing for growth of lower-GWP HFCs as needed.

67. Viet Nam is proposing three stages for the KIP implementation. Stage I is proposed to be implemented simultaneously with the HPMP until 2030. Stage II is expected to cover a period of five years (from 2030 to 2034), stage III is expected to cover a period of five years until 2039, and stage IV is expected to cover a period of five years until 2044.

68. Stage I includes interventions to manage and control HFCs in almost all HFC-consuming sectors except for aerosol, foam and solvents. Targeted sectors include domestic, commercial (stand-alone applications), transport, and industrial refrigeration; chillers and central AC; residential and mobile AC; HFC-23 in fire suppression; and the RAC and MAC servicing sector. HFCs targeted are two of the three most consumed HFCs, HFC-134a and R-410A, as well as R-417A, R-404A, R-407C, HFC-23, R-507A and R-508B. Six bans are proposed to prohibit manufacturing with HFCs in addition to controls on supply of various HFCs through a revamped quota system. In addition to bans and quotas to control the supply of those HFCs, Viet Nam will require that HFCs imported and consumed are within GWP thresholds as soon as 2024. Starting in 2024, Viet Nam will establish a threshold of 4,000 for the fire suppression sector. This will be followed by five more thresholds starting in 2029 for AC/heat pumps, large AC and chillers, commercial and industrial refrigeration, and the MAC sectors. Table 6 summarizes Viet Nam’s planned thresholds and associated timelines.

**Table 6. Planned application-specific thresholds and timelines**

Sector	Maximum GWP	Time Period
AC and heat pumps	1,700	2029-2039
Chillers and central AC	1,800	2029-2034
AC and heat pumps, chillers and central AC	700	2040 onwards
Stand-alone commercial refrigeration	3	2029 onwards
Industrial refrigeration	1,800	2029-2034
Industrial refrigeration	1,700	2035-2044
MAC	1,700	2029-2044
Fire suppression	4,000	2024-2044
Industrial and transport refrigeration, foam, and fire suppression	150	2045 onwards



69. The Government of Viet Nam will adopt a comprehensive approach to readying all servicing subsectors. Initiation of work in the industrial refrigeration and MAC sectors in particular was determined as necessary since significant additional reductions in HFC consumption in those sectors will likely be included in the subsequent stage of HFC phasedown. The servicing sector will be assisted to renew and build the infrastructure for sustainable and sound management of refrigerants, from import to final disposal, which will include updating the technician training curriculum and certification schemes as well as studying how to encourage recovery, recycling and, if necessary, final disposal. The safety of technicians must also be ensured as hydrocarbons begin to replace high-GWP HFCs in domestic and commercial refrigeration equipment and ammonia and carbon dioxide in industrial refrigeration.

*Estimated HFC baseline and proposed reductions*

70. The Government of Viet Nam reported its Article 7 data for 2020-2022. By adding 65 per cent of the HCFC baseline (in CO<sub>2</sub>-eq tonnes) to the average HFC consumption in 2020-2022, the HFC baseline is 13,991,360 CO<sub>2</sub>-eq tonnes, as shown in table 7.

**Table 7. HFC baseline for Viet Nam (CO<sub>2</sub>-eq tonnes)**

<b>Baseline calculation</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>
HFC annual consumption	10,061,296	9,765,603	10,727,091
HFC average consumption 2020-2022			10,184,633
HCFC baseline (65%)			3,806,696
HFC established baseline			<b>13,991,360</b>

*Proposed activities*

71. Stage I includes the following activities:

- (a) Two investment subprojects:
  - (i) A conversion subproject in the industrial refrigeration sector targeted at a heat exchanger manufacturer and its end-users and contractors to transition 20 per cent of the sector from R-404A and R-507A to ammonia;
  - (ii) Conversion to R-454C<sup>19</sup> of the largest manufacturer of AC train systems in Viet Nam to phase-out R-407C in the MAC sector; and
- (b) Non-investment activities, including training, equipment support and technician certification in the MAC and refrigeration servicing sectors; policy and regulatory support (including support for the management and allocation of annual import quotas of HFCs and HFC blends, and development of bans on the use of HFC-23 in new installations of fire suppression systems by 1 January 2025; on manufacturing/imports of stand-alone commercial refrigeration and domestic refrigeration equipment using HFCs by 1 January 2029; on manufacturing/imports of MAC systems using R-407C by 1 January 2029; and on manufacturing/imports of room AC and heat pumps below 60,000 BTU/hr using R-410A and R-417A by 1 January 2029); technical assistance; public awareness; and project management.

*Industrial refrigeration sector investment subproject*

72. The investment subproject comprises three components: support to the component manufacturer Quang Thang to manufacture heat exchangers with stainless steel pipes and aluminum fins for installation

<sup>19</sup> Mildly flammable blend of HFC-32 (21.5 per cent) and HFO-1234yf (78.5 per cent) with a GWP of 145.125.

in ammonia industrial refrigeration systems with cooling capacity of 100 kW or more (including procurement of fin press and die, tube expanding equipment, and an industrial welding machine); support to 11 contractors to enable proper design and installation of ammonia industrial refrigeration systems (including technical assistance, a portable welding machine, tools and personal protection equipment (PPE)); and an end-user incentive component for contractors to promote installation of ammonia-based refrigeration systems at the project owners' facilities.

73. Incremental capital costs (ICCs) include equipment for Quang Thang to manufacture heat exchangers for use with ammonia and for contractors to install ammonia industrial refrigeration systems based on ammonia-based heat exchangers, as summarized in table 8. In general, the cost of an ammonia industrial refrigeration system is estimated to be 25 per cent more expensive than a conventional HFC-based system, which for systems with a cooling capacity of 100 kW or more cost at least US \$100,000. Accordingly, the additional cost of an ammonia-based system was estimated at US \$25,000, which would be provided to each of 11 contractors installing Quang Thang's equipment to subsidize an installation of ammonia-based industrial refrigeration system with cooling capacity of 100 kW or more, resulting in an end-user incentive cost of US \$275,000.

**Table 8. ICCs for the industrial refrigeration sector investment subproject at Quang Thang**

Description	Cost (US \$)
Investment component for Quang Thang	
Fin press machine	75,000
Fin press dies	100,800
Tube expanding machines	27,200
U-shape tube bending machines	17,600
Welding machine	64,000
Civil and electrical works <sup>20</sup>	50,000
<i>Subtotal Quang Thang</i>	<i>334,600</i>
Investment component for contractors	
Portable welding machine	33,000
Two-stage pressure regulator	5,500
Personal protection equipment	11,000
Training	15,000
<i>Subtotal contractors</i>	<i>64,500</i>
<b>Subtotal</b>	<b>399,100</b>
<b>Contingency</b>	<b>27,822</b>
<b>Total</b>	<b>426,922</b>

74. Quang Thang products are sourced through contractors and installers of industrial refrigeration system and then installed at the project owners' facilities. Table 9 shows the amount of HFCs used in 2018-2022 for the initial charge of industrial refrigeration systems with Quang Thang products. HFC-134a is used exclusively to charge refrigeration systems with a capacity smaller than 100 kW; 30 per cent of the R-404A and R-507A is used to charge systems with a capacity of 100 kW or more, and the remaining consumption is used to charge smaller systems.

**Table 9. Estimated 2018-2022 HFC consumption of contractors using Quang Thang products (mt)**

HFC	2018	2019	2020	2021	2022
HFC-134a	26.64	32.51	40.03	51.61	58.72
R-404A	33.30	42.63	50.04	64.51	95.57
R-507A	6.66	8.13	10.01	12.90	21.29
<b>Total</b>	<b>66.60</b>	<b>83.27</b>	<b>100.07</b>	<b>129.02</b>	<b>175.58</b>

<sup>20</sup> To be partly co-financed by Quang Thang.

75. Through the implementation of the project, Quang Thang was committed to stop manufacturing copper heat exchangers for HFC-based industrial refrigeration system with capacity of 100 kW or more, which is expected to result in the phase-out of 28.67 mt (112,436 CO<sub>2</sub>-eq tonnes) of R-404A and 6.39 mt (25,452 CO<sub>2</sub>-eq tonnes) of R-507A. Based on co-financing of US \$42,912 by Quang Thang for civil and electrical works, the total cost of the subproject is US \$659,010, with a cost-effectiveness of US \$18.80/kg.

*Train mobile air-conditioning systems investment subproject*

76. Viet Nam National Railways (VNR) operates approximately 1,000 passenger railroad cars, each of which has an AC unit charged with approximately 12 kg of R-407C that were manufactured by the enterprise Quang Thang. Each unit will be replaced when it reaches the end of its service life. In order to phase out the use of R-407C in MAC, assistance will be provided to Quang Thang to develop R-454C-based MAC units and manufacture 10 units that will be installed on 10 passenger railroad cars; Quang Thang will maintain and monitor the operation of those units for one year to evaluate the performance and reliability. VNR will develop the technical specification for future procurement of new AC for their passenger railroad cars based on R-454C if the performance of the new MAC systems meet performance requirements.

77. ICCs for Quang Thang comprise procurement of a charging machine capable of handling the mildly flammable refrigerant R-454C (US \$10,000); research and development, prototyping, bench tests and validation (US \$50,000); manufacturing 10 R-454C-based AC units (US \$180,000) and a year of performance monitoring (US \$20,000); development of technical specifications for VNR (US \$10,000); and contingencies (US \$25,000). Accordingly, the total project cost is US \$295,000, of which Quang Thang would co-finance US \$20,000, resulting in a funding request of US \$275,000. Implementation of the project will result in the replacement of approximately 1,000 R-407C MAC units with an associated phase-out of 12 mt of R-407C. The phase-out of R-407C in MAC will be supported by the implementation of a ban on the import and manufacture of R-407C-based MAC equipment by 1 January 2029.

*Non-investment activities*

78. Stage I of the KIP proposes the following non-investment activities:

- (a) Strengthening of RAC servicing sectors through training, assessment, and equipment support (World Bank and UNEP) (US \$2,806,000), including:
  - (i) MAC servicing training and assessment (UNEP) (US \$718,000): Support to training centres through the development of standardized MAC servicing training modules and organization of two train-the-trainer workshops (US \$18,000), training of 1,500 technicians on good MAC servicing practices (US \$336,000), support to assessment centres through the development of an assessment standard for certification in good servicing practices and organization of two assessment training workshops (US \$18,000), assessment and certification of 1,500 technicians on MAC servicing practices (US \$336,000), and revision of occupational standards and training curriculum to include good MAC servicing practices (US \$10,000);
  - (ii) MAC servicing equipment procurement (World Bank) (US \$1,740,000): Procurement of 60 training equipment kits (i.e., electronic scale, vacuum pump, manifold, refrigerant leak detector, micron gauge, recovery cylinder and recovery and recycling (R&R) machine) to support training in good servicing practices in MAC for training centres (US \$450,000), assessment centres (US \$450,000), and servicing tools for certified servicing technicians (US \$840,000);

- (iii) Refrigeration and commercial AC servicing (UNEP) (US \$70,000): Development of standardized training and assessment modules to support servicing technicians of commercial AC, chillers, and commercial and industrial refrigeration systems (US \$60,000) and domestic and stand-alone commercial refrigeration (US \$10,000);
  - (iv) Training and certification management: Create a centralized online platform to manage and disseminate information on training and certification by upgrading and expanding the RAC training website developed under stage II of the HPMP (UNEP) (US \$50,000);
  - (v) Compliance workshops: Six workshops will be held (three at the start of and three during project implementation) to ensure technician certification requirements are in line with regulations on controlled substances, as posted in the country's 2022 decree and legal circular (30 participants each) (UNEP) (US \$108,000);
  - (vi) Stakeholder outreach: Raise awareness among stakeholders and the public on issues related to the servicing sector under stage I of the KIP, such as proposed regulations, alternative technologies, safety information, OzonAction tools, and the new online platform (UNEP) (US \$120,000);
- (b) Regulatory, policy, and technical assistance will be provided to assess alternative technologies, support regulatory and policy development, and increase capacity (World Bank) (US \$910,000), including;
- (i) Information sharing: five workshops with the real estate sector to promote low-GWP and energy efficient cooling (e.g., chillers, VRF, and room AC) in large apartment complexes; in-country training through a technical expert for fire protection authorities and industry on low-GWP alternatives in firefighting; three study tours for industry representatives and Government authorities in fire suppression and the railway sector; and five workshops on stage I of the KIP (US \$370,000);
  - (ii) Impact assessments: Five studies assessing the market implications, costs, and benefits of alternative technologies to support development of the proposed bans (US \$250,000);
  - (iii) Feasibility studies: Two studies to understand HFC phase-out needs in the public transport sector and to support the integration of low-GWP products in public procurement, and a market survey and policy review to support the introduction of alternative technologies in the firefighting sector and the development of technical standards for their use (US \$180,000);
  - (iv) Policy and regulations controlling HFC import and consumption, including development of standard operating procedures and an online system to facilitate applying for and processing quotas, and review and updates to the 2022 decree and legal circular (World Bank) (US \$80,000); and
  - (v) Energy efficiency in residential AC: Market survey determining type and quantity of refrigerants used and the average energy performance of residential AC equipment to support Viet Nam's mandatory energy performance and labeling standards (MEPs); this activity would compliment the conversion under stage II of the HPMP of HCFC-22 to HFC-32 in room AC manufacturing (US \$30,000).

*Project implementation, coordination and monitoring*

79. The project management unit (PMU) will work in cooperation with the NOU to cover the financial, operational, and technical implementation of the project, including verification of consumption. The World Bank will assist eligible enterprises to participate in the project whereas UNEP will be involved in implementing servicing sector activities, with a breakdown as shown in table 10.

**Table 10. PMU budget for stage I of the KIP for Viet Nam (US \$)**

Item	World Bank	UNEP
Staff and consultants	232,400	90,000
Travel	6,001	9,000
Meetings and workshops	0	7,600
Operating expenses	90,000	0
Verification of consumption	30,000	0
<b>Total</b>	<b>358,401</b>	<b>106,600</b>

*Gender policy implementation*

80. An important part of Viet Nam's KIP strategy is to make continued efforts to mainstream gender to the extent possible, noting that the industry and sectors in the project traditionally have low female representation. This is particularly the case for technicians in the servicing sector. In contrast, gender balance is more common in terms of ownership of small- and medium-sized enterprises and in management offices. To track male/female representation in implementation, the KIP will carry over the tool used under the HPMP by the PMU to monitor women's participation in all activities and provide data for gender-disaggregated analysis. In the servicing sector, training of female instructors will be encouraged. Public awareness material on HCFC phase-out and HFC phase-down and Viet Nam's obligations will portray the required actions of society and industry in a gender-balanced manner.

Total cost of stage I of the Kigali HFC implementation plan

81. The budget for stage I has been established at US \$5,115,011. The cost of activities in the refrigeration servicing sector are established in line with decision 92/37. In the absence of cost funding guidelines, the funding requested for activities in the manufacturing/local installation and assembly is the best available estimate for each activity based on Viet Nam's experience in implementing similar activities.

82. The proposed activities, phase-out, and costs for stage I of the KIP are summarized in table 11.

**Table 11. Stage I of the KIP for Viet Nam, as submitted**

Sector	Agency	Phase-out (mt)	Phase-out (CO <sub>2</sub> -eq tonnes)	Cost (US \$)	Requested grant (US \$)	CE (US \$/kg)
Investment component						
Industrial refrigeration conversion to ammonia	WB	35.06	137,889	701,922	659,010	18.80
Rail MAC conversion to R-454C	WB	12.00	21,286	295,000	275,000	22.92
Non-investment activities						
MAC servicing (training and assessment)	UNEP	140.78	201,322	718,000	718,000	5.10
MAC servicing (equipment procurement)	WB	341.18	487,882	1,740,000	1,740,000	5.10
RAC servicing and outreach	UNEP	68.24	241,134	348,000	348,000	5.10
Regulatory, policy and technical assistance	WB	167.90	309,622	910,000	910,000	5.42
PMU	WB	0	0	358,401	358,401	n/a

Sector	Agency	Phase-out (mt)	Phase-out (CO <sub>2</sub> -eq tonnes)	Cost (US \$)	Requested grant (US \$)	CE (US \$/kg)
	UNEP	0	0	106,600	106,600	n/a
<b>Total</b>		<b>765.16</b>	<b>1,399,135</b>	<b>5,177,923</b>	<b>5,115,011</b>	<b>6.68</b>

#### Coordination of activities in the servicing sector under HCFC phase-out and HFC phase-down plans

83. The servicing sector is a critical component to both the KIP and the HPMP. Stage III of the HPMP focuses on the servicing of residential AC and the KIP will focus on the servicing of MAC, commercial AC, and refrigeration. Support from both projects is part of a comprehensive strategy to strengthen the country's servicing sector. In addition, stage III of the HPMP includes activities to strengthen customs, including training of customs officers, inspection techniques, use of refrigerant identifiers,<sup>21</sup> risk profiling, the safe handling of refrigerant cylinders, Harmonized System (HS) codes, reporting and declaration, handling unauthorized shipments, and accessing information for cross-checks. Those activities will strengthen the monitoring, reporting and control of both HCFC and HFC imports and exports. The KIP will complement those activities by focusing on strengthening the quota system, and includes TA activities that focus on those sectors and applications that predominantly consume HFCs.

84. Stage I of the KIP will be implemented in three tranches. The schedule of HFC phase-down and HCFC phase-out commitments, and of the KIP and HPMP tranches, is presented in annex III to the present document.

#### Implementation plan for the first tranche of stage I of the Kigali HFC implementation plan

85. The first funding tranche of stage I of the KIP in the total amount of US \$2,043,342 will be implemented between January 2024 and December 2026 and will include the following activities:

- (a) Investment subprojects: Two payments to Quang Thang for the to develop ammonia-based industrial refrigeration systems (US \$234,220) and R-454C-based MAC units (US \$55,000) (World Bank);
- (b) Policy and regulations controlling HFC import and consumption: Development of standard operating procedures and an online system to facilitate applying for and processing quotas (World Bank) (US \$50,000);
- (c) Strengthening of RAC servicing sectors through training, assessment, and equipment support (World Bank and UNEP) (US \$1,417,507), including:
  - (i) MAC servicing training and assessment: Development of standardized MAC servicing training modules and organization of one train-the-trainer workshops; development of an assessment standard for certification in good servicing practices for MAC and organization of one assessment training workshop; revision of occupational standards and training curriculum to include good MAC servicing practices; and training, assessment and certification of approximately 450 technicians on good MAC servicing practices (UNEP) (US \$238,000);
  - (ii) MAC servicing equipment procurement: Procurement of training kits for MAC for training centres, assessment centres, and begin tool procurement of tools to support servicing technicians (World Bank) (US \$984,000);

<sup>21</sup> Refrigerant identifiers purchased under the HPMP will be able to detect both HCFCs and HFCs.

- (iii) Refrigeration and commercial AC servicing: Initiate the development of standardized training and assessment modules for commercial AC, chillers, and commercial and industrial refrigeration systems (US \$40,000) (UNEP);
  - (iv) Training and certification management: Create a centralized online platform to manage and disseminate information on training and certification by upgrading and expanding the RAC training website developed under stage II of the HPMP (UNEP) (US \$50,000);
  - (v) Compliance workshops and stakeholder outreach: Three workshops to ensure technician certification requirements are in line with regulations on controlled substances, and stakeholder consultations in the servicing sector (UNEP) (US \$105,507);
- (d) Technical assistance, including study assessing the market implications, costs, and benefits of alternative technologies in the firefighting sector (US \$50,000); awareness-raising activities in firefighting, railway systems, and large apartment complexes (US \$71,817); and market survey related to residential AC and MEPS (US \$10,000) (World Bank); and
  - (e) Project management, including implementation, reporting, and 2024-2025 consumption verification, with the following breakdown: staff and consultants (US \$105,265); travel (US \$4,500); meetings and workshops (US \$2,533); operating expenses (US \$37,500); and verification of consumption (US \$5,000) (World Bank and UNEP).

## SECRETARIAT’S COMMENTS AND RECOMMENDATION

### COMMENTS

86. The Secretariat reviewed stage I of the KIP for Viet Nam in light of the existing policies and guidelines of the Multilateral Fund, including decisions 91/38<sup>22</sup> and 92/37,<sup>23</sup> stages II and III of the HPMP, and the 2023–2025 business plan of the Multilateral Fund.

#### Overarching strategy

##### *Exports to non-Article 5 countries and non-Article 5 ownership of manufacturing enterprises*

87. Based on the limited information available, it appears that two vehicle manufacturers exported a few thousand vehicles to non-Article 5 countries in 2022; it is not clear whether the MAC in those vehicles are HFC-134a-based. There was no evidence of other possible exports of HFC-based RAC equipment to non-Article 5 countries. While some RAC manufacturing enterprises in the country include non-Article 5 ownership, further details were not available; the World Bank would provide such information when conversion projects for the subsectors where those enterprises manufacture are submitted.

##### *Starting point for sustained reductions in HFC consumption*

88. The established baseline for HFC consumption in Viet Nam is 13,991,360 CO<sub>2</sub>-eq tonnes, as shown in table 7 above. The methodology for calculating the starting point for sustained reductions in HFC

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<sup>22</sup> In the absence of the cost guidelines for HFC phase-down, to consider HFC individual investment projects and stage I of KIPs on a case-by-case basis, without setting a precedent for the cost guidelines or any future HFC individual investment projects and stage I of KIPs.

<sup>23</sup> Level and modalities of funding for HFC phase-down in the refrigeration servicing sector.

consumption is still under discussion. The Secretariat notes that the starting point will be established once the Executive Committee agrees on the above-mentioned methodology.

### Policy, regulatory and institutional frameworks

#### *HFC licensing and quota system*

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

90. Viet Nam chose to deploy a quota system whereby the initial allocation will not exceed 80 per cent of the country's target; that initial quota will be allocated to importers based on their average imports in the preceding three years. Quotas will be in CO<sub>2</sub>-eq tonnes, thereby providing importers flexibility to import the substances required as long as they do not exceed their assigned quota, and an incentive to import lower-GWP HFCs. The remaining 20 per cent of the country's target will be allocated to organizations importing low-GWP HFCs,<sup>24</sup> to new importers, and to entities with additional demand, prorated based on historical consumption in the preceding three years.

### Technical and cost-related issues

#### *Industrial refrigeration sector investment subproject*

91. The proposal for the conversion of industrial refrigeration systems of 100 kW or more to ammonia is well-conceived and innovative as it combines a conversion at a component manufacturer, assistance to contractors assembling those components, and an incentive to end-users, in line with the conclusions contained in document UNEP/OzL.Pro/ExCom/92/49, including that assistance in the local assembly and installation subsector be provided in conjunction with other activities in KIPs, and that strategies that address enterprises in the local installation and assembly subsector along with major end-users may provide opportunities to facilitate the adoption of low-GWP alternatives.

92. On that basis, the Secretariat and the World Bank had detailed discussions regarding the proposed costs of the subproject. The World Bank clarified that Quang Thang wished to have the flexibility to use both steel alloy and aluminium alloy fins. As such steel alloys are harder than the baseline copper, the fin press machine is incremental. Noting that the proposed equipment costs were based on a quote from a supplier, those costs were agreed on the understanding that no contingencies would be requested. The Secretariat did not assess the costs of civil and electrical works as those will be co-financed by Quang Thang. In addition, costs for PPE for the contractors were adjusted based on the provision of safety glasses, gloves and an ammonia respirator, resulting in agreed costs of US \$1,430 for PPE, and agreed ICCs of US \$339,530.

93. The requested funding for the end-user incentive component of the subproject was estimated based on the difference in cost between an HFC-based and an ammonia-based system, which is uncertain. In addition, the Executive Committee has not considered incremental operating costs (IOCs) in the context of component manufacturers; an assessment of IOCs would need to consider both the additional costs associated with the safety features the converted equipment would require as well as the savings from the use of steel tubing and aluminium or steel fins (versus copper tubing and fins), and the lower price of ammonia relative to that of HFC refrigerants. Moreover, end-user incentive schemes are accounted for in the servicing sector in other Article 5 countries and it was therefore agreed the same should apply in Viet

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<sup>24</sup> The Government was developing a national plan on management and phase-out of controlled substances that will be issued by the Prime Minister by 31 December 2023. That plan will include a definition of "low-GWP HFC."



Nam. Accordingly, it was agreed to associate reductions for the end-user incentive component of the subproject in line with the methodology used by the Secretariat for the servicing sector, resulting in additional reductions from the country's remaining HFC consumption of 96,656 CO<sub>2</sub>-eq tonnes (53.92 mt).

*Train air-conditioning systems investment subproject*

94. As the use of R-454C in MAC for trains was new in Viet Nam, VNR was hesitant to commit to the technology until the performance of the ten units to be manufactured was assessed. Further discussions with component manufacturers and refrigerant suppliers reinforced the selection of R-454C for the subproject. In the unlikely event that VNR determined that the R-454C-based MAC could not satisfy performance specifications, the Government committed to exploring other low-GWP alternatives; to submitting an annual report on progress in identifying a suitable alternative; and that the World Bank would submit a request to the Executive Committee for a change of technology once a suitable technology was found for the consideration of the Committee. In addition, Quang Thang would seek to ensure that MAC systems based on an alternative refrigerant would be at least as energy efficient as the R-454C-based systems.

95. As most of the costs for the project were associated with the manufacturing of 10 MAC units, which were difficult to assess and which the enterprise could control, it was agreed not to include contingencies, resulting in agreed costs of US \$250,000.

*Non-investment activities*

96. The Secretariat and the World Bank had detailed discussions on the activities and costs, resulting in the following agreed adjustments:

- (a) *MAC servicing*: Noting the large number of trainings and assessments planned for MAC technicians, rationalization of the associated costs, resulting in agreed costs of US \$650,800 for MAC servicing and assessment; costs for the MAC servicing equipment were adjusted based on the price of a machine capable of recovering and recycling both HFC-134a and HFO-1234yf, resulting in agreed costs of US \$1,632,200 for MAC equipment procurement;
- (b) *RAC servicing and outreach*: Rationalization of costs associated with developing the training and assessment modules given opportunities to use a common consultant and data, and for stakeholder outreach and workshops given potential synergies and overlaps with activities under the regulatory, policy, and technical assistance component, resulting in agreed costs of US \$311,000 for RAC servicing and outreach; and
- (c) *Regulatory, policy, and technical assistance*: Adjustments to the costs of training for fire protection authorities and industry on low-GWP alternatives (based on the cost of an expert and workshop costs); a reduction in the number of study tours; the studies to support bans, noting there is a single manufacturer of R-407 MAC; the study related to public transport; and removing the activity related to energy efficiency in the residential AC sector as it was not eligible under the KIP, resulting in agreed costs of US \$770,000 for regulatory, policy, and technical assistance.

97. At its 92<sup>nd</sup> meeting, the Executive Committee agreed on funding at a level of up to US \$5.10/kg. for countries with consumption above 360 mt in servicing (decision 92/37(b)(iii)). In order to calculate the reductions from the country's remaining HFC consumption eligible for funding associated with the above non-investment activities, the Secretariat used the methodology for converting US \$/kg to

US \$/CO<sub>2</sub>-eq tonnes in the servicing sector described in annex I of document 92/46.<sup>25</sup> The average HFC consumption in Viet Nam's servicing sector during the baseline years was 3,973.25 mt or 7,122,171 CO<sub>2</sub>-eq tonnes, resulting in a cost-effectiveness in the servicing sector for Viet Nam of US \$2.85/CO<sub>2</sub>-eq tonnes.

98. In line with other projects, the PMU costs were agreed at US \$422,833. Funding for the first tranche was adjusted to US \$2,019,488 based on the revised PMU costs and the removal of activity related to energy efficiency in the residential AC sector.

99. Table 12 summarizes the agreed costs and associated reductions from the country's remaining HFC consumption eligible for funding for stage I of the KIP for Viet Nam.

**Table 12. Agreed cost of activities to be implemented in stage I of the KIP for Viet Nam**

Sector	Agency	Phase-out (mt)	Phase-out (CO <sub>2</sub> -eq tonnes)	Cost (US \$)	CE (US \$/kg)
Investment component					
Industrial refrigeration conversion to ammonia	WB	35.06	137,888	339,530	9.68
End-user incentive for ammonia-based industrial refrigeration systems	WB	53.92	96,656	275,000	5.10
Rail MAC conversion to R-454C	WB	12.00	21,286	250,000	20.83
Non-investment activities					
MAC servicing (training and assessment)	UNEP	127.61	228,741	650,800	5.10
MAC servicing (equipment procurement)	WB	320.00	573,610	1,632,000	5.10
RAC servicing and outreach	UNEP	60.98	109,309	311,000	5.10
Regulatory, policy and technical assistance	WB	150.98	270,637	770,000	5.10
PMU	WB	0	0	326,653	n/a
	UNEP	0	0	96,180	n/a
<b>Total</b>		<b>760.55</b>	<b>1,438,128</b>	<b>4,651,163</b>	<b>6.12</b>

### Impact on the climate

100. The Secretariat was in the process of updating the Multilateral Fund Climate Impact Indicator (MCII). As that revision is not yet complete, the Secretariat is presenting the annual reductions in CO<sub>2</sub>-eq tonnes associated with the conversions in the RAC manufacturing sector in table 13. The Secretariat has not estimated the climate benefits associated with any energy efficiency benefits in this calculation.

**Table 13. Annual reduction in CO<sub>2</sub>-eq tonnes in RAC investment activities**

Subsector	HFC consumption		Consumption of alternatives		Reduction (CO <sub>2</sub> -eq tonnes)
	mt	CO <sub>2</sub> -eq tonnes	mt	CO <sub>2</sub> -eq tonnes	
Industrial refrigeration	35.06	137,888	35.06	0	137,888
MAC trains	12.00	21,286	12.00	1,751	19,535
<b>Total</b>	<b>47.06</b>	<b>159,174</b>	<b>47.06</b>	<b>1,751</b>	<b>157,423</b>

<sup>25</sup> Paper on the starting point for sustained aggregate reductions based on discussions at the 91<sup>st</sup> meeting in the contact group on the cost guidelines for the phase-down of HFCs (decision 91/64(a)).

101. The activities proposed, including inter alia efforts to promote low-GWP alternatives, the strengthening of the infrastructure for refrigerant recovery and recycling, and the provision of tools, training and certification on good servicing practices to technicians, indicate that the implementation of stage I of the KIP will reduce refrigerant emissions into the atmosphere, resulting in climate benefits. A calculation of the impact on the climate of the activities in the KIP indicates that by 2029, Viet Nam will have reduced its emissions by approximately 1,399,136 CO<sub>2</sub>-eq tonnes of HFCs, calculated as the difference between baseline HFC consumption and the target proposed to be achieved by 2029.

#### Sustainability of the HFC phase-down and assessment of risks

102. While the phase-out of R-407C in the MAC sector will be ensured by a ban, the sustainability of the conversion in industrial refrigeration systems will be challenged by the fact that other component manufacturers may continue to manufacture HFC-based heat exchangers for such systems, and that Quang Thang will continue to manufacture HFC-based heat exchangers for systems with capacity smaller than 100 kW. In addition, contractors would be provided with a specified level of funding to incentivize ammonia-based systems; accordingly, the Secretariat sought to better understand how the sustainability of the conversion would be ensured after each contractor had used the allocated funding to subsidize the cost of a new ammonia-based system.

103. Large industrial refrigeration systems with a capacity of over 1,000 kW in the country predominantly use ammonia; accordingly, there already is experience working with ammonia-based refrigeration systems. The subproject targets the installation of medium-scale systems with a cooling capacity between 100 and 1,000 kW. The Secretariat considers it unlikely that an end-user would choose to install two smaller HFC-based systems rather than one medium-sized ammonia-based system as the cost to install and operate two systems was likely higher. Relative to HFC-based systems, a key advantage of ammonia-based systems is their higher energy efficiency. It was agreed that the PMU would make best efforts to capture the baseline energy consumption at end-users of the HFC-based industrial refrigeration equipment during subproject appraisal, and to work with the World Bank on possible mechanisms to monitor the energy consumption of installed ammonia-based equipment; the PMU would highlight those energy efficiency benefits in the awareness-raising activities that target the sector. In addition, in order to ensure the continued, efficient operation of the equipment, Quang Thang agreed to offer an extended warranty for its ammonia-based components, and the contractors may similarly be able to offer such an extended warranty.

104. The implementation by the Government of bans on the use of HFC-23 in new installations of fire suppression systems by 1 January 2025; on manufacturing/imports of stand-alone commercial refrigeration and domestic refrigeration equipment using HFCs by 1 January 2029; on manufacturing/imports of MAC systems using R-407C by 1 January 2029; and on manufacturing and imports of room AC and heat pumps below 60,000 BTU/hr using R-410A and R-417A by 1 January 2029, will enhance the sustainability of the phase-down. That sustainability will be further sustained through the implementation of the planned application specific GWP thresholds, including in fire suppression, AC/heat pumps, large AC and chillers, commercial and industrial refrigeration, and the MAC sectors. The World Bank confirmed that enterprises manufacturing domestic and stand-alone refrigeration equipment with HFCs have decided to convert to R-600a and R-290 by 1 January 2029 without assistance from the Multilateral Fund.

105. One risk identified in the submission is the possible growth in consumption of some HFCs. Indeed, the Secretariat considers it likely that the consumption in metric tonnes of some HFCs, such as HFC-32, will increase. The Secretariat considers that this risk will be mitigated by the comprehensive strategy developed by the Government, including the implementing a well-crafted and innovative quota allocation system, planned bans and GWP thresholds for certain applications, and a focus on those HFCs with the highest GWP and for which low-GWP alternatives are available.

106. As further discussed in paragraph 37 of the present document, to mitigate the risk associated to a delay in the finalization of the grant agreement between the World Bank and the Government, a single grant agreement will be used for stage III of the HPMP and the KIP. Documentation for that agreement was already being prepared by a consultant so that, upon approval of the projects by the Executive Committee, the agreement can be finalized and signed expeditiously.

#### 2023-2025 business plan of the Multilateral Fund

107. The World Bank and UNEP are requesting US \$4,651,163, plus agency support costs, for the implementation of stage I of the KIP for Viet Nam. The total value of US \$2,183,683, including agency support costs, requested for the period of 2023–2025, is US \$197,154 above the amount in the business plan.

#### Draft Agreement

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

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

### **RECOMMENDATION**

110. The Executive Committee may wish to consider:

- (a) Approving, in principle, stage I of the Kigali HFC implementation plan (KIP) for Viet Nam for the period 2023-2029 to reduce HFC consumption by 10 per cent of the country's established baseline in 2029, in the amount of US \$5,029,063, consisting of US \$3,593,183, plus agency support costs of US \$251,522, for the World Bank and US \$1,057,980, plus agency support costs of US \$126,378, for UNEP, as reflected in the schedule contained in annex III to the present document;
- (b) Noting:
  - (i) That the Government of Viet Nam will establish its starting point for sustained aggregate reductions in HFC consumption based on guidance provided by the Executive Committee;
  - (ii) That, once the cost guidelines for HFC phase-down are agreed by the Executive Committee, the reductions from the country's remaining HFC consumption eligibility for funding will be determined in line with these guidelines;
  - (iii) That the reductions from the country's remaining HFC consumption eligible for funding referred to in subparagraph (b)(ii) above will be deducted from the starting point referred to in subparagraph (b)(i);
  - (iv) The commitment of the Government of Viet Nam to issue a ban on the use of HFC-23 in new installations of fire suppression systems by 1 January 2025; on the manufacturing and import of stand-alone commercial refrigeration and domestic refrigeration equipment using HFCs by 1 January 2029; on the manufacturing and

import of mobile air-conditioning systems using R-407C by 1 January 2029; and on the manufacturing and import of residential air-conditioning units and heat pumps below 60,000 BTU/hr using R-410A and R-417A by 1 January 2029;

- (v) That upon completion of the end-user project included in stage I of the KIP, the World Bank will submit a final report on the implementation of this project, including the HFC phase-out and, if available, energy efficiency gains achieved, in line with decision 92/36(g);
- (c) Approving the first tranche of stage I of the KIP for Viet Nam, and the corresponding tranche implementation plan, in the amount of US \$2,183,683, consisting of US \$1,557,792, plus agency support costs of US \$109,045, for the World Bank and US \$461,696, plus agency support costs of US \$55,150, for UNEP; and
- (d) Requesting the Government of Viet Nam, the World Bank, UNEP and the Secretariat to finalize the draft Agreement between the Government of Viet Nam and the Executive Committee for the reduction in consumption of HFCs, including the information contained in the annex referred to in subparagraph (a) above, and to submit it to a future meeting once the KIP Agreement template has been approved by the Executive Committee.



## Annex I

### **DRAFT AGREEMENT BETWEEN THE GOVERNMENT OF VIET NAM AND THE EXECUTIVE COMMITTEE OF THE MULTILATERAL FUND FOR THE REDUCTION IN CONSUMPTION OF HYDROCHLOROFLUOROCARBONS IN ACCORDANCE WITH STAGE III OF THE HCFC PHASE-OUT MANAGEMENT PLAN**

#### **Purpose**

1. This Agreement represents the understanding of the Government of Viet Nam (the “Country”) and the Executive Committee with respect to the reduction of controlled use of the ozone-depleting substances (ODS) set out in Appendix 1-A (“The Substances”) to a sustained level of zero ODP tonnes by 1 January 2030 in compliance with Montreal Protocol schedule.
2. The Country agrees to meet the annual consumption limits of the Substances as set out in row 1.2 of Appendix 2-A (“The Targets, and Funding”) in this Agreement as well as in the Montreal Protocol reduction schedule for all Substances mentioned in Appendix 1-A. The Country accepts that, by its acceptance of this Agreement and performance by the Executive Committee of its funding obligations described in paragraph 3, it is precluded from applying for or receiving further funding from the Multilateral Fund in respect to any consumption of the Substances that exceeds the level defined in row 1.2 of Appendix 2-A as the final reduction step under this Agreement for all of the Substances specified in Appendix 1-A, and in respect to any consumption of each of the Substances that exceeds the level defined in rows 4.1.3, 4.2.3, 4.3.3 and 4.4.3 (remaining consumption eligible for funding).
3. Subject to compliance by the Country with its obligations set out in this Agreement, the Executive Committee agrees, in principle, to provide the funding set out in row 3.1 of Appendix 2-A to the Country. The Executive Committee will, in principle, provide this funding at the Executive Committee meetings specified in Appendix 3-A (“Funding Approval Schedule”).
4. The Country agrees to implement this Agreement in accordance with stage III of the HCFC phase-out management plan approved (“the Plan”). In accordance with sub-paragraph 5(b) of this Agreement, the Country will accept independent verification of the achievement of the annual consumption limits of the Substances as set out in row 1.2 of Appendix 2-A of this Agreement. The aforementioned verification will be commissioned by the relevant bilateral or implementing agency.

#### **Conditions for funding release**

5. The Executive Committee will only provide the Funding in accordance with the Funding Approval Schedule when the Country satisfies the following conditions at least eight weeks in advance of the applicable Executive Committee meeting set out in the Funding Approval Schedule:
  - (a) That the Country has met the Targets set out in row 1.2 of Appendix 2-A for all relevant years. Relevant years are all years since the year in which this Agreement was approved. Years for which there are no due country programme implementation reports at the date of the Executive Committee meeting at which the funding request is being presented are exempted;
  - (b) That the meeting of these Targets has been independently verified for all relevant years, unless the Executive Committee decided that such verification would not be required;
  - (c) That the Country had submitted a Tranche Implementation Report in the form of Appendix 4-A (“Format of Tranche Implementation Reports and Plans”) covering each

previous calendar year; that it had achieved a significant level of implementation of activities initiated with previously approved tranches; and that the rate of disbursement of funding available from the previously approved tranche was more than 20 per cent; and

- (d) That the Country has submitted a Tranche Implementation Plan in the form of Appendix 4-A covering each calendar year until and including the year for which the funding schedule foresees the submission of the next tranche or, in case of the final tranche, until completion of all activities foreseen.

### **Monitoring**

6. The Country will ensure that it conducts accurate monitoring of its activities under this Agreement. The institutions set out in Appendix 5-A (“Monitoring Institutions and Roles”) will monitor and report on implementation of the activities in the previous Tranche Implementation Plans in accordance with their roles and responsibilities set out in the same appendix.

### **Flexibility in the reallocation of funds**

7. The Executive Committee agrees that the Country may have the flexibility to reallocate part or all of the approved funds, according to the evolving circumstances to achieve the smoothest reduction of consumption and phase-out of the Substances specified in Appendix 1-A:

- (a) Reallocations categorized as major changes must be documented in advance either in a Tranche Implementation Plan as foreseen in sub-paragraph 5(d) above, or as a revision to an existing Tranche Implementation Plan to be submitted eight weeks prior to any meeting of the Executive Committee, for its approval. Major changes would relate to:
  - (i) Issues potentially concerning the rules and policies of the Multilateral Fund;
  - (ii) Changes which would modify any clause of this Agreement;
  - (iii) Changes in the annual levels of funding allocated to individual bilateral or implementing agencies for the different tranches;
  - (iv) Provision of funding for activities not included in the current endorsed Tranche Implementation Plan, or removal of an activity in the Tranche Implementation Plan, with a cost greater than 30 per cent of the total cost of the last approved tranche;
  - (v) Changes in alternative technologies, on the understanding that any submission for such a request would identify the associated incremental costs, the potential impact to the climate, and any differences in ODP tonnes to be phased out if applicable, as well as confirm that the Country agrees that potential savings related to the change of technology would decrease the overall funding level under this Agreement accordingly.
- (b) Reallocations not categorized as major changes may be incorporated in the approved Tranche Implementation Plan, under implementation at the time, and reported to the Executive Committee in the subsequent Tranche Implementation Report;
- (c) Any enterprise to be converted to non-HCFC technology included in the Plan and that would be found to be ineligible under the policies of the Multilateral Fund (i.e., due to



foreign ownership or establishment post the 21 September 2007 cut-off date), would not receive financial assistance. This information would be reported as part of the Tranche Implementation Plan;

- (d) The Country commits to examining the possibility of using pre-blended systems with low-global-warming-potential blowing agents instead of blending them in-house, for those foam enterprises covered under the Plan, should this be technically viable, economically feasible and acceptable to the enterprises;
- (e) The Country agrees, in cases where HFC technologies have been chosen as an alternative to HCFCs, and taking into account national circumstances related to health and safety: to monitor the availability of substitutes and alternatives that further minimize impacts on the climate; to consider, in the review of regulations, standards and incentives, adequate provisions that encourage introduction of such alternatives; and to consider the potential for adoption of cost-effective alternatives that minimize the climate impact in the implementation of the Plan, as appropriate, and inform the Executive Committee on the progress accordingly in tranche implementation reports; and
- (f) Any remaining funds held by the bilateral or implementing agencies or the Country under the Plan will be returned to the Multilateral Fund upon completion of the last tranche foreseen under this Agreement.

#### **Considerations for the refrigeration servicing sector**

8. Specific attention will be paid to the execution of the activities in the refrigeration servicing sector included in the Plan, in particular:

- (a) The Country would use the flexibility available under this Agreement to address specific needs that might arise during project implementation; and
- (b) The Country and relevant bilateral and/or implementing agencies would take into consideration relevant decisions on the refrigeration servicing sector during the implementation of the Plan.

#### **Bilateral and implementing agencies**

9. The Country agrees to assume overall responsibility for the management and implementation of this Agreement and of all activities undertaken by it or on its behalf to fulfil the obligations under this Agreement. The World Bank has agreed to be the lead implementing agency (the "Lead IA") in respect of the Country's activities under this Agreement. The Country agrees to evaluations, which might be carried out under the monitoring and evaluation work programmes of the Multilateral Fund or under the evaluation programme of the Lead IA taking part in this Agreement.

10. The Lead IA will be responsible for ensuring coordinated planning, implementation and reporting of all activities under this Agreement, including but not limited to independent verification as per sub-paragraph 5(b). The role of the Lead IA is contained in Appendix 6-A. The Executive Committee agrees, in principle, to provide the Lead IA with the fees set out in row 2.2 of Appendix 2-A.

#### **Non-compliance with the Agreement**

11. Should the Country, for any reason, not meet the Targets for the elimination of the Substances set out in row 1.2 of Appendix 2-A or otherwise does not comply with this Agreement, then the Country agrees

that it will not be entitled to the Funding in accordance with the Funding Approval Schedule. At the discretion of the Executive Committee, funding will be reinstated according to a revised Funding Approval Schedule determined by the Executive Committee after the Country has demonstrated that it has satisfied all of its obligations that were due to be met prior to receipt of the next tranche of funding under the Funding Approval Schedule. The Country acknowledges that the Executive Committee may reduce the amount of the Funding by the amount set out in Appendix 7-A (“Reductions in Funding for Failure to Comply”) in respect of each ODP kilogram of reductions in consumption not achieved in any one year. The Executive Committee will discuss each specific case in which the Country did not comply with this Agreement, and take related decisions. Once decisions are taken, the specific case of non-compliance with this Agreement will not be an impediment for the provision of funding for future tranches as per paragraph 5 above.

12. The Funding of this Agreement will not be modified on the basis of any future Executive Committee decision that may affect the funding of any other consumption sector projects or any other related activities in the Country.

13. The Country will comply with any reasonable request of the Executive Committee and the Lead IA to facilitate implementation of this Agreement. In particular, it will provide the Lead IA with access to the information necessary to verify compliance with this Agreement.

#### **Date of completion**

14. The completion of the Plan and the associated Agreement will take place at the end of the year following the last year for which a maximum allowable total consumption level has been specified in Appendix 2-A. Should at that time there still be activities that are outstanding, and which were foreseen in the last Tranche Implementation Plan and its subsequent revisions as per sub-paragraph 5(d) and paragraph 7, the completion of the Plan will be delayed until the end of the year following the implementation of the remaining activities. The reporting requirements as per sub-paragraphs 1(a), 1(b), 1(d), and 1(e) of Appendix 4-A will continue until the time of the completion of the Plan unless otherwise specified by the Executive Committee.

#### **Validity**

15. All of the conditions set out in this Agreement are undertaken solely within the context of the Montreal Protocol and as specified in this Agreement. All terms used in this Agreement have the meaning ascribed to them in the Montreal Protocol unless otherwise defined herein.

16. This Agreement may be modified or terminated only by mutual written agreement between the Government of the Country and the Executive Committee of the Multilateral Fund.

## **APPENDICES**

### **APPENDIX 1-A: THE SUBSTANCES**

<b>Substance</b>	<b>Annex</b>	<b>Group</b>	<b>Starting point for aggregate reductions in consumption (ODP tonnes)</b>
HCFC-22	C	I	167.15
HCFC-123	C	I	0.16
HCFC-141b	C	I	53.90
Sub-total			221.21
HCFC-141b contained in imported pre-blended polyols	C	I	164.56
<b>Total</b>			<b>385.77</b>

## APPENDIX 2-A: THE TARGETS, AND FUNDING

Row	Particulars	2023	2024	2025	2026	2027	2028	2029	2030	Total
1.1	Montreal Protocol reduction schedule of Annex C, Group I substances (ODP tonnes)	143.78	143.78	71.89	71.89	71.89	71.89	71.89	0	n/a
1.2	Maximum allowable total consumption of Annex C, Group I substances (ODP tonnes)	143.78	143.78	71.89	71.89	71.89	71.89	71.89	0	n/a
2.1	Lead IA (World Bank) agreed funding (US \$)	3,227,127	0	0	4,610,182	0	0	1,383,055	0	9,220,364
2.2	Support costs for Lead IA (US \$)	225,899	0	0	322,712	0	0	96,814	0	645,425
3.1	Total agreed funding (US \$)	3,453,026	0	0	4,932,894	0	0	1,479,869	0	9,865,789
4.1.1	Total phase-out of HCFC-22 agreed to be achieved under this Agreement (ODP tonnes)									105.21
4.1.2	Phase-out of HCFC-22 to be achieved in previously approved projects (ODP tonnes)									61.94
4.1.3	Remaining eligible consumption for HCFC-22 (ODP tonnes)									0
4.2.1	Total phase-out of HCFC-123 agreed to be achieved under this Agreement (ODP tonnes)									0.16
4.2.2	Phase-out of HCFC-123 to be achieved in previously approved projects (ODP tonnes)									0
4.2.3	Remaining eligible consumption for HCFC-123 (ODP tonnes)									0
4.3.1	Total phase-out of HCFC-141b agreed to be achieved under this Agreement (ODP tonnes)									0
4.3.2	Phase-out of HCFC-141b to be achieved in previously approved projects (ODP tonnes)									53.90
4.3.3	Remaining eligible consumption for HCFC-141b (ODP tonnes)									0
4.4.1	Total phase-out of HCFC-141b contained in imported pre-blended polyols agreed to be achieved under this Agreement (ODP tonnes)									0
4.4.2	Phase-out of HCFC-141b contained in imported pre-blended polyols to be achieved in previously approved projects (ODP tonnes)									164.56
4.4.3	Remaining eligible consumption for HCFC-141b contained in imported pre-blended polyols (ODP tonnes)									0

\*Date of completion of stage II as per stage II Agreement: 31 December 2023

## APPENDIX 3-A: FUNDING APPROVAL SCHEDULE

1. Funding for the future tranches will be considered for approval at the first meeting of the year specified in Appendix 2-A.

## APPENDIX 4-A: FORMAT OF TRANCHE IMPLEMENTATION REPORTS AND PLANS

1. The submission of the Tranche Implementation Report and Plans for each tranche request will consist of five parts:

- (a) A narrative report, with data provided by tranche, describing the progress achieved since the previous report, reflecting the situation of the Country in regard to phase out of the Substances, how the different activities contribute to it, and how they relate to each other. The report should include the amount of ODS phased out as a direct result from the implementation of activities, by substance, and the alternative technology used and the related phase-in of alternatives, to allow the Secretariat to provide to the Executive Committee information about the resulting change in climate relevant emissions. The report should further highlight successes, experiences, and challenges related to the different activities included in the Plan, reflecting any changes in the circumstances in the Country, and providing other relevant information. The report should also include information on and justification for any changes vis-à-vis the previously submitted Tranche Implementation Plan(s), such as delays, uses of the flexibility for reallocation of funds

during implementation of a tranche, as provided for in paragraph 7 of this Agreement, or other changes;

- (b) An independent verification report of the Plan results and the consumption of the Substances, as per sub-paragraph 5(b) of the Agreement. If not decided otherwise by the Executive Committee, such a verification has to be provided together with each tranche request and will have to provide verification of the consumption for all relevant years as specified in sub-paragraph 5(a) of the Agreement for which a verification report has not yet been acknowledged by the Committee;
- (c) A written description of the activities to be undertaken during the period covered by the requested tranche, highlighting implementation milestones, the time of completion and the interdependence of the activities, and taking into account experiences made and progress achieved in the implementation of earlier tranches; the data in the plan will be provided by calendar year. The description should also include a reference to the overall Plan and progress achieved, as well as any possible changes to the overall Plan that are foreseen. The description should also specify and explain in detail such changes to the overall plan. This description of future activities can be submitted as a part of the same document as the narrative report under sub-paragraph (b) above;
- (d) A set of quantitative information for all Tranche Implementation Reports and Plans, submitted through an online database; and
- (e) An Executive Summary of about five paragraphs, summarizing the information of the above sub-paragraphs 1(a) to 1(d).

2. In the event that in a particular year two stages of the Plan are being implemented in parallel, the following considerations should be taken in preparing the Tranche Implementation Reports and Plans:

- (a) The Tranche Implementation Reports and Plans referred to as part of this Agreement, will exclusively refer to activities and funds covered by this Agreement; and
- (b) If the stages under implementation have different HCFC consumption targets under Appendix 2-A of each Agreement in a particular year, the lower HCFC consumption target will be used as reference for compliance with these Agreements and will be the basis for the independent verification.

#### **APPENDIX 5-A: MONITORING INSTITUTIONS AND ROLES**

1. The Viet Nam National Focal Point for the Implementation of the Montreal Protocol (the national ozone unit (“NOU”)), under the Ministry of Natural Resources and Environment (“MONRE”), is responsible for managing and coordinating Viet Nam’s overall ODS phase-out programme, including all phase-out activities and measures controlling Annex C, Group I substances (HCFCs). The management and implementation of this Agreement will be undertaken by the Plan’s project management unit (“PMU”) which falls under the direct authority of the NOU.

2. MONRE, through its PMU and the NOU, will collaborate and coordinate with the Ministry of Industry and Trade (“MOIT”) and the General Department of Viet Nam Customs (“GDC”) to implement the import/control system for HCFCs; review annual HCFC import/export licence applications; and establish and publish the annual import quotas for HCFCs for the period 2016 through 2021.

3. In order assist MONRE in monitoring and evaluating the progress of Agreement implementation, the PMU and NOU will:

- (a) Update the HCFC management information system (“MIS”) that captures and tracks all relevant and required data on the importation of Annex C, Group I substances (HCFCs) on an annual basis;
- (b) Update the data on the actual amount of imported HCFCs;
- (c) Monitor and report, in cooperation with GDC, any incidents of illegal import of HCFCs;
- (d) Monitor progress of HCFC phase-out on the demand side by direct oversight of sub-project implementation;
- (e) Maintain the HCFC phase-out project MIS on HCFC-consuming enterprises and sub-projects;
- (f) Compile periodic progress reports of HPMP implementation and HCFC phase-out achievements for sharing with MONRE, MOIT, the GDC and the Ministry of Planning and Investment;
- (g) Prepare Tranche Implementation Reports and Plans according to the schedule set forth in Appendix 2-A;
- (h) Prepare other monitoring reports as required by MONRE or other Government authorities and by MLF Executive Committee decision, in coordination with the Lead Agency; and
- (i) Carry out safety and technical reviews of all relevant activities undertaken under this plan.

4. MONRE, along with its government partner agencies (MOIT, the GDC and Ministry of Planning and Investment), will be responsible for reviewing PMU reports and data and instituting control and policy measures which facilitate HCFC control and reductions according to the Agreement.

#### **APPENDIX 6-A: ROLE OF THE LEAD IMPLEMENTING AGENCY**

1. The Lead IA will be responsible for a range of activities, including at least the following:

- (a) Ensuring performance and financial verification in accordance with this Agreement and with its specific internal procedures and requirements as set out in the Country’s Plan;
- (b) Assisting the Country in preparation of the Tranche Implementation Reports and Plans as per Appendix 4-A;
- (c) Providing independent verification to the Executive Committee that the Targets have been met and associated tranche activities have been completed as indicated in the Tranche Implementation Plan consistent with Appendix 4-A;
- (d) Ensuring that the experiences and progress is reflected in updates of the overall plan and in future Tranche Implementation Plans consistent with sub-paragraphs 1(c) and 1(d) of Appendix 4-A;

- (e) Fulfilling the reporting requirements for the Tranche Implementation Reports and Plans and the overall plan as specified in Appendix 4-A for submission to the Executive Committee;
- (f) In the event that the last funding tranche is requested one or more years prior to the last year for which a consumption target had been established, annual tranche implementation reports and, where applicable, verification reports on the current stage of the Plan should be submitted until all activities foreseen had been completed and HCFC consumption targets had been met;
- (g) Ensuring that appropriate independent technical experts carry out the technical reviews;
- (h) Carrying out required supervision missions;
- (i) Ensuring the presence of an operating mechanism to allow effective, transparent implementation of the Tranche Implementation Plan and accurate data reporting;
- (j) In case of reductions in funding for failure to comply in accordance with paragraph 11 of the Agreement, to determine, in consultation with the Country, the allocation of the reductions to the different budget items and to the funding of the Lead IA;
- (k) Ensuring that disbursements made to the Country are based on the use of the indicators;
- (l) Providing assistance with policy, management and technical support when required; and
- (m) Timely releasing funds to the Country/participating enterprises for completing the activities related to the project.

2. After consultation with the Country and taking into account any views expressed, the Lead IA will select and mandate an independent entity to carry out the verification of the Plan's results and the consumption of the Substances mentioned in Appendix 1-A, as per sub-paragraph 5(b) of the Agreement and sub-paragraph 1(b) of Appendix 4-A.

#### **APPENDIX 7-A: REDUCTIONS IN FUNDING FOR FAILURE TO COMPLY**

1. In accordance with paragraph 11 of the Agreement, the amount of funding provided may be reduced by US \$133 per ODP kg of consumption beyond the level defined in row 1.2 of Appendix 2-A for each year in which the target specified in row 1.2 of Appendix 2-A has not been met, on the understanding that the maximum funding reduction would not exceed the funding level of the tranche being requested. Additional measures might be considered in cases where non-compliance extends for two consecutive years.

2. In the event that the penalty needs to be applied for a year in which there are two Agreements in force (two stages of the Plan being implemented in parallel) with different penalty levels, the application of the penalty will be determined on a case-by-case basis taking into consideration the specific sectors that lead to the non-compliance. If it is not possible to determine a sector, or both stages are addressing the same sector, the penalty level to be applied would be the largest.

## Annex II

## HFC USE IN THE REFRIGERATION AND AIR-CONDITIONING MANUFACTURING SUBSECTORS FOR 2022

Sector	HFC-134a	HFC-32	HFC-227ea	R-404A	R-407C	R-410A	R-507A	Other	Total	Share of total (%)
<b>metric tonnes (mt)</b>										
Domestic refrigeration	67.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	67.51	4.0
Transport refrigeration	8.93	0.00	0.00	3.80	0.00	0.00	0.00	0.00	12.73	0.7
Commercial refrigeration	8.63	0.00	0.00	0.17	0.06	0.00	0.00	0.00	8.86	0.5
Industrial refrigeration	144.48	0.00	0.00	128.09	2.63	0.97	25.40	0.00	301.57	17.7
Residential AC and heat pumps	0.08	209.34	0.00	0.00	0.00	62.76	0.00	0.00	272.18	16.0
Mobile AC	165.91	0.00	0.00	0.00	0.16	0.00	0.00	0.00	166.07	9.7
Commercial AC	296.99	0.00	0.00	0.00	9.33	331.19	0.00	0.00	637.51	37.4
Foam	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.15	5.15	0.3
Aerosol/solvent	0.55	0.00	0.00	0.03	0.00	0.00	0.00	7.20	7.78	0.5
Firefighting	0.00	0.00	220.78	0.00	0.00	0.00	0.00	4.45	225.24	13.2
<b>Total (mt)</b>	<b>693.09</b>	<b>209.34</b>	<b>220.78</b>	<b>132.09</b>	<b>12.18</b>	<b>394.93</b>	<b>25.40</b>	<b>16.81</b>	<b>1,704.61</b>	<b>100.0</b>
<b>CO<sub>2</sub>-eq tonnes</b>										
Domestic refrigeration	96,536	0	0	0	0	0	0	0	96,536	2.9
Transport refrigeration	12,769	0	0	14,898	0	0	0	0	27,667	0.8
Commercial refrigeration	12,341	0	0	647	114	0	0	0	13,102	0.4
Industrial refrigeration	206,612	0	0	502,306	4,667	2,029	101,227	0	816,841	24.5
Residential AC and heat pumps	120	141,301	0	0	0	131,014	0	0	272,435	8.2
Mobile AC	237,253	0	0	0	287	0	0	0	237,540	7.1
Commercial AC	424,700	0	0	0	16,541	691,367	0	0	1,132,608	33.9
Foam	0	0	0	0	0	0	0	5,305	5,305	0.2
Aerosol/solvent	781	0	0	133	0	0	0	5,725	6,639	0.2
Firefighting	0	0	710,924	0	0	0	0	15,589	726,513	21.8
<b>Total (CO<sub>2</sub>-eq tonnes)</b>	<b>991,112</b>	<b>141,301</b>	<b>710,924</b>	<b>517,985</b>	<b>21,609</b>	<b>824,410</b>	<b>101,227</b>	<b>26,619</b>	<b>3,335,187</b>	<b>100.0</b>





## Annex III

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

**Kigali HFC implementation plan (stage I)**

Row	Particulars	2023	2024	2025	2026	2027	2028	2029	Total
1.1	Montreal Protocol reduction schedule of Annex F substances (CO <sub>2</sub> -eq tonnes)	n/a	13,991,360	13,991,360	13,991,360	13,991,360	13,991,360	12,592,224	n/a
1.2	Maximum allowable total consumption of Annex F substances (CO <sub>2</sub> -eq tonnes)	n/a	13,991,360	13,991,360	13,991,360	13,991,360	13,991,360	12,592,224	n/a
2.1	Lead IA (the World Bank) agreed funding (US \$)	1,557,792	0	0	1,513,187	0	0	522,204	3,593,183
2.2	Support costs for Lead IA (US \$)	109,045	0	0	105,923	0	0	36,554	251,522
2.3	Cooperating IA (UNEP) agreed funding (US \$)	461,696	0	0	440,301	0	0	155,983	1,057,980
2.4	Support costs for Cooperating IA (US \$)	55,150	0	0	52,595	0	0	18,633	126,378
3.1	Total agreed funding (US \$)	2,019,488	0	0	1,953,488	0	0	678,187	4,651,163
3.2	Total support costs (US \$)	164,195	0	0	158,518	0	0	55,187	377,900
3.3	Total agreed costs (US \$)	2,183,683	0	0	2,112,006	0	0	733,374	5,029,063

**HCFC phase-out management plan (stage III)**

Row	Particulars	2023	2024	2025	2026	2027	2028	2029	2030	Total
1.1	Montreal Protocol reduction schedule of Annex C, Group I substances (ODP tonnes)	143.78	143.78	71.89	71.89	71.89	71.89	71.89	0	n/a
1.2	Maximum allowable total consumption of Annex C, Group I substances (ODP tonnes)	143.78	143.78	71.89	71.89	71.89	71.89	71.89	0	n/a
2.1	Lead IA (World Bank) agreed funding (US \$)	3,227,127	0	0	4,610,182	0	0	1,383,055	0	9,220,364
2.2	Support costs for Lead IA (US \$)	225,899	0	0	322,712	0	0	96,814	0	645,425
3.1	Total agreed funding (US \$)	3,453,026	0	0	4,932,894	0	0	1,479,869	0	9,865,789