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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Ninety-third Meeting
Montreal, 15-19 December 2023
Item 9(d) of the provisional agenda[1]

PROJECT PROPOSALS: ECUADOR

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

Phase-out

- HCFC phase-out management plan (stage II, second tranche) UNIDO

Phase-down

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

Energy efficiency

- Pilot project to maintain and/or enhance the energy efficiency of replacement technologies and equipment in the context of HFC phase-down (non-investment activities) UNIDO

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

PROJECT EVALUATION SHEET – MULTI-YEAR PROJECTS

Ecuador

(I) PROJECT TITLE	AGENCY	MEETING APPROVED	CONTROL MEASURE
HCFC phase-out plan (stage II)	UNIDO	86th	100% phase-out by 2030

(II) LATEST ARTICLE 7 DATA (Annex C Group I)	Year: 2022	9.15 ODP tonnes

(III) LATEST COUNTRY PROGRAMME SECTORAL DATA (ODP tonnes)							Year: 2022	
Chemical	Aerosol	Foam	Fire-fighting	Refrigeration		Solvent	Process agent	Total sector consumption
				Manufacture	Servicing			
HCFC-22					9.15			9.15
HCFC-141b in imported pre-blended polyols		0.17						0.17

(IV) CONSUMPTION DATA (ODP tonnes)			
2009-2010 baseline:	23.49	Starting point for sustained aggregate reductions:	44.16
CONSUMPTION ELIGIBLE FOR FUNDING			
Already approved:	44.16	Remaining:	0.00

(V) ENDORSED BUSINESS PLAN		2023	2024	2025	Total
UNIDO	ODS phase-out (ODP tonnes)	0.00	5.31	0.00	5.31
	Funding (US $)	0	*564,157	0	*564,157

*Including US $128,400 for UNIDO for additional activities to maintain energy efficiency (decision 89/6)

(VI) PROJECT DATA			2020	2021-2022	2023*	2024	2025 2026	2027	2028-2029	2030	Total
Montreal Protocol consumption limits (ODP tonnes)			15.27	15.27	15.27	15.27	7.63	7.63	7.63	0	n/a
Maximum allowable consumption (ODP tonnes)			15.27	15.27	15.27	15.27	7.63	7.63	7.63	0	n/a
Funds agreed in principle (US $)	UNIDO	Project costs	292,750	0	0	527,250	0	255,500	0	214,500	1,290,000
		Support costs	20,493	0	0	36,908	0	17,885	0	15,015	90,301
Funds approved by ExCom (US $)		Project costs	292,750	0		0	0	0	0	0	292,750
		Support costs	20,493	0		0	0	0	0	0	20,493
Total funds recommended for approval at this meeting (US $)		Project costs			527,250						527,250
		Support costs			36,908						36,908

*The second tranche was planned for 2024 but requested in 2023. The modified funding request includes US $120,000, plus agency support costs of US $8,401, to implement additional activities to maintain energy efficiency (decision 89/6).

Secretariat's recommendation:	Blanket approval

PROJECT DESCRIPTION

1. On behalf of the Government of Ecuador, UNIDO as the designated implementing agency has submitted a request for funding for the second tranche of stage II of the HCFC phase-out management plan (HPMP), in the amount of US $527,250, plus agency support costs of US $36,908.[2] The submission includes a progress report on the implementation of the first tranche, the verification report on HCFC consumption for 2018-2022, a request for funding additional activities to maintain energy efficiency in the refrigeration servicing sector,[3] and the tranche implementation plan for 2024 to 2026.

Report on HCFC consumption

2. The Government of Ecuador reported a consumption of 9.15 ODP tonnes of HCFCs in 2022, which is 61 per cent below the HCFC baseline for compliance. The 2018-2022 HCFC consumption is shown in table 1.

Table 1. HCFC consumption in Ecuador (2018-2022 Article 7 data)

HCFC	2018	2019	2020	2021	2022	Baseline
metric tonnes (mt)						
HCFC-22	243.00	241.21	244.40	185.22	166.28	382.27
HCFC-123	0.00	0.47	0.43	0.00	0.00	9.18
HCFC-124	0.26	0.00	0.15	0.27	0.00	9.99
HCFC-141b	19.06	6.70	0.00	0.00	0.00	7.84
HCFC-142b	0.15	0.00	0.09	0.16	0.00	18.45
Total (mt)	**262.47**	**248.38**	**245.07**	**185.65**	**166.28**	**427.73**
HCFC-141b in imported pre-blended polyols*	131.29	101.79	75.88	67.08	1.51	**187.91
ODP tonnes						
HCFC-22	13.37	13.27	13.44	10.19	9.15	21.02
HCFC-123	0.00	0.01	***0.03	0.00	0.00	0.18
HCFC-124	0.01	0.00	0.00	0.006	0.00	0.22
HCFC-141b	2.10	0.74	0.00	0.00	0.00	0.86
HCFC-142b	0.01	0.00	0.01	0.01	0.00	1.20
Total (ODP tonnes)	**15.48**	**14.01**	**13.48**	**10.20**	**9.15**	**23.49**
HCFC-141b in imported pre-blended polyols*	14.44	11.20	8.35	7.38	0.17	**20.67

* Country programme data

** Starting point established in the Agreement with the Executive Committee

***Article 7 data report wrongly indicates that this substance is HFC-123a. The report is being corrected.

3. The consumption of HCFC-22 in the country has continued to decrease since 2018 due to activities implemented under the HPMP, including the enforcement of the HCFC import/export licensing and quota system, training of technicians, and promotion of alternative technologies in the refrigeration and air-conditioning (RAC) sector. The introduction of non-HCFC-based RAC equipment into the market, combined with the economic slowdown and ceased consumption of pure HCFC-141b following the import ban imposed on 1 January 2020, have further contributed to these reductions. In 2022, only limited import quotas of HCFC-141b contained in pre-blended polyols were provided before restrictions were imposed in 2023.

Country programme implementation report

4. The Government of Ecuador reported the HCFC sector consumption data in its country programme implementation report for 2022, consistent with the data reported under Article 7 of the Montreal Protocol.

[2] As per the letter of 29 August 2023 from the Ministry of Production, Foreign Trade, Investments and Fisheries of Ecuador to UNIDO.

[3] For the purposes of the HPMP, Ecuador is funded as a low-volume-consuming country; in line with decision 89/6, these countries can include in their HPMPs additional activities for the introduction of alternatives with low or zero global-warming potential and for maintaining energy efficiency in the refrigeration servicing sector.

Verification report

5. The verification report confirmed that the Government was implementing a licensing and quota system for HCFC imports and exports and that the total consumption of HCFCs reported under Article 7 for 2018-2022 was below the HCFC consumption targets set out in the Agreement between the country and the Executive Committee. Minor differences between the verified values and those officially reported to the Ozone Secretariat in 2020 and 2021[4] were due to the accounting for HCFC-123 as HFC-123a in 2020, and to the erroneous recording of R-409A in 2021. Although these differences are negligible, the national ozone unit (NOU) has requested that Article 7 data for these two years be corrected.

Status of implementation of stage I of the HCFC phase-out management plan

6. Stage I of the HPMP was completed on 31 December 2021. Project completion reports were submitted by UNEP and UNIDO, respectively, on 31 March and 3 April 2023.

Progress report on implementation of the first tranche of stage II of the HCFC phase-out management plan

Legal framework

7. The Government of Ecuador ratified the Kigali Amendment on 22 January 2018. The import of polyols premixed with HCFC-141b for foaming applications has been restricted since 6 January 2023, and a resolution on the licensing of imports and exports of substances controlled by the Montreal Protocol, adopted on 23 July 2019, is currently being revised. Since 2020, the NOU has been using an online platform for the import licensing system, which facilitates quarterly control of granted licenses. The following activities were implemented during the reporting period:

(a) *Technical assistance for strengthening control of traffic in ozone-depleting substances (ODSs):* 87 customs agents and brokers (41 of them women) were trained in ODS monitoring, illegal trade prevention, harmonized customs codes system and reporting tools; information material about tariff changes was prepared and delivered to importers in print and digital form; and a study tour to Colombia took place to enhance the NOU's and customs agents' expertise on *inter alia* inspection procedures for imported substances and equipment, refrigerant analysis, and control measures including licenses and standards; and

(b) *Adoption and implementation of safety standards and guidelines for alternative refrigerants:* a technical standard was adopted on refrigerant designation and safety classification;[5] another technical standard on the safety requirements for people, facilities, and procedures for the operation, maintenance and repair of refrigeration systems, including refrigerant recovery, reuse and disposal, was approved by the technical committee and is awaiting adoption;[6] and a manual on good practices was published, including topics such as maintenance of RAC equipment charged with hydrocarbon (HC), tools, risk assessment, safe handling of HC refrigerants, potential sources of ignition, and refrigerant charge limits.

Refrigeration servicing sector

8. The following activities were implemented during the reporting period:

[4] HCFC consumption reported under Article 7 for 2020 and 2021 was 13.48 and 10.20 ODP tonnes, respectively, while the verified consumption levels in 2020 and 2021 stood at 13.46 and 10.17 ODP tonnes.
[5] ISO-817:2014 + AMD.1:2017 + AMD.2:2021.
[6] ISO-5149-1:2014 + AMD.1:2015 + AMD.2:2021.

(a) *Strengthening of the training programme on good maintenance practices for RAC systems*: a manual on good refrigeration practices was reprinted in 1,000 copies and distributed to technicians; four training workshops on good practices were held for 98 refrigeration technicians (including five women) and 35 RAC students and trainers (six of them women) by female UNIDO experts; and two female teachers participated in the GIZ Cool Training 2022 Programme in Germany (activity funded by UNIDO);

(b) *Application of good practices in the use of HC and other refrigerants with zero ODP and low global-warming potential (GWP):* a training centre for the safe handling of HC refrigerants was established at the National Polytechnic School (EPN) and supplied with tools, equipment, and instruments suitable for flammable refrigerants;[7] four EPN instructors were trained on good practices with flammable refrigerants; and four additional courses on basic refrigeration, the Montreal Protocol, and natural refrigerants were held for a total of 310 students, trainers and technicians (including 43 women) from the EPN, the Salesian Polytechnic University, and the private sector;

(c) *Development and strengthening of a network of RAC training institutes:* six training institutes were strengthened with tools and equipment, including pressure gauges, recovery machines, vacuum pumps and gauges, digital clamp meters, and domestic refrigerators and freezers for practical training;

(d) *Strengthening of the RAC technician certification system:* in cooperation with the Ecuadorian Professional Training Service (SECAP), a pilot group of 55 technicians was evaluated and certified (40 of them by a female SECAP official); and three webinars conducted by a female consultant were held for 120 attendees, including four women, to promote the certification process;

(e) *Strengthening of the refrigerant recovery and reclaim (RRR) network:* two study tours to Colombia and Mexico were held to analyse these countries' RRR networks and programmes for environmentally sound disposal of RAC equipment reaching its end of life; a reclaim centre was established at one technical school in Guayaquil, with operators receiving associated training; and recovery cylinders were supplied to equipment waste management enterprises operating as refrigerant collection centres, with the enterprises self-funding their refrigerant recovery equipment;

(f) *Pilot projects for conversion to zero-ODP, low-GWP alternatives and technical assistance to large RAC end users:* guides on the implementation of the "Zero Leaks" programme and on the management of RAC equipment during its lifetime and final disposal were developed, made available online, printed in 500 and 200 copies, respectively, and distributed to end users; seven large end users participating in the "Zero Leaks" programme received visits, training, and technical assistance to apply proper management practices for refrigerants and RAC equipment throughout their life cycle; and two end users in the fisheries sector were identified as potential beneficiaries of a project to replace their HCFC-22-based equipment by HC-based refrigeration systems; and

(g) *Public awareness activities*: the certification programme was promoted in all workshops held for RAC technicians and trainers; the country's obligations under the Montreal Protocol were disseminated in annual meetings with importers; HPMP activities were promoted by the Ministry of Production, Foreign Trade, Investment and Fisheries through social media posts and press releases in national newspapers; pamphlets on counterfeit

[7] Including one R-290-based air-conditioning unit, vacuum pumps, leak detectors, manometers, cylinders, thermometers, and scales.

refrigerants were printed and handed out at relevant events; a quick guide to identifying controlled substances was developed and provided to importers; and information material on the updated harmonized system for controlled substances was prepared and distributed to importers.

Project implementation and monitoring

9. With UNIDO's support, the NOU coordinated and monitored the implementation of activities, carrying out regular visits to refrigerant retailers, servicing workshops, customs facilities and end users; organizing awareness workshops, both onsite and online, to promote HCFC phase-out commitments and alternatives; and reporting on results. The funds approved for project implementation and monitoring in the first tranche have been fully disbursed (US $8,000 for project staff and US $12,000 for monitoring visits).

Level of fund disbursement

10. As of September 2023, of the US $292,750 approved so far, US $281,246 (96 per cent) had been disbursed. The balance of US $11,504 will be disbursed in 2023 - 2024.

Implementation plan for the second tranche of stage II of the HCFC phase-out management plan

11. The following activities will be implemented by UNIDO between January 2024 and December 2026:

(a) *Technical assistance for strengthening control of ODS traffic:* training of at least 200 customs and enforcement officers and 20 importers and brokers on the harmonized customs code system updates, reporting tools, and prevention of illegal trade in HCFCs (US $14,000);

(b) *Adoption and implementation of safety standards and guidelines for alternative refrigerants:* organization of two or more outreach meetings for at least 80 end users, trainers, and RAC technicians on the regulations and standards related to the safe handling of flammable refrigerants, including the finalized risk assessment guidelines for RAC servicing with HC refrigerants (US $10,000);

(c) *Strengthening of the training programme on good maintenance practices for RAC systems*: training of 80 RAC technicians on good practices, with priority given to female technicians; implementation of an online training course on good servicing practices (US $40,000);

(d) *Application of good practices in the use of HC and other refrigerants with zero ODP and low GWP:* finalization of risk-assessment guidelines for servicing RAC equipment with HC refrigerant; training of 80 technicians on the safe handling of HC; provision of basic toolkits[8] for the application of good practices in HC-based RAC systems to 20 technicians (US $79,000);

(e) *Strengthening of the RAC technician certification system:* certification of 150 technicians in one labour competency standard; organization of an annual follow-up meeting on the RAC technician certification programme; design of an online course for the certification system; and organization of awareness-building meetings for RAC technicians and end users on the importance and advantages of certified labor competencies in good practices (US $16,000);

[8] Including *inter alia* manifold gauges, electronic leak detectors for HC, safety-related tools, brazing units, compression fitting tools, personal protection items and miscellaneous tubing tools.

(f) *Strengthening of the RRR network:* monitoring the operation of the newly established reclaiming centre, validation of the RRR network business model; delivery of at least 80 cylinders and 40 refrigerant recovery machines to end users and RAC technicians, launching of associated training on RRR in five cities with large HCFC consumption; and organization of an awareness-raising campaign to promote refrigerant recovery practices and use of the reclaiming centre among technicians and end users (US $132,250);

(g) *Pilot projects for conversions to zero-ODP, low-GWP alternatives and technical assistance to large RAC end users:* implementation of a pilot project to replace the RAC system at one end user with equipment based on low-GWP technology, following safety standards; organization of at least four awareness-building meetings for large RAC end users on low-GWP refrigerants and on the "Zero Leaks" programme (US $70,000);

(h) *Public awareness activities:* organization of three campaigns for end users, technicians, and students to promote the phase-out of HCFCs (US $20,000);

(i) *Activities to maintain energy efficiency*: described in detail in the following section (US $120,000); and

(j) *Project implementation and monitoring*: staff costs (US $10,400) and monitoring visits (US $15,600) (total of US $26,000).

Activities to maintain energy efficiency in the refrigeration servicing sector

12. The project related to energy efficiency, submitted in line with decision 89/6, is designed to promote the use of energy-efficient equipment based on low-GWP technologies in the residential and commercial RAC sectors. Its objectives are aligned with the country's National Energy Efficiency Plan. The description and proposed cost breakdown of relevant activities are presented below:

(a) *Strengthening the capacity of importers and customs agents* (US $20,000): formulation, design and printing of a guide for importers and customs agents on conformity assessment procedures, energy-efficiency labelling, minimum energy performance standards applied to RAC equipment, the effective use of risk analysis, and case studies to prevent counterfeiting, piracy, and false marking of origin (US $12,000), and organization of four training workshops for 90 importers, customs and trade officials on the monitoring, labelling, and inspection of products based on low-GWP refrigerants and their energy-efficiency classification (US $8,000);

(b) *Capacity building and additional training on energy efficiency in the RAC servicing sector* (US $65,000): delivery of eight toolkits to vocational training institutes and basic schools to support the training of technicians in determining RAC systems' performance and energy efficiency (US $55,000), and organization of four training workshops for 80 trainers and technicians on procedures to limit energy-efficiency depreciation during the servicing, maintenance, and installation of RAC equipment (US $10,000); and

(c) *Awareness and outreach activities to promote energy efficiency* (US $35,000): design of an awareness and outreach campaign for RAC technicians, importers, distributors, retailers, and end users on the importance and advantages of using low-GWP alternatives with higher energy-efficiency products, including the creation of two videos and the development and distribution of 3,000 copies of two infographics on reading energy-efficiency labels, ODP and GWP values of refrigerants, related costs, and environmental benefits.

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

Early submission

13. As per the Agreement between the Government of Ecuador and the Executive Committee, the second tranche of stage II of the HPMP is only due at the 95th meeting in 2024. Given the substantive progress and level of disbursement achieved so far, upon consultation with the Secretariat, UNIDO submitted the present request in advance of the scheduled date. The Secretariat has reviewed and recommended approval of the tranche based on the level of progress and of disbursement achieved (i.e., 96 per cent), noting that postponing the approval of this tranche could disrupt the momentum of the implementation and that after the approval of all projects and activities programmed in the business plan for this year, there would be sufficient funds for the approval of this tranche.

Progress report on implementation of the first tranche of stage II of the HCFC phase-out management plan

Legal framework

14. The Government of Ecuador has already issued HCFC import quotas for 2023 at 10.69 ODP tonnes, which is lower than the Montreal Protocol control targets.

15. Regarding the commitment to establishing regulatory measures to control intended refrigerant emissions during equipment installation, servicing and decommissioning by 1 January 2023, UNIDO reported that, as establishing and enforcing of a specific regulation had not been possible as initially thought, the Government intended to achieve that goal through the adoption of technical standards, complemented by training, development of manuals on leak prevention, and awareness-building activities. As a case in point, technical standard ISO-5149, approved in July 2023 regarding *inter alia* the operation, maintenance, repair and recovery of refrigeration systems and heat pumps, requires that systems with a refrigerant load larger than 3 kg be inspected for leaks at least once a year. This standard will be promulgated among technicians, manufacturers, and end users to minimize the release of refrigerants into the atmosphere throughout the life cycle of equipment. The Secretariat suggested that UNIDO and the Government continue exploring additional measures to help reduce refrigerant emissions during servicing, and report on any additional progress on this matter in the next tranche request.

Polyurethane foam manufacturing sector

16. At the time of approval of stage II of the HPMP, in line with decision 81/47(c)(iii), the Government of Ecuador was allowed to submit as part of the stage a project proposal for the phase-out of HCFC-141b contained in imported pre-blended polyols used in the manufacturing of spray foam, noting that the enforcement of the import ban on HCFC-141b used in spray foam had been deferred from 1 January 2022 to 1 January 2024 to allow more time for enterprise conversions. UNIDO reported that, in line with decision 86/67(b)(ii),[9] the import of HCFC-141b contained in polyols had been restricted as of 6 January 2023, leaving only an import quota of 7 mt in 2023 for spray applications; to date, no import licenses were requested. UNIDO also informed the Secretariat that the project would not be submitted as no alternatives for the spray sector were currently available in the Ecuadorian market, other than those based on HFC-227ea and HFC-365mfc. UNIDO expects to reuptake work in the spray foam application sector under stage II of the KIP.

[9] To note the Commitment of the Government of Ecuador not to issue any import quota for HCFC-141b contained in pre-blended polyols, except for a maximum of 0.86 ODP tonnes (7.78 metric tonnes), for spray foam, for each year between 2021 and 2023.

Refrigeration servicing sector

17. Regarding the commitments made by the six training institutes strengthened with equipment under the first tranche, UNIDO explained that they incorporated issues related to good refrigeration practices in their regular curricula. Several of these institutes will also start offering training on the safe handling of flammable refrigerants, and will serve as venues to evaluate the labor competencies of technicians in the standard of good refrigeration practices.

18. On the status of the technician certification programme, UNIDO reaffirmed that it had been fully operational since 2019; however, only three training institutes received accreditation as examination centres so far. As a result, out of the 150 technicians trained under the first tranche, only 55 have been certified, with the remaining 95 to be certified during 2023 and 2024. During the second tranche, two additional training institutes will be accredited as examination centres, and 150 additional technicians will be certified. The NOU will continue supporting the relevant government institutions to expedite the process and meet the target of 500 certified technicians proposed in the stage implementation plan.

19. Noting that stage II of the HPMP envisaged the provision of tools and equipment to two reclaiming centres but that only one centre had been equipped, the Secretariat enquired whether the establishment of another reclaiming centre was still planned. UNIDO reported that during the second tranche, the existing centre would be strengthened with 80 cylinders and at least 40 recovery machines to increase the amount of refrigerant recovered and reclaimed, and that additional reclaiming infrastructure would be established based on needs; a feasibility study would also be conducted for that purpose. Stage I of the Kigali HFC implementation plan for Ecuador, also presented for the consideration of the Executive Committee at the present meeting, includes the establishment of additional reclaiming capacity in one city where refrigerant demand justified it, and procurement of a mobile reclaiming unit to provide services to large end users (e.g., in the supermarket and agroindustry sectors), as discussed in paragraph 83 of the present document.

20. In providing details about activities addressing end users, UNIDO confirmed that one of the seven large end users participating in the "Zero Leaks" project would be assisted to replace an HCFC-22-based chiller[10] to one charged with R-290. The enterprise, located in the city of Manta, produces greases and oils, personal care products, supplies for baking and pastry, and biofuels. The project is expected to have an approximate cost of US $30,000, including the R-290 compressor and safety items (funded by the project), and electrical items designed for flammable atmospheres and elimination of ignition sources (funded by the beneficiary). Additional technical details, including potential energy efficiency gains are still being determined. In line with decision 92/36, UNIDO was requested to report, upon completion of this project, on the achieved HFC phase-out and energy efficiency gains.

21. UNIDO also informed the Secretariat that the example of another "Zero Leaks" programme participant that replaced with its own funds its HCFC-22-based chiller by an R-290-based one, had been showcased in meetings with other end users.

Implementation plan for the second tranche of stage II of the HCFC phase-out management plan

22. The Secretariat considers that the plan of action for the second tranche is consistent with the overall objectives and targets set for stage II of the HPMP. Upon discussion with UNIDO, the target of customs officers to be trained under the second tranche has increased from 40 to 200 (as reflected in paragraph 11 of the present document) to ensure that the overall target of training 600 customs officers under stage II would be met.

[10] Capacity of 40 tons of refrigeration, with a semi-hermetic compressor, two air-cooled copper and aluminum condensers, and one shell and tube type evaporator.

Activities to maintain energy efficiency in the refrigeration servicing sector

23. In line with decision 89/6(d), UNIDO has included in the tranche implementation plan the specific actions, performance indicators and funding associated with additional activities to maintain energy efficiency in the servicing sector. Regarding the eight toolkits provided to vocational training institutes and basic schools to support technician training, UNIDO explained that they would be used by instructors and technicians to determine the energy performance of the RAC equipment and to verify the increase in energy efficiency achieved by using alternative refrigerants. Each kit will consist of two multimeters, two wattmeters or a network analyzer, two anemometers, two laser thermometers, and two contact thermometers.

24. The Secretariat notes that UNIDO has also submitted to the present meeting a pilot project on energy efficiency pursuant to decision 91/65. A detailed discussion of that project and how its activities relate to the additional activities included in the HPMP pursuant to decision 89/6 can be found in paragraphs 108 to 111 of the present document.

Gender policy implementation

25. In line with decisions 84/92(d) and 90/48(c), UNIDO plans to increase the participation of women in the RAC sector by means of creating a favourable environment for gender mainstreaming, improving women's employment opportunities and working conditions, and strengthening the technical capacities of female technicians through training courses and provision of toolkits. The project collects sex-disaggregated data and qualitative information to analyse and track gender issues; its outcomes, output, and activities are designed to meet the different needs and priorities of women and men; it has taken into account budget allocations for the proposed gender activities; ensures that both women and men can provide input, access and participate in project activities; offers a gender-balanced recruitment of project personnel and representation in project boards and steering committees; and its monitoring and evaluation component requires specific reporting on gender issues and progress made to address them. During the implementation of the first tranche, a number of activities, including the training of technicians on good practices, the certification of technicians in labor competencies, the "Zero Leaks" programme and the promotion of alternative substances in the RAC sector, were led by local and international female consultants.

Updated Agreement

26. In view of the revised funding level due to the inclusion of funding for additional activities to maintain energy efficiency in the refrigeration servicing sector and the accordingly revised funding schedule, the Agreement between the Government of Ecuador and the Executive Committee has been updated. Specifically, Appendix 2-A has been revised, and paragraph 17 has been updated to indicate that the revised updated Agreement supersedes that reached at the 87th meeting, as contained in annex I to the present document. The full updated Agreement will be appended to the final report of the 93rd meeting.

Sustainability of the HCFC phase-out and assessment of risks

27. To ensure long-term sustainability of the HCFC phase-out, the application of the HCFC import licensing and quota system by the NOU will be complemented by continuous improvements, including those made to the online platform for quarterly control and communication with the Customs Agency to ensure effective HCFC import control. The enforcement of the ban on imports of pure HCFC-141b (January 2020) and the restriction on imports of polyols premixed with HCFC-141b for foaming applications (January 2023) will ensure the sustained phase-out of this substance.

28. To ensure the continuity of training in good servicing practices, the assisted training institutes have incorporated this component into their curricula. The Government of Ecuador is committed to continue

formulating and introducing new norms and standards for the safe handling of alternative refrigerants, as well as raising public awareness on HCFC phase-out to facilitate transition to low-GWP technologies.

Conclusion

29. As corroborated by the independent verification of national levels of HCFC consumption, the Government of Ecuador continues to comply with the targets determined under the Montreal Protocol and stated in its Agreement with the Executive Committee. With UNIDO's assistance, an extensive set of activities has been implemented to strengthen the national capacity to control trade in HCFCs, adopt technical standards on refrigeration, train 87 customs agents and brokers, certify 55 technicians, establish one refrigerant reclaiming centre, and promote refrigerant containment and leakage reduction among large end users. The overall disbursement rate stands at 96 per cent of the approved funding. The proposed activities to maintain energy efficiency in the refrigeration servicing sector are consistent with the Executive Committee's decision on the matter.

30. The second tranche of stage II was only due at the 95th meeting of the Executive Committee, in 2024. However, given the level of progress and disbursement achieved so far, the Secretariat considers the approval of the second tranche at the present meeting to be conducive to ensuring a continued implementation of the phase-out activities and recommends blanket approval for the tranche since there are adequate funds in the current triennium.

RECOMMENDATION

31. The Fund Secretariat recommends that the Executive Committee note:

(a) The progress report on the implementation of the first tranche of stage II of the HCFC phase-out management plan (HPMP) for Ecuador;

(b) The submission of a request for funding for additional activities to maintain energy efficiency in the refrigeration servicing sector in the amount of US $120,000, plus agency support costs of US $8,401, for UNIDO;

(c) That upon completion of the pilot project for end users included in stage II of the HPMP, UNIDO will submit a final report on the implementation of this project, including the HCFC phase out and energy efficiency gains achieved, in line with decision 92/36(g); and

(d) That the Fund Secretariat has updated the Agreement between the Government of Ecuador and the Executive Committee, as contained in annex I to the present document, specifically: Appendix 2-A, to reflect the inclusion of funding for additional activities to maintain energy efficiency in the refrigeration servicing sector referred to in subparagraph (a)(ii) above, and paragraph 17 that has been updated to indicate that the revised updated Agreement supersedes that reached at the 87th meeting.

32. The Fund Secretariat further recommends blanket approval of the second tranche of stage II of the HPMP for Ecuador and the corresponding 2024-2026 tranche implementation plan at the funding level shown in the table below.

	Project title	Project funding (US $)	Support costs (US $)	Implementing agency
(a)	HCFC phase-out management plan (stage II, second tranche)	527,250	36,908	UNIDO

PROJECT EVALUATION SHEET – MULTI-YEAR PROJECTS

Ecuador

(I) PROJECT TITLE	AGENCY
Kigali HFC implementation plan (stage I)	UNIDO

(II) LATEST ARTICLE 7 DATA (Annex F)	Year: 2022	1,597.67 mt	3,937,954 CO_2-eq tonnes

(III) LATEST COUNTRY PROGRAMME SECTORAL DATA (CO_2-eq tonnes)									Year: 2022
Chemical	Aerosol	Foam	Firefighting	AC and refrigeration			Solvent	Other	Total sector consumption
				Manufacturing		Servicing			
				AC	Other				
HFC-23						25,441			25,441
HFC-125			3,390						3,390
HFC-134a				16,273	14,901	980,156			1,011,330
HFC-152a								455	455
HFC-227ea			506						506
R-404A						1,022,562			1,022,562
R-407C						31,840			31,840
R-407F						722			722
R-410A						590,158			590,158
R-417A						27,571			27,571
R-422D						18,849			18,849
R-452A						4,860			4,860
R-507A						1,200,272			1,200,272
HFC-227ea*		37,867							37,867
HFC-365mfc*		124,055							124,055

*In imported pre-blended polyols

(IV) AVERAGE 2020-2022 HFC CONSUMPTION IN SERVICING	1,141.05 mt	2,657,432 CO_2-eq tonnes

(V) CONSUMPTION DATA (CO_2-eq tonnes)			
Baseline: average 2020-2022 HFC consumption plus 65% of HCFC baseline	3,179,294	Starting point for sustained aggregate reductions	TBD
CONSUMPTION ELIGIBLE FOR FUNDING			
Already approved	0	Remaining	TBD

(VI) ENDORSED BUSINESS PLAN		2023	2024	2025	Total
UNIDO	HFC phase-down (CO_2-eq tonnes)	0	0	0	0
	Funding (US $)	115,560	0	0	115,560

(VII) PROJECT DATA			2023	2024	2025	2026	2027	2028	2029	Total
Consumption (CO_2-eq tonnes)	Montreal Protocol limits		n/a	3,179,294					2,861,365	n/a
	Maximum allowable		n/a	3,179,924					2,861,365	n/a
Amounts requested in principle (US $)	UNIDO	Project costs	292,600	0	0	364,414	0	0	72,930	729,944
		Support costs	20,482	0	0	25,509	0	0	5,105	51,096
Amounts recommended in principle (US $)	Total project costs		292,600	0	0	364,414	0	0	72,930	729,944
	Total support costs		20,482	0	0	25,509	0	0	5,105	51,096
	Total funds		313,082	0	0	389,923	0	0	78,035	781,040

(VIII) Request for approval of funding for the first tranche (2023)		
Implementing agency	**Funds recommended (US $)**	**Support costs (US $)**
UNIDO	292,600	20,482
Total	**292,600**	**20,482**

Secretariat's recommendation:	Individual consideration

PROJECT DESCRIPTION

33. On behalf of the Government of Ecuador, UNIDO as the designated implementing agency has submitted a request for stage I of the Kigali HFC implementation plan (KIP), in the amount of US $742,500, plus agency support costs of US $51,975, as originally submitted.[11]

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

35. The first tranche of stage I of the KIP being requested at this meeting amounts to US $376,500, plus agency support costs of US $26,355 for UNIDO, as originally submitted, for the period of January 2024 to December 2025.

36. As part of stage I of the KIP, a pilot project for maintaining and/or enhancing the energy efficiency of replacement technologies and equipment in the context of HFC phase-down, has also been submitted in line with decision 91/65, at a total amount of US $275,000, plus agency support costs of US $19,250. The project is presented separately from stage I of the KIP, in paragraphs 99 to 114 of the present document.

Background

37. The Government of Ecuador has ratified all amendments to the Montreal Protocol, including the Kigali Amendment on 22 January 2018. Ecuador has an HCFC consumption baseline of 23.49 ODP tonnes or 427.73 metric tonnes (mt) and is set to completely phase out consumption of HCFCs by 1 January 2030.[12]

Status of implementation of the HCFC phase-out management plan

38. Stage I of the HCFC phase-out management plan (HPMP) for Ecuador was originally approved at the 65th meeting[13] of the Executive Committee and later updated at its 70th, 81st, and 87th meetings,[14] to meet the 35 per cent reduction from the baseline by 2020 and phase out 28.03 ODP tonnes of HCFCs, at a total cost of US $2,393,159, plus agency support costs. Stage I of the HPMP was completed in December 2021.

39. Stage II of the HPMP for Ecuador was originally approved at the 86th meeting[15] and revised at the 87th meeting[16] to reduce HCFC consumption by 100 per cent from the baseline by 2030, at a total cost of US $1,170,000, plus agency support costs. Stage II will be completed by December 2031, as stipulated in the Agreement between the Government of Ecuador and the Executive Committee.

Status of implementation of HFC-related activities

40. At the 74th meeting, Ecuador received funding (US $110,000) to conduct a national survey on the use and imports of alternatives to ozone-depleting substances (ODSs),[17] which was completed in December 2016. The survey became the basis of the Roadmap for the Implementation of the Kigali Amendment in Ecuador.

[11] As per the letter of 7 August 2023 from the Ministry of Production, Foreign Trade, Investments and Fisheries of Ecuador to UNIDO.
[12] Except for those HCFCs allowed for a servicing tail between 2030 and 2040, where required, consistent with the provisions of the Montreal Protocol.
[13] Decision 65/25
[14] Annex XV of UNEP/OzL.Pro/ExCom/70/59, decision 81/47(c)(ii), and decision 87/21(a)(ii), respectively.
[15] Decision 86/67
[16] Decision 87/21(a)(iii)
[17] Decision 74/35(c)

41. At the 80th meeting, the country received funding for the preparation of a stand-alone investment project to replace HFC-134a with isobutane (R-600a) in self-contained commercial refrigeration equipment manufactured at the enterprise Ecasa (US $30,000).[18] Subsequently, the project was considered but not approved by the Executive Committee at its 81st and 82nd meetings.[19]

42. Also at the 80th meeting, Ecuador received US $150,000 for the implementation of enabling activities for HFC phase-down,[20] which were completed in December 2021. These activities have assisted the country *inter alia* in ratifying the Kigali Amendment; strengthening the capacities of the National Ozone Unit (NOU), servicing workshops, customs officials, and other stakeholders; incorporating HFCs and related equipment in the existing mechanisms for HCFC import/export, data collection, monitoring and reporting; revising the harmonized customs codes; developing software for the online import/export quota and licensing system for HFCs; and identifying the link between the HFC phase-down and energy efficiency.

43. At the 91st meeting, Ecuador received US $267,885 to implement, with UNIDO's assistance, an investment project to convert the manufacturing of domestic and commercial refrigerators at the enterprise Induglob from HFC-134a to R-600a and R-290.[21] The project is expected to be completed by December 2024, phasing out 10.42 mt or 14,901 CO_2-equivalent (CO_2-eq) tonnes of HFC-134a.

Stage I of the Kigali HFC implementation plan

Policy, regulatory and institutional frameworks

44. The implementation of the Montreal Protocol in Ecuador is coordinated by the NOU, which is embedded in the Ministry of Production, Foreign Trade, Investments and Fisheries (MPCEIP).

45. On 22 August 2017, the country incorporated HFCs into its licensing system for the imports and exports of controlled substances. The quota system for HFCs has also been developed and will be applied from January 2024 onward, to ensure meeting the country's consumption freeze target. Quotas will be allocated to importers in metric and CO_2-eq tonnes, based on the levels of imports in baseline years and augmented by a percentage of the HCFC component allocated to each importer.

46. The MPCEIP champions a circular-economy approach to boost innovation in equipment design and to ensure that HFC replacement projects minimize waste generated by the refrigeration and air-conditioning (RAC) sector. Ministerial Agreement No. 67 (2022), issued under the country's circular-economy strategy, contains instructions for the application of extended responsibility in the comprehensive management of Waste from Electrical and Electronic Equipment (WEEE) of domestic origin.

HFC consumption

47. Ecuador only imports HFCs for use mostly in the refrigeration servicing sector, with a small portion used in refrigeration and mobile air-conditioning (MAC) manufacturing as well as firefighting. In 2022, the

[18] Decisions 80/42(b)(iv) and 80/51(a)(i); the project was to be funded from the additional voluntary contributions of non-Article 5 countries, on the understanding that the approval of project preparation did not denote approval of the project proposal or its level of funding when submitted for consideration by the Executive Committee.

[19] Decisions 81/58 and 82/78

[20] Decision 80/49(h), to be funded from the additional voluntary contributions of non-Article 5 countries.

[21] Decision 91/59, approved on the understanding that 14,901 CO_2-eq tonnes (10.42 mt) of HFC-134a would be deducted from the starting point for sustained aggregate reductions in HFC consumption once it had been established; that this deduction would be undertaken in accordance with the methodology agreed under the HFC cost guidelines currently under discussion; and that the project would be integrated into stage I of the KIP for Ecuador, once the plan had been fully formulated and submitted for consideration by the Executive Committee.

most consumed HFCs in Ecuador were R-507A (30.5 per cent of total HFC consumption in CO_2-eq tonnes), R-404A (26 per cent), HFC-134a (25.7 per cent), R-410A (15 per cent), and other HFCs (2.8 per cent). Table 1 presents the country's HFC consumption as reported under Article 7 to the Ozone Secretariat.

Table 1. HFC consumption in Ecuador (2019–2022 Article 7 data)

HFC	GWP*	2019	2020	2021	2022	Share of HFC consumption in 2022 (%)
mt						
HFC-23	14,800	0.23	0.03	0.00	1.72	0.1
HFC-125	3,500	1.04	0.83	2.11	0.97	0.1
HFC-134a	1,430	594.79	600.18	427.17	707.22	44.3
HFC-152a	124	0.00	1.07	1.78	3.67	0.2
HFC-227ea	3,220	0.00	0.00	0.01	0.16	0.0
R-404A	3,922	114.23	108.43	82.11	260.75	16.3
R-407C	1,774	21.17	23.39	17.70	17.95	1.1
R-410A	2,088	242.19	152.96	159.10	282.71	17.7
R-417A	2,346	12.43	18.98	26.31	11.75	0.7
R-422D	2,729	10.66	5.42	5.26	6.91	0.4
R-507A	3,985	115.90	40.65	137.16	301.20	18.9
Others**		1.04	86.62	0.73	2.67	0.2
Total (mt)		**1,113.50**	**1,038.56**	**860.36**	**1,597.68**	**100**
CO_2-eq tonnes						
HFC-23	14,800	3,404	400	0	25,441	0.6
HFC-125	3,500	3,640	2,920	7,389	3,390	0.1
HFC-134a	1,430	850,289	858,260	610,854	1,011,330	25.7
HFC-152a	124	0	132	221	455	0.0
HFC-227ea	3,220	0	0	47	506	0.0
R-404A	3,922	447,964	425,229	322,003	1,022,561	26.0
R-407C	1,774	37,549	41,486	31,402	31,840	0.8
R-410A	2,088	505,565	319,296	332,127	590,157	15.0
R-417A	2,346	29,161	44,536	61,889	27,571	0.7
R-422D	2,729	29,102	14,801	14,848	18,852	0.5
R-507A	3,985	461,862	161,993	546,588	1,200,270	30.5
Others**		1,723	343,095	1,760	5,581	0.1
Total (CO_2-eq tonnes)		**2,370,259**	**2,212,148**	**1,931,128**	**3,937,954**	**100**

*Global-warming potential

**HFC-32, R-407F, R-413A, R-422A, R-437A, R-452A, R-507C, R-508B

48. Due to the impact of the COVID-19 pandemic, the national consumption of HFCs had temporarily dipped from 1,114 mt in 2019 and 1,039 mt in 2020 to 861 mt in 2021, increasing again to 1,598 mt in 2022 and outgrowing its pre-pandemic levels in the midst of market recovery. The largest growth in consumption, compared to the pandemic and pre-pandemic years, was recorded for R-507A and R-404A. Because of these substances' high GWP, this increase had a major impact on the country's 2022 consumption measured in CO_2-eq tonnes.

Country programme implementation report

49. The Government of Ecuador reported its HFC sector consumption data in the 2020-2022 country programme implementation reports, consistent with the data reported under Article 7 of the Montreal Protocol.

HFC distribution by sector

50. Nearly all HFCs in Ecuador are consumed in the refrigeration servicing sector, mainly in commercial refrigeration (26.2 per cent in CO_2-eq tonnes or 19.1 per cent in mt), industrial refrigeration (23.4 per cent in CO_2-eq tonnes or 16.1 per cent in mt), stationary air-conditioning (AC) (16.6 per cent in CO_2-eq tonnes or 19.8 per cent in mt), MAC (13.8 per cent in CO_2-eq tonnes or 23.8 per cent in mt), and others, as shown in table 2. The manufacturing sector, where HFC-134a is used in the production of domestic refrigeration appliances, stand-alone commercial refrigeration units, and MAC installations, accounts for 1.4 per cent in mt, and 0.9 per cent in CO_2-eq tonnes of total HFC consumption in the country.

Table 2. HFC consumption in Ecuador – sectoral distribution (2022)*

Sector	HFC-134a	R-404A	R-410A	R-507A	Others	Total	Share of total (%)
mt							
Manufacturing sectors							
Domestic refrigeration	0.52	0.00	0.00	0.00	0.00	0.52	0.0
Commercial refrigeration (stand-alone units)	9.90	0.00	0.00	0.00	0.00	9.90	0.6
MAC	11.38	0.00	0.00	0	0.00	11.38	0.7
Firefighting	0.00	0.00	0.00	0.00	1.13	1.13	0.1
Subtotal manufacturing (mt)	**21.80**	**0.00**	**0.00**	**0.00**	**1.13**	**22.93**	**1.4**
Servicing sectors							
Domestic refrigeration	111.29	0.00	0.00	0.00	0.00	111.29	7.0
Commercial refrigeration:							
Stand-alone units	66.67	4.40	0.00	0.00	0.00	71.07	4.4
Condenser units	0.00	49.92	0.00	62.79	0.24	112.95	7.1
Centralized systems	0.00	60.03	0.00	58.40	2.67	121.10	7.6
Industrial refrigeration	42.61	94.50	0.00	113.78	5.93	256.82	16.1
Refrigerated transport	75.60	24.42	0.00	35.93	7.10	143.05	9.0
Residential AC	3.93	0.00	123.40	0.00	25.06	152.39	9.5
Commercial AC	4.60	0.00	159.31	0.00	0.00	163.91	10.3
MAC	380.72	0.00	0.00	0.00	0.00	380.72	23.8
Subtotal servicing (mt)	**685.42**	**233.27**	**282.71**	**270.90**	**41.00**	**1,513.30**	**94.7**
Local installation and assembly	0.00	27.49	0.00	30.30	0.00	57.79	3.6
Other	0.00	0.00	0.00	0.00	3.67	3.67	0.2
Total consumption (mt)	**707.22**	**260.76**	**282.71**	**301.20**	**45.80**	**1,597.69**	**100**
CO_2-eq tonnes							
Manufacturing sectors							
Domestic refrigeration	745	0	0	0	0	745	0.0
Commercial refrigeration (stand-alone units)	14,157	0	0	0	0	14,157	0.4
MAC	16,273	0	0	0	0	16,273	0.4
Firefighting	0	0	0	0	3,896	3,896	0.1
Subtotal manufacturing (CO_2-eq tonnes)	**31,175**	**0**	**0**	**0**	**3,896**	**35,070**	**0.9**
Servicing sectors							
Domestic refrigeration	159,151	0	0	0	0	159,151	4.0
Commercial refrigeration:							
Stand-alone units	95,334	17,247	0	0	0	112,581	2.9
Condenser units	0	195,756	0	250,218	564	446,538	11.3
Centralized systems	0	235,408	0	232,724	5,582	473,714	12.0
Industrial refrigeration	60,931	370,591	0	453,414	35,063	919,999	23.4

Sector	HFC-134a	R-404A	R-410A	R-507A	Others	Total	Share of total (%)
Refrigerated transport	108,110	95,766	0	143,179	16,718	363,773	9.2
Residential AC	5,621	0	257,597	0	51,356	314,574	8.0
Commercial AC	6,579	0	332,560	0	0	339,139	8.6
MAC	544,430	0	0	0	0	544,430	13.8
Subtotal servicing (CO_2-eq tonnes)	**980,156**	**914,768**	**590,157**	**1,079,535**	**109,282**	**3,673,899**	**93.3**
Local installation and assembly	0	107,794	0	120,737	0	228,531	5.8
Other	0	0	0	0	455	455	0.0
Total consumption (CO_2-eq tonnes)	**1,011,330**	**1,022,562**	**590,157**	**1,200,272**	**113,633**	**3,937,954**	**100**

*Does not include consumption of HFCs contained in imported pre-blended polyols

Manufacturing sectors

51. Induglob, the only local manufacturer of domestic and stand-alone commercial refrigerators using HFCs, is currently converting with Multilateral Fund's assistance from the use of HFC-134a (10.42 mt) to R-600a and R-290. While there are other enterprises in the country that still import this type of equipment, a ban on the imports and manufacturing of domestic refrigerators using HFC-134a has been developed and is expected to enter into force upon completion of the Induglob conversion project, including in its scope commercial stand-alone units based on HFC-134a.

52. In the MAC sector, three assemblers are using HFCs for AC installations in cars, pickup trucks, sport utility vehicles, and vans: General Motors, Aymesa and Ciauto. The use of HFO-1234yf as an alternative to HFC-134a is gradually increasing in new vehicle manufacturing.

53. In 2022, the firefighting subsector consumed about 1.13 mt or 3,896 CO_2-eq tonnes of HFCs, primarily HFC-227ea and HFC-125 in portable fire extinguishers and pressurized fire extinguishing systems used to suppress class A, B, and C fires without water or harmful chemical residues. Small consumption of HFC-152a (3.67 mt or 455 CO_2-eq tonnes) has also been recorded in the glass manufacturing sector.

54. In 2022, the polyurethane (PU) foam sector reported consumption of the HFC-365mfc/HFC-227ea blend contained in imported pre-blended polyols (156.24 mt of HFC-365mfc and 11.76 mt of HFC-227ea), possibly due to the recent total phase-out of HCFC-141b in the sector. No HFC consumption in this sector was reported in previous years under the CP report.

Refrigeration and air-conditioning servicing sector

55. There are approximately 2,700 technicians and 900 RAC workshops in the country, servicing commercial refrigeration equipment (stand-alone units, condensers, and centralized systems), industrial refrigeration equipment, residential and commercial AC, domestic refrigerators, chillers, and other equipment, as described below. Around 540 technicians are employed in well-established workshops; the remaining ones are independent. It is estimated that around 2,100 technicians require training, and that most of them do not have tools for the proper handling of flammable refrigerants.

Domestic refrigeration

56. The domestic refrigeration subsector uses HFC-134a; servicing consists mostly in attending to leakages and refrigerant recharging. Full adoption of R-600a, the main alternative identified for this subsector, is expected in the short or medium term, as it is locally available both for the manufacturing of new appliances and for equipment servicing and offers optimal energy performance.

Commercial refrigeration

57. HFCs (mostly R-507A, R-404A and HFC-134a) are used in centralized refrigeration systems for supermarkets, in condensing units for businesses and convenience stores, and, on a smaller scale, in self-contained plug-in equipment such as freezers, display cases, and beverage coolers. High levels of consumption in the centralized refrigeration systems are due *inter alia* to their age, size, number of pipes and ducts involved, lack of preventive maintenance and insufficient refrigerant recovery rates. Market penetration of low-GWP alternatives for larger systems is contingent on the development of suitable regulations, system components, and safety standards. Alternative substances that are already used in the servicing of self-contained appliances are hydrocarbons (HCs), especially R-290.

Industrial and transport refrigeration

58. Industrial refrigeration is the second largest HFC-consuming subsector, using mostly R-507A, R-404A and HFC-134a for the servicing and maintenance of refrigeration chambers, process chillers and distributed systems, with ammonia identified as a cost-effective alternative for many industrial applications.

59. Refrigerated transport is an essential part of the country's food and pharmaceutical cold chain, with most equipment used in this subsector being imported. HFCs are consumed in both small and large vehicles distributing food over short distances, intermodal containers transported by rail or road, and maritime transport vessels; suitable alternatives include HFO/HFC blends, carbon dioxide, ammonia and HCs, noting that some of these substances are not locally available yet.

Residential and commercial air-conditioning servicing

60. The stationary AC servicing subsector is the country's third largest consumer of HFCs, especially R-410A that has been introduced as a substitute for HCFC-22. Given the rapid growth of the AC sector at the time of transition from HCFC-22 to R-410A, reducing HFC consumption might pose a challenge. Potential alternatives to R-410A, such as HFC-32, R-290 or R-452B, are either not yet fully available in Ecuador or are flammable and require the development and implementation of new standards and related training.

Mobile air-conditioning servicing

61. The MAC servicing subsector uses HFC-134a to serve mostly the light vehicle subsector, which accounts for over a quarter of the estimated four million automobiles currently in circulation, many of them requiring annual maintenance and recharging of AC systems. Significant demand for servicing is due to high leakage rates, particularly in regions prone to extreme weather conditions. HFC-134a is expected to remain the dominant refrigerant in MAC systems in Ecuador in the coming years. HFO-1234yf is available in the local market and its use in new vehicle manufacturing is gradually increasing; however, its adoption in the servicing subsector requires further regulations.

Local installation and assembly subsector

62. The consumption of HFCs in the assembly and initial charging of new equipment in the commercial refrigeration subsector in 2022 has been estimated at 27.49 mt of R-404A and 30.30 mt of R-507A, mostly for the assembly of centralized systems (51 per cent) and condensing units (49 per cent).

63. Several supermarket chains in Ecuador continue expanding, unhindered by the COVID-19 pandemic. In 2022, an estimated 20 new HFC-based centralized systems and between 1,500 and 2,000 HFC-based condensing units were installed in supermarkets across the country.

64. One of the leading enterprises in this subsector, Megafrio, installs RAC systems in buildings, supermarkets, and construction projects, including condensing units with a capacity of up to 5 refrigeration tonnes (TR) and 1 to 10 kg refrigerant charge, and centralized systems with 10 to 50 TR capacity and refrigerant charges ranging from 200 to 1,500 kg. While most of these installations are HFC-based, the enterprise has taken the lead in installing condensing units and centralized systems based on carbon dioxide. Currently, 60 supermarkets and convenience stores in the country use this technology, which has rapidly penetrated the local market.

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

Overarching strategy

65. The Government of Ecuador is proposing three stages for its KIP. Stage I is to be implemented simultaneously with the HPMP until 2029. Stage II is expected to cover a period of 11 years (from 2030 to 2040), and stage III will extend over five years until 2045.

Established HFC baseline and proposed reductions

66. The Government of Ecuador reported its Article 7 data for 2020-2022. By adding 65 per cent of the HCFC baseline (in CO_2-eq tonnes) to the average HFC consumption in 2020-2022, the established HFC baseline is 3,179,294 CO_2-eq tonnes, as shown in table 3.

Table 3. HFC baseline for Ecuador (CO_2-eq tonnes)

Baseline calculation	2020	2021	2022
HFC annual consumption	2,212,148	1,931,128	3,937,954
HFC average consumption 2020-2022			2,693,743
HCFC baseline (65%)			485,551
HFC baseline			3,179,294

67. The Government of Ecuador has forecasted future HFC consumption based on an annual average growth of 9 per cent for the period 2023–2029. Noting that HFC consumption in 2022 was already 24 per cent above the baseline level, immediate action is needed to ensure compliance in 2024.

Proposed activities and total cost of stage I of the Kigali HFC implementation plan

68. Stage I of the KIP has four main goals: prioritize conversion from HFC-134a to R-600a and R-290 in the manufacturing of domestic and commercial stand-alone refrigeration appliances; prepare the refrigeration servicing sector to handle HCs; promote the recovery and recycling of HFC-134a used in the existing vehicles and its replacement by HFO-1234yf in new vehicles in the MAC sector; and initiate pilot projects to phase out the use of R-404A and R-507A in condensing units and centralized refrigeration systems in supermarkets while improving their energy efficiency and ensuring sustainability of the transition.

69. The activities planned under the KIP are divided into the following main pillars: reduction of HFC supply and demand through policies and regulations; capacity building for the servicing sector through technician training and provision of tools; strengthening of refrigerant management practices, including recovery and reclaiming; and project monitoring, coordination and management. The budget for stage I had been established at US $742,500, as submitted, and subsequently revised to US $729,944, as explained in paragraphs 84 to 88 below. The proposed activities and their costs are summarized in table 4.

Table 4. Activities proposed for implementation in the servicing sector under stage I of the KIP

KIP component	Cost as submitted (US $)	Adjusted cost (US $)
Policies and regulations to reduce HFC supply and demand		
Automatization of the HFC quota and licensing system and updates to related legislation	20,000	20,000
Two workshops for customs agents, appraisers and officers on HFC control and the prevention of illegal trade; procurement of four refrigerant identifiers for the customs officers and two refrigerant standards for customs labs; and a study carried out on risk management and tariff codifications based on the updated harmonized code system	50,000	50,000
Raising awareness on the HFC phase-down among Government institutions, academia, industry, end users, and other stakeholders through media campaigns, dissemination of materials and press conferences	15,000	15,000
Subtotal	**85,000**	**85,000**
Technician training, certification, and capacity building		
Establishing a collaboration agreement with three training institutions, preparation of a manual and teaching materials, and training of 30 trainers and 600 RAC technicians in the safe handling of flammable refrigerants	85,500	95,000
Provision of RAC and MAC servicing tools and equipment[22] for three training institutions	180,000	180,000
Delivery of 35 toolkits[23] (increased to 44 kits) for RAC and MAC servicing technicians	125,000	156,586
Study tour to an international training centre for six trainers and NOU staff	12,000	12,000
Subtotal	**402,500**	**443,586**
Refrigerant recovery and reclaiming scheme		
Establishment of one additional upgraded reclaiming centre[24] in a selected high-demand location and procurement of one mobile reclaiming machine to provide services to large end users including supermarkets and agroindustry	120,000	120,000
Subtotal	**120,000**	**120,000**
Public awareness		
Design and creation of multiple communication products, including infographics, postcards and videos, to promote good servicing practices and training on the handling of flammable refrigerants, identification of counterfeit refrigerants, refrigerant recycling, energy efficiency, and other relevant topics	15,000	15,000
Subtotal	**15,000**	**15,000**
Total activities in the refrigeration servicing sector	**622,500**	**663,586**
Project coordination and monitoring (PMU)		
National consultant to liaise between the NOU, MPCEIP and UNIDO	60,000	33,179
Expert to guide project implementation	40,000	22,119
Gender specialist to implement gender action lines in all KIP activities	15,000	8,295
Coordination meetings with stakeholders	5,000	2,765
Subtotal PMU	**120,000**	**66,358**
Grand total for stage I of the KIP	**742,500**	**729,944**

[22] Including, *inter alia*: (a) for RAC technicians: recovery units, R-290-based AC unit (18,000 BTU), R-600a-based domestic refrigerator, refrigerant identifiers, electronic leak detectors, brazing equipment, vacuum pumps, venting hoses for flammable refrigerants, manifolds, scales, and cylinders; and (b) for MAC technicians: recovery and recycling units for HFC-134a and HFO-1234yf and associated consumables kits (oil, hoses, valves, filters, cylinders).
[23] Including, *inter alia*: (a) for RAC technicians: vacuum and charging kit for HCs, portable nitrogen blowing equipment, welding kit, leak detector spray, portable air blowers, and leak detectors; and (b) for MAC technicians: recovery and recycling units for HFC-134a and associated consumables kits (oil, hoses, valves, filters, cylinders).
[24] Equipped *inter alia* with a refrigerant reclamation unit with an associated consumables kit and cylinders of several capacities, drying system for refrigeration cylinders, vacuum pumps, recovery units, 1,000 lb storage tanks, electronic leak detectors, pollution detector kits, and an advanced refrigerant identifier.

Project coordination and monitoring

70. The NOU, with the assistance of national consultants and experts, will coordinate the implementation of the KIP, including meetings with stakeholders, follow up on the implementation of activities, and manage both KIP and HPMP activities.

Gender policy implementation

71. The KIP applies a gender-sensitive perspective in all its components. Under stage I, a dedicated specialist will assess the current state of gender-related issues in the industry and, considering the national mainstreaming policies, develop a gender action plan in connection with the institutional strengthening project. Relevant activities and their gender indicators include at least one female trainer and 10 female customs officers trained, eight female trainers participating in the technician training programme, one female RAC management specialist engaged in the recovery and reclaiming scheme, and the promotion of gender aspects in planned public awareness activities.

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

72. The activities under stage I of the KIP and stage II of the HPMP will be implemented in parallel. Most KIP activities will focus on strengthening the implementation of the existing quota and licensing system and on providing training and equipment for the proper handling of flammable substances such as HCs to technicians, while the technician certification scheme will continue being implemented under the HPMP. The KIP will further strengthen the country's refrigerant recovery, reclaim and reuse (RRR) infrastructure, created under the HPMP. A project to develop a strategy to handle banks of unwanted RAC equipment and refrigerants and for their proper end-of-life management is being presented separately, in line with decision 91/66,[25] and a pilot project to improve the energy efficiency of RAC equipment is being submitted in line with decision 91/65. The activities implemented under the two projects will be complementary to the activities carried out in the RAC servicing sector under both the HPMP and the KIP.

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

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

74. The first funding tranche of stage I of the KIP, in the total amount of US $376,500, as submitted, will be implemented by UNIDO between January 2024 and December 2025, including the following activities:

(a) *Policies and regulations to reduce HFC supply and demand*: upgrading the Ozone Ecuador online platform to include HFCs and RAC appliances in its database and tracking system (US $8,000); delivery of two refrigerant identifiers to two customs offices and one refrigerant standard for the customs lab; training of 20 customs appraisers, risk management officers, laboratory staff and customs agents on the prevention of illegal trade in HFCs and related controls; completion of one study on risk management and tariff codifications (US $20,000); and the design and implementation of a media campaign and awareness-raising activities on HFC controls at government institutions (US $6,000) (total of US $34,000);

[25] UNEP/OzL.Pro/ExCom/93/37

(b) *Technician training, certification, and capacity building:* signing of collaboration agreements with three training institutions, preparation of two training manuals, and training of 30 instructors and 60 technicians on the safe use of flammable refrigerants in the RAC and MAC sectors (US $45,000); provision of tools and equipment for the safe handling of flammable refrigerants in the RAC and MAC sectors to three training institutions (US $180,000); provision of 10 tool kits for seven RAC and three MAC servicing technicians (US $36,500); organization of a study tour to an international training centre on the use of flammable refrigerants for six trainers and NOU staff (US $12,000) (total of US $273,500);

(c) *Refrigerant recovery and reclaiming scheme*: deployment of one mobile unit to reclaim refrigerant onsite at large end users (US $15,000);

(d) *Public awareness*: production and release of four media kits including infographics, images, postcards, videos, and multimedia content to promote good practices in the handling of flammable refrigerants, refrigerant recycling, energy efficiency, and the identification of counterfeit refrigerants (US $6,000); and

(e) *PMU*: recruitment of one national consultant on the KIP (US $24,000), one expert on HFCs (US $16,000), and one specialist in gender mainstreaming (US $6,000); issuance of two annual project reports; and organization of two coordination meetings with stakeholders (US $2,000) (total of US $48,000).

SECRETARIAT'S COMMENTS AND RECOMMENDATION

COMMENTS

75. The Secretariat reviewed stage I of the KIP for Ecuador in light of the existing policies and guidelines of the Multilateral Fund, including decision 92/37,[26] stage II of the HPMP, and the 2023–2025 business plan of the Multilateral Fund.

HFC consumption levels

76. HFC consumption decreased for two years, reaching 860.36 mt (1,931,128 CO_2-eq tonnes) in 2021, followed by an increase to a level of 1,597.68 mt (3,937,954 CO_2-eq tonnes) in 2022, exceeding the baseline level by 24 per cent. The Secretariat notes that while the increase in consumption in most HFCs could be associated with a regular growing trend after some reductions due to COVID-19, R-404A consumption doubled pre-pandemic levels and R-507A consumption tripled them. Because of their high GWP, the overall increase of HFC consumption in CO_2-eq tonnes is more prominent.

77. The Secretariat enquired whether the recorded increase in imports was to serve regular refrigerant needs after the reductions in 2020 and 2021. UNIDO explained that the increase in imports of R-404A and R-507A was due to the migration of many HCFC-22-based systems to those refrigerants, a rebound after a reduction of consumption during the pandemic, and a 40 per cent growth in exports of shrimp and seafood compared with 2021, which caused a significant increase in installed refrigeration capacity and demand for refrigerant. No historical data was available because the Government only started to formally record imports of HFCs in 2018, and an estimate of the 2023 consumption level was not available either.

78. The Secretariat considers it important to continue monitoring the country's HFC consumption behavior over the coming years to determine whether the high imports reported in 2022 are representative of the local market's regular consumption needs or were an isolated occurrence, expecting that by the time

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

the next tranche request is submitted in 2026, the availability of data on longer-term HFC consumption trends will allow more clarity on the issue.

Overarching strategy

Starting point for sustained reductions in HFC consumption

79. The estimated baseline for HFC consumption in Ecuador is 3,179,294 CO_2-eq tonnes, as shown in table 3 above. The methodology for calculating the starting point for sustained reductions in HFC consumption is still under discussion. The Secretariat notes that the starting point will be established once the Executive Committee agrees on the above-mentioned methodology.

80. In addition to the deductions from HFC phase-down funded during stage I of the KIP, in line with decision 91/59(b)(i), 14,901 CO_2-eq tonnes (10.42 mt) of HFC-134a associated with the stand-alone project at Induglob will be deducted from the starting point once it has been established.

Policy, regulatory and institutional frameworks

HFC licensing and quota system

81. 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. Accordingly, the Government of Ecuador incorporated HFCs into its licensing system for imports and exports of controlled substances on 22 August 2017 and has also established a quota system that will be implemented from 2024 onward. Ecuador also adopted the seventh amendment of the harmonized code system, which differentiates pure HFCs from those contained in blends.

Technical and cost-related issues

82. Stage I of the KIP proposes activities in the refrigeration servicing sector only, in addition to the ongoing conversion of Induglob. Other sectors such as local installation and assembly, firefighting and PU foam (consuming only imported pre-blended polyols) will be addressed at future stages. The Secretariat notes that stage I of the KIP for Ecuador was prepared in a comprehensive manner combining current different funding opportunities such as the submission of a stand-alone investment project to the 91st meeting under decision 87/50(e), which will ensure early and sustained phase-out of HFC-134a in domestic and commercial stand-alone manufacturing;[27] the development of a strategy to manage unwanted refrigerants under decision 91/66, which will complement refrigerant management activities under the KIP; and the pilot project on energy efficiency under decision 91/65, which will help create the conditions for a transition to more energy-efficient large RAC systems in the commercial refrigeration sector. While these funds are derived from different decisions and are being considered by the Committee separately, they are part of a comprehensive strategy that will facilitate HFC reductions during stage I.

83. The activities included in the refrigeration servicing sector are eligible and will be implemented in coordination with the ongoing HPMP activities to avoid duplication of efforts, as shown in annex III. In relation to the new reclaiming centre, UNIDO explained that it was going to be established in Manta, a different city than the ones that already have reclaiming capacity. Based on the information collected, it was determined that the level of refrigerant use due to the expanding seafood export industry justifies the establishment of the reclaiming centre. Consistent with the approach being followed under the HPMP, funding for reclaiming infrastructure will only be included in the second tranche when the feasibility study

[27] In decision 91/59(c), the Executive Committee noted the commitment of the Government of Ecuador to establish a ban on the import and manufacturing of domestic refrigerators and commercial stand-alone refrigeration units using HFC-134a upon completion of the Induglob conversion project.

and business model have been completed. UNIDO will only include in the first tranche the mobile reclaiming unit, which will be used to serve end users of large RAC systems (many of them using R-404A and R-507A) where it is easier to mobilize the reclaiming service to the site than recover and transport cylinders. The unit will be made available to technicians and end users through the refrigeration association.

Total project cost

84. UNIDO had initially estimated the cost of implementation of stage I of the KIP for Ecuador at US $742,500, including US $622,500 for activities in the refrigeration servicing sector and US $120,000 for project coordination and monitoring. The Secretariat's total estimate aligns with that submitted by UNIDO, with certain differences in cost distribution, as detailed in the following paragraphs and table 5.

85. The average HFC consumption in Ecuador's refrigeration servicing sector during the baseline years was 1,141.05 mt, or 2,657,432 CO_2-eq tonnes. At the 92nd meeting, the Executive Committee agreed on funding at a level of up to US $5.10/kg for countries with consumption above 360 mt in servicing (decision 92/37(b)(iii)). The Secretariat calculated the cost of stage I of the KIP using the methodology for converting US $/kg to US $/$CO_2$-eq tonne in the servicing sector described in annex I of document 92/46.[28] A 10 per cent reduction from an HFC baseline of 3,179,294 CO_2-eq tonnes is 317,929 CO_2-eq tonnes. The Government of Ecuador has already received funding to reduce 14,901 CO_2-eq tonnes with the conversion of Induglob; therefore, the reduction required from the servicing sector to reach the overall 10 per cent reduction target is 303,028 CO_2-eq tonnes.

86. To determine the cost of reducing 303,028 CO_2-eq tonnes at US $5.10/kg, the Secretariat converted this consumption to mt using the average GWP of the HFC consumption in the servicing sector in baseline years (HFC consumption in servicing in CO_2-eq tonnes (2,657,432 CO_2-eq tonnes) divided by HFC consumption in servicing in mt (1,141.05 mt)). With the obtained GWP value of 2,329, the phase-out tonnage required in the servicing sector to reach the 10 per cent reduction target is 130.11 mt.

87. The cost of phasing out 130.11 mt at US $5.10/kg is US $663,586. By adding the project management unit (PMU) costs, estimated at 10 per cent of the project costs,[29] the total cost of stage I of the KIP (without agency support costs) amounts to US $729,944, as shown in table 5.

Table 5. Cost calculation for activities in the servicing sector under stage I of the KIP for Ecuador

HFC consumption data		
Established HFC consumption baseline	CO_2-eq tonnes	3,179,294
Average HFC consumption in the servicing sector in baseline years	mt	1,141.05
	CO_2-eq tonnes	2,657,432
Average GWP of HFC consumption in the servicing sector		2,329
Reduction target for stage I of the KIP		
10 per cent reduction from the HFC baseline	CO_2-eq tonnes	317,929
Reductions already funded (Induglob project)	CO_2-eq tonnes	14,901
Reductions required from the servicing sector	CO_2-eq tonnes	303,028
	mt	130.11
Cost of stage I of the KIP for the servicing sector		
Agreed cost-effectiveness threshold	US $/kg	5.10
Cost of phasing down 130.11 mt at US $5.10/kg	US $	663,586
Project management costs (10% of total cost of stage I)	US $	66,358
Total project cost	**US $**	**729,944**

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

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

88. Table 6 summarizes the cost of stage I of the KIP including the conversion of Induglob approved at the 91st meeting. Regarding the funding requested at the present meeting, while the overall level of funding recommended was slightly reduced from US $742,500 to US $729,944, there is an increase of funding in the refrigeration servicing sector and a reduction in the PMU taking into consideration the funding approved for the same purpose under the HPMP. The additional funding in servicing will be used for *inter alia* the provision of training on the safe handling of flammable refrigerants to additional technicians and the distribution of nine additional tool kits to servicing technicians (these adjustments are already reflected in table 4).

Table 6. Agreed cost of stage I of the KIP, including the previously approved Induglob project

Cost (US $)	Cost (US $)		Reduction from baseline	
	As submitted	As agreed	CO_2-eq tonnes	%
Induglob project approved at the 91st meeting	*267,885*	*267,885*	*14,901*	*0.5*
Refrigeration servicing sector activities	622,500	663,586	303,028	9.5
PMU	120,000	66,358	0	0.0
Total funds requested at the 93rd meeting	*742,500*	*729,944*	*303,028*	*9.5*
Grand total for stage I of the KIP	**1,010,385**	**997,829**	**317,929**	**10.0**

89. The funding for stage I of the KIP will be released in three tranches, the first one (2023) accounting for 40 per cent of the total value of stage I, the second (2026) for 50 per cent, and the third (2029) for 10 per cent. It was also agreed that tranche requests would be submitted to the first Executive Committee meeting in the relevant years, to be reflected in the finalized Agreement for stage I.

Impact on the climate

90. The activities proposed in the refrigeration servicing sector, including efforts to promote low-GWP alternatives, refrigerant recovery and reclaiming, and good servicing practices, 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, including those in the refrigeration servicing sector and the conversion of Induglob, indicates that the Government of Ecuador will have achieved annual emission reductions of 317,929 CO_2-eq tonnes of HFCs when the final target of stage I of the KIP is achieved, calculated as the difference between the HFC baseline and the final target set in stage I.

Sustainability of the HFC phase-down and assessment of risks

91. Based on the level of HFC consumption in 2022 and the expectation of continuous growth in an unconstrained scenario, there is a risk of potential non-compliance for Ecuador. The Government will mitigate this risk with the implementation of the quota system for HFCs as of 2024, the training of enforcement and customs officers, and the development of regulations to control HFC-based equipment in those sectors where low-GWP technologies are available, in order to disincentivize demand for HFCs. The Government will establish a ban on the imports and manufacturing of domestic and commercial stand-alone refrigeration units using HFC-134a upon completion of the Induglob conversion project.

92. The risk related to the availability of training centres and the potentially insufficient numbers of instructors and technicians who are suitably equipped and trained in the handling of flammable refrigerants used in domestic and commercial stand-alone appliances and low-GWP alternatives used in the MAC sector will be mitigated with the activities proposed under stage I, specifically the provision of relevant training to trainers and equipment to training centres.

93. To ensure the sustainability of technician training, training centres will update their curricula to include aspects related to good refrigeration practices and the safe handling of low-GWP alternatives to

HFCs. The Customs Service will develop online education modules to ensure, to a certain extent, the sustainability of training for customs personnel.

Co-financing

94. Induglob is providing co-financing in the implementation of the ongoing project to convert its domestic and commercial refrigeration manufacturing process from the use of HFC-134a to R-600a and R-290. No additional co-financing sources have been identified so far, but the Government of Ecuador and UNIDO intend to identify further co-financing opportunities in the implementation of stage I of the KIP.

2023–2025 business plan of the Multilateral Fund

95. UNIDO is requesting US $729,944, plus agency support costs, for the implementation of stage I of the KIP for Ecuador. The total value of US $313,082, including agency support costs, requested for the period 2023–2025, is US $197,522 above the amount in the business plan.

Draft Agreement

96. A draft Agreement between the Government of Ecuador 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.

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

RECOMMENDATION

98. The Executive Committee may wish to consider:

(a) Approving, in principle, stage I of the Kigali HFC implementation plan (KIP) for Ecuador for the period 2023–2029 to reduce HFC consumption by 10 per cent of the country's baseline in 2029, in the amount of US $729,944 plus agency support costs of US $51,096, for UNIDO, as reflected in the schedule contained in annex II of the present document;

(b) Noting:

(i) That the Government of Ecuador 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 subparagragh (b)(ii) above, will be deducted from the starting point referred to in subparagraph (b)(i);

(c) Approving the first tranche of stage I of the KIP for Ecuador, and the corresponding tranche implementation plan, in the amount of US $292,600, plus agency support costs of US $20,482, for UNIDO; and

(d) Requesting the Government of Ecuador, UNIDO and the Secretariat to finalize the draft Agreement between the Government of Ecuador 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.

PILOT PROJECT TO MAINTAIN AND/OR ENHANCE THE ENERGY EFFICIENCY OF REPLACEMENT TECHNOLOGIES AND EQUIPMENT IN THE CONTEXT OF HFC PHASE-DOWN (NON-INVESTMENT ACTIVITIES)

PROJECT DESCRIPTION

Background

99. On behalf of the Government of Ecuador, UNIDO has submitted, in line with decision 91/65, a request for a pilot project to maintain and/or enhance the energy efficiency of replacement technologies and equipment in the context of HFC phase-down (non-investment activities), in the amount of US $275,000, plus agency support costs of US $19,250, as originally submitted.[30]

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

100. Under the enabling activities for HFC phase-down, the NOU has strengthened its partnership with the Ministry of Energy and Non-Renewable Natural Resources to identify the links between HFC phase-down and energy efficiency. The investment project to convert the manufacturing of domestic and commercial refrigerators from HFC-134a to R-600a and R-290 at Induglob did not include an energy-efficiency component, but calculations reported by the enterprise show a 4 per cent improvement in the energy efficiency of R-600a-based domestic refrigerators manufactured at the converted line.

Energy-efficiency pilot project

101. Information on the country's status of ratification to the Kigali Amendment; policy, regulatory and institutional frameworks for the implementation of the Montreal Protocol; HFC consumption and its distribution by sector; established HFC baseline; and relevant activities are presented in the project proposal for the first tranche of stage I of the Kigali HFC implementation plan (KIP), contained in paragraphs 33 to 98 of the present document.

Policy, regulatory and institutional framework

102. The Ministry of Energy and Non-Renewable Natural Resources, in charge of energy-related matters, has developed 11 standards to promote energy efficiency and 23 technical regulations to ensure the commercialization of energy-efficient domestic and industrial equipment, including technical standard No. 2495 on energy-efficiency requirements for air conditioners (2015); technical regulation No. 35 on energy-efficiency reporting, test methods and labeling in domestic refrigeration (2020); and technical standard No. 2511 on the requirements for energy efficiency in refrigeration chambers installed in motor vehicles.

Project objective

103. The objective of the project is to enhance the Government's coordination in promoting alternatives with low global-warming potential (GWP) and energy-efficient systems in the commercial refrigeration sector among key national stakeholders. It includes activities to facilitate the adoption of new, energy-efficient refrigeration and air-conditioning (RAC) systems and strengthening preventive maintenance and good practices for the already installed RAC systems to reduce electricity consumption.

[30] Originally included in the proposal for stage I of the Kigali HFC implementation plan for Ecuador, as per the letter of 7 August 2023 from the Ministry of Production, Foreign Trade, Investments and Fisheries of Ecuador to UNIDO.

Proposed activities

104. The following activities are proposed to be implemented within 36 months:

(a) Hold one workshop to bring together the national authorities on energy efficiency and climate change, the NOU, customs authorities, and equipment manufacturers and importers; organize a study tour to a non-Article 5 country on the adoption of energy-efficiency standards in the RAC sector; define strategies to introduce or improve relevant minimum energy performance standards (MEPS) and labelling; and carry out a feasibility study for an energy-efficiency testing laboratory for RAC equipment (US $30,000);

(b) Revise the curricula of vocational training institutes to include energy efficiency; formulate guides for technicians to check the performance of RAC systems; establish two didactic modules for commercial refrigeration in one training centre; and organize courses for teachers and large end users on energy-efficiency calculation and maintenance practices to improve or maintain energy efficiency (US $155,000);

(c) Develop and disseminate outreach material on energy-efficient equipment and its relation to ozone-layer protection and climate-change mitigation, with emphasis on commercial and industrial RAC systems (US $20,000);

(d) Develop a pilot project for controlling refrigerant emissions in vehicle inspection centres; carry out a field study to identify potential beneficiaries for two demonstration projects to convert from HFCs to low-GWP alternatives and to enhance energy efficiency (US $20,000); and

(e) Design and organize a training course on energy efficiency in commercial and industrial refrigeration; elaborate a handbook and print related materials; and organize two training workshops for RAC technicians: on energy efficiency, leak detection, and use of low-GWP refrigerants is supermarkets and convenience stores; and on good practices and equipment maintenance in the industrial refrigeration sector (US $50,000).

Total cost of the pilot project

105. The total cost of the project to maintain and enhance the energy efficiency of replacement technologies and equipment in the context of HFC phase-down amounts to US $275,000, plus agency support costs, and will be implemented between January 2024 and December 2026.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

106. The Secretariat has reviewed the project proposal in light of activities described under decision 89/6 and decision 91/65.

107. In line with decision 91/65, the Government of Ecuador has confirmed that the NOU will coordinate with relevant energy-efficiency authorities and national standards bodies to facilitate consideration of refrigerant transition when developing energy-efficiency standards in the relevant sectors/applications; that, if Ecuador has mobilized or is to mobilize funding from sources other than the Multilateral Fund for energy-efficiency components when phasing down HFCs, the project will not result in the duplication of activities among those funded by the Multilateral Fund and those funded from other sources; that the information on project progress, results and key learning will be made available, as

appropriate; and that the date of completion of the project will be set as no more than 36 months after the date of approval by the Executive Committee and a detailed project report will be submitted to the Executive Committee within six months of the date of completion of the project.

Technical and cost-related issues

108. The Secretariat and UNIDO discussed the potential duplication of activities listed in this project and the additional activities included in the country's HCFC phase-out management plan (HPMP) to maintain or enhance energy efficiency (decision 89/6) (paragraphs 12 and 23 of the present document). UNIDO explained that the focus of each project was different. The additional activities under the HPMP are focused on developing national capacities to strengthen the energy efficiency of stand-alone RAC appliances where MEPS have been developed and would need to be updated, whereas the present project is focused on the promotion of actions to improve energy efficiency in the commercial and industrial refrigeration sectors, specifically for condensing units and centralized systems.

109. The additional activities under the HPMP include training provided to importers and customs officers on labelling and MEPS applied to imported RAC equipment; tool kits for measuring energy efficiency supplied to vocational centres; and training on maintaining energy efficiency during servicing. This project includes activities aimed at enhancing the coordination of all institutions engaged in improving energy efficiency; strategies to introduce or improve MEPS related to commercial refrigeration; and strengthening training capacity related to energy efficiency in commercial refrigeration.

110. Upon discussion, the present project was adjusted to clearly differentiate its outcomes from the additional activities under the HPMP (decision 89/6), and to ensure that all activities within its scope serve its main objective. In the first activity, the formulation of a draft proposal to improve energy-efficiency labeling and MEPS in condensing units was added (the budget was adjusted to US $45,000); in the second activity, only one commercial refrigeration module was included (the budget was adjusted to US $95,000); in the third activity, the awareness-building activities were redirected to focus on promoting the introduction and improvement of MEPS and related labeling in commercial and industrial RAC systems (budget adjusted to US $15,000); the fourth activity was removed as it did not contribute to the main objective of the project; and in the fifth activity, only training associated with energy efficiency was kept, while training in good practices was removed as it could be provided under the KIP (budget adjusted to US $35,000).

111. A total cost of US $190,000 was agreed to implement the pilot project for maintaining and enhancing the energy efficiency of replacement technologies for Ecuador. The adjusted activities and their agreed costs are presented in table 7.

Table 7. Total cost of the energy efficiency pilot project for Ecuador as agreed

Activities	Cost (US $)
Workshop to integrate the national authorities on energy efficiency and climate change, the NOU, customs authorities, and equipment manufacturers and importers; study tour to a non-Article 5 country on the adoption of energy-efficiency standards in the RAC sector; feasibility study for a testing laboratory on energy efficiency for RAC equipment; and a draft proposal to improve energy-efficiency labeling and MEPS related to condensing units	45,000
Revision of curricula of vocational training institutes to include energy efficiency; formulation of guides for technicians to check the performance of RAC systems in commercial refrigeration; and establishment of a didactic module on commercial refrigeration in one training centre	95,000
Design and dissemination of outreach material to promote the introduction/improvement of MEPS and labelling systems, with emphasis on commercial and industrial RAC systems	15,000
Design and organization of a training course on energy efficiency for large agroindustry end users; elaboration of a handbook and printing of related materials; and a training workshop for RAC technicians on energy efficiency, leak detection, and low-GWP refrigerants in supermarkets and convenience stores	35,000
Total	**190,000**

Agreed cost of the pilot project

112. The cost of the project was agreed at US $190,000, plus agency support costs of US $17,100 for UNIDO.

Sustainability of the pilot project and assessment of risks

113. The activities proposed to integrate the national authorities on energy efficiency and climate change, the NOU, customs authorities, and equipment manufacturers and importers will help ensure the continued commitment of relevant institutions to the implementation of this project and any future initiatives related to energy efficiency in the RAC sector. The formulation of a draft proposal to improve energy-efficiency labelling and MEPS related to condensing units will help create conditions for adopting more energy-efficient equipment in the commercial refrigeration sector, which is the largest consumer of HFCs in the country, particularly R-404A and R-507A. The revision of the curricula of vocational training institutes to include energy efficiency will help ensure that energy-efficiency considerations are included in regular training provided to refrigeration technicians.

RECOMMENDATION

114. The Executive Committee may wish to consider approving the pilot project to maintain and/or enhance the energy efficiency of replacement technologies and equipment in the context of HFC phase-down (non-investment activities) for Ecuador, in the amount of US $190,000, plus agency support costs of US $17,100 for UNIDO, noting:

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

(b) That the project will be operationally completed no later than 31 December 2026, and a detailed project report will be submitted to the Executive Committee within six months of the date of completion of the project.

Annex I

TEXT TO BE INCLUDED IN THE REVISED UPDATED AGREEMENT BETWEEN THE GOVERNMENT OF ECUADOR AND THE EXECUTIVE COMMITTEE OF THE MULTILATERAL FUND FOR THE REDUCTION IN CONSUMPTION OF HYDROCHLOROFLUOROCARBONS IN ACCORDANCE WITH STAGE II OF THE HCFC PHASE-OUT MANAGEMENT PLAN

(Relevant changes are in bold font for ease of reference)

17. At the 87th meeting, UNEP stopped being the Cooperating Agency in respect of the Country's activities under this Agreement. Therefore, the responsibilities of UNEP under this Agreement only extend up to the 87th meeting. This **revised** updated Agreement supersedes the **updated** Agreement reached between the Government of Ecuador and the Executive Committee at the **87th** meeting of the Executive Committee.

APPENDIX 2-A: THE TARGETS, AND FUNDING

Row	Particulars	2020	2021-2022	2023	2024	2025-2026	2027	2028-2029	2030	Total
1.1	Montreal Protocol reduction schedule of Annex C, Group I substances (ODP tonnes)	15.27	15.27	15.27	15.27	7.63	7.63	7.63	0	n/a
1.2	Maximum allowable total consumption of Annex C, Group I substances (ODP tonnes)	15.27	15.27	15.27	15.27	7.63	7.63	7.63	0	n/a
2.1	Lead IA (UNIDO) agreed funding (US $)	292,750	0	**527,250**	**0**	0	255,500	0	214,500	**1,290,000**
2.2	Support costs for Lead IA (US $)	20,493	0	**36,908**	**0**	0	17,885	0	15,015	**90,301**
3.1	Total agreed funding (US $)	292,750	0	**527,250**	**0**	0	255,500	0	214,500	**1,290,000**
3.2	Total support costs (US $)	20,493	0	**36,908**	**0**	0	17,885	0	15,015	**90,301**
3.3	Total agreed costs (US $)	313,243	0	**564,158**	**0**	0	273,385	0	229,515	**1,380,301**
4.1.1	Total phase-out of HCFC-22 agreed to be achieved under this Agreement (ODP tonnes)									13.66
4.1.2	Phase-out of HCFC-22 to be achieved in the previous stage (ODP tonnes)									7.36
4.1.3	Remaining eligible consumption for HCFC-22 (ODP tonnes)									0
4.2.1	Total phase-out of HCFC-141b agreed to be achieved under this Agreement (ODP tonnes)									0
4.2.2	Phase-out of HCFC-141b to be achieved in the previous stage (ODP tonnes)									0.86
4.2.3	Remaining eligible consumption for HCFC-141b (ODP tonnes)									0
4.3.1	Total phase-out of HCFC-142b agreed to be achieved under this Agreement (ODP tonnes)									1.20
4.3.2	Phase-out of HCFC-142b to be achieved in the previous stage (ODP tonnes)									0
4.3.3	Remaining eligible consumption for HCFC-142b (ODP tonnes)									0
4.4.1	Total phase-out of HCFC-123 agreed to be achieved under this Agreement (ODP tonnes)									0.18
4.4.2	Phase-out of HCFC-123 to be achieved in the previous stage (ODP tonnes)									0
4.4.3	Remaining eligible consumption for HCFC-123 (ODP tonnes)									0
4.5.1	Total phase-out of HCFC-124 agreed to be achieved under this Agreement (ODP tonnes)									0.22
4.5.2	Phase-out of HCFC-124 to be achieved in the previous stage (ODP tonnes)									0
4.5.3	Remaining eligible consumption for HCFC-124 (ODP tonnes)									0
4.6.1	Total phase-out of HCFC-141b contained in imported pre-blended polyols agreed to be achieved under this Agreement (ODP tonnes)									0
4.6.2	Phase-out of HCFC-141b contained in imported pre-blended polyols to be achieved in the previous stage (ODP tonnes)									20.67
4.6.3	Remaining eligible consumption for HCFC-141b contained in imported pre-blended polyols (ODP tonnes)									0

Annex II

SCHEDULE OF HFC PHASE-DOWN AND HCFC PHASE-OUT COMMITMENTS AND FUNDING TRANCHES UNDER THE KIGALI HFC IMPLEMENTATION PLAN AND THE HCFC PHASE-OUT MANAGEMENT PLAN FOR ECUADOR

Kigali HFC implementation plan (stage I)

Row	Particulars	2023	2024	2025	2026	2027	2028	2029	Total
1.1	Montreal Protocol reduction schedule of Annex F substances (CO_2-eq tonnes)	n/a	3,179,294	3,179,294	3,179,294	3,179,294	3,179,294	2,861,365	n/a
1.2	Maximum allowable total consumption of Annex F substances (CO_2-eq tonnes)	n/a	3,179,294	3,179,294	3,179,294	3,179,294	3,179,294	2,861,365	n/a
2.1	Lead IA (UNIDO) agreed funding (US $)	292,600	0	0	364,414	0	0	72,930	729,944
2.2	Support costs for Lead IA (US $)	20,482	0	0	25,509	0	0	5,105	51,096
3.1	Total agreed funding (US $)	292,600	0	0	364,414	0	0	72,930	729,944
3.2	Total support costs (US $)	20,482	0	0	25,509	0	0	5,105	51,096
3.3	Total agreed costs (US $)	313,082	0	0	389,923	0	0	78,035	781,040

HCFC phase-out management plan (stage II)

Row	Particulars	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
1.1	Montreal Protocol reduction schedule of Annex C, Group I substances (ODP tonnes)	15.27	15.27	15.27	15.27	15.27	7.63	7.63	7.63	7.63	7.63	0	n/a
1.2	Maximum allowable total consumption of Annex C, Group I substances (ODP tonnes)	15.27	15.27	15.27	15.27	15.27	7.63	7.63	7.63	7.63	7.63	0	n/a
2.1	Lead IA (UNIDO) agreed funding (US $)	292,750	0	0	0	407,250	0	0	255,500	0	0	214,500	1,170,000
2.2	Support costs for Lead IA (US $)	20,493	0	0	0	28,507	0	0	17,885	0	0	15,015	81,900
3.1	Total agreed funding (US $)	292,750	0	0	0	407,250	0	0	255,500	0	0	214,500	1,170,000
3.2	Total support costs (US $)	20,493	0	0	0	28,507	0	0	17,885	0	0	15,015	81,900
3.3	Total agreed costs (US $)	313,243	0	0	0	435,757	0	0	273,385	0	0	229,515	1,251,900

Annex III

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

Stage II of the HPMP			Stage I of the KIP		Combined cost (US $)
Area of work	**Activities**	**Cost (US $)**	**Activities**	**Cost (US $)**	
Strengthening of the legal and institutional framework	Training of 800 customs officers in preventing illegal trade in HCFCs (use of gas identifier, sample testing of containers, physical analysis of HCFCs in pre-blended polyols, etc.); Two updated training courses for importers, brokers and customs officers on harmonized systems and reporting tools; Design of an online customs training course; Design of a model to prevent illegal trade in HCFCs and other controlled substances.[31]	37,000	Automatization and operation of the HFC quota and licensing system, updates to the legislation to include control of HFCs; Training of 40 customs officers in preventing HFC illegal trade; Provision of 4 refrigerant identifiers; Acquisition of standards to help identification of controlled substances; Study on risk management and tariff codifications based on the updated harmonized code system; Raising awareness on HFC phase-down in Government institutions.	85,000	122,000
Adoption and implementation of guidelines for alternative refrigerants	Adoption of a standard for safety measures in the installation and servicing of RAC equipment containing flammable, toxic, or high-pressure refrigerants; Development of guidelines for end users and RAC technicians on methods of risk assessment and mitigation in installation and servicing of RAC equipment with flammable refrigerants.	30,000			30,000
Strengthening of the training programme on good servicing practices for RAC technicians	Four training courses for at least 80 female RAC technicians; Development of an online training programme; Reissuance of an updated technical manual on best maintenance practices in the RAC sector; Training for 15 trainers and 500 technicians on RRR, leak detection, energy efficiency and good servicing practices.	64,500			64,500
Network of technical centres to upgrade the training programme for RAC technicians	Provision of tool kits and basic equipment for the laboratories of 6 technical institutes, including training on alternative refrigerants, their environmental impact and energy efficiency; Formal agreements for the inclusion of good practices in the curricula of technical institutes.	195,000			195,000

[31] A statistical model that could identify potential illegal import movements based on an analysis of estimated values of different variables and their behaviour. If the characteristics of an import movement do not fit with the designed matrix of variables, the system requests an inspection.

Stage II of the HPMP			Stage I of the KIP		Combined cost (US $)
Area of work	**Activities**	**Cost (US $)**	**Activities**	**Cost (US $)**	
Training on the safe handling of flammable refrigerants	Establishment of a training centre for the safe handling of HCs; Standard training programme on the safe handling of HCs and risk assessment guidelines for RAC servicing with HCs, addressed to 15 instructors and around 900 technicians; Delivery of 80 basic tool kits to technicians	287,000	Establishing a collaboration agreement and provision of RAC and MAC servicing tools and equipment to 3 additional training centres; Preparation of manual and teaching materials and training of an additional 30 trainers and 600 additional RAC technicians on the safe handling of flammable refrigerants; Delivery of 35 toolkits for RAC and MAC servicing technicians; Study tour to an international training centre for 4 instructors and NOU staff	443,586	730,586
Strengthening of the refrigerant RRR network	Equipment and supplies provided for 2 reclamation centres; Ten workshops for 200 technicians on good RRR practices; A study tour to a country in the region with established RRR centres.	279,820	Establishment of one additional upgraded reclamation centre in a high-refrigerant demand location; Establishment and operation of one mobile reclaiming machine to provide services to large end users.	120,000	399,820
Strengthening of the certification system for RAC technicians	Formulation and validation of a labour competency standard for handling flammable refrigerants; Design of a registration and licensing (carnet) system for the identification of technicians; Certification of at least 1,000 RAC technicians.	48,000			48,000
Awareness activities	Awareness-building campaigns for end users, technicians, and the general public.	28,000	Design and creation of communication products to promote good servicing practices and training on the handling of flammable refrigerants, identification of counterfeit refrigerants, refrigerant recycling, energy efficiency, and other relevant topics.	15,000	43,000
Pilot conversion projects at large end users	Four pilot conversions/replacements of HCFC-based RAC systems to systems operating with HC or CO_2 at large end users in the dairy processing, beef storage, fruit and vegetable storage, flowers, and fisheries sectors; Four training workshops for end users on the technical and environmental benefits of using HC or CO_2 refrigerants.	105,000			105,000
Project implementation and monitoring	The NOU and UNIDO will monitor activities, report on progress, and work with stakeholders to phase out HCFCs.	95,680	The NOU, with the assistance of national consultants and experts, will coordinate the implementation of the KIP.	66,358	162,038
Total for the HPMP		**1,170,000**	**Total for the KIP**	**729,944**	**1,899,944**