UNITED
NATIONS

EP

United Nations
Environment
Programme

Distr.
GENERAL

UNEP/OzL.Pro/ExCom/98/16
4 June 2026

ORIGINAL: ENGLISH

EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Ninety-eighth Meeting
Montreal, 22–26 June 2026
Items 8(c) and 8(d) of the provisional agenda[1]

UNIDO's WORK PROGRAMME FOR 2026

[1] UNEP/OzL.Pro/ExCom/98/1

COMMENTS AND RECOMMENDATION OF THE FUND SECRETARIAT

1. UNIDO is requesting approval from the Executive Committee of US $1,559,118, plus agency support costs of US $113,038 for its 2026 work programme listed in table 1. The submission is attached to the present document.

Table 1: UNIDO's work programme for 2026

Country	Activity/Project	Amount requested (US $)	Amount recommended (US $)
SECTION A: ACTIVITIES RECOMMENDED FOR BLANKET APPROVAL			
A1: Renewal of institutional strengthening projects			
Ecuador	Renewal of institutional strengthening project (phase IX)	468,452	468,452
Montenegro	Renewal of institutional strengthening project (phase III)	180,000	180,000
North Macedonia	Renewal of institutional strengthening project (phase IX)	350,666	350,666
	Subtotal for A1	999,118	999,118
	Agency support costs	69,938	69,938
	Total for A1	1,069,056	1,069,056
A2: Project preparation for Kigali HFC implementation plans (KIPs)			
Saint Kitts and Nevis [a]	Preparation of a KIP (stage I)	35,000	35,000
	Subtotal for A2	35,000	35,000
	Agency support costs	2,450	2,450
	Total for A2	37,450	37,450
A3: Technical assistance to prepare a verification report on HFC and/or HCFC consumption			
Armenia	Verification report for stage I of the KIP	30,000	30,000
Bosnia and Herzegovina	Verification report for stage I of the KIP	30,000	30,000
Guatemala	Verification report for stage II of the HPMP	30,000	30,000
Honduras	Verification report for stage II of the HPMP	30,000	30,000
Montenegro	Verification report for stage II of the HPMP and stage I of the KIP	45,000	45,000
Niger	Verification report for stage I of the KIP	30,000	30,000
	Subtotal for A3	195,000	195,000
	Agency support costs	17,550	17,550
	Total for A3	212,550	212,550
A4: Preparation of a pilot project to maintain and/or enhance the energy efficiency of replacement technologies and equipment in the context of HFC phase-down under decision 91/65[2]			
Armenia	A4.1: Preparation of a project to enhance energy efficiency in the commercial refrigeration sector	30,000	30,000
Bolivia (Plurinational State of)	A4.2: Preparation of a project to enhance energy efficiency in the commercial refrigeration sector	30,000	30,000
Brazil	A4.3: Preparation of a project to enhance energy efficiency in the industrial refrigeration sector	40,000	40,000
Mexico	A4.4: Preparation of a project to enhance energy efficiency in data centres	30,000	30,000
Viet Nam	A4.5: Preparation of a project to enhance energy efficiency in data centres	30,000	30,000
	Subtotal for A4	160,000	160,000
	Agency support costs	11,200	11,200
	Total for A4	171,200	171,200

[2] Herein referred to as preparation for a pilot project to maintain and/or enhance energy efficiency

Country	Activity/Project	Amount requested (US $)	Amount recommended (US $)
A5: Preparation of a regional pilot project to maintain and/or enhance energy efficiency under decision 91/65			
Regional (Eswatini, Rwanda, Somalia, Uganda, Zambia, Zimbabwe)	Preparation of a project to enhance energy efficiency in the commercial refrigeration sector in the context of HFC phase-down	60,000	60,000
	Subtotal for A5	60,000	60,000
	Agency support costs	4,200	4,200
	Total for A5	64,200	64,200
A6: Project preparation for enhancing energy efficiency in the context of HFC phase-down in the refrigeration and air-conditioning (RAC) manufacturing sector (decision 94/60)			
Ecuador	A6.1: Preparation of a project for enhancing energy efficiency in RAC manufacturing in the context of HFC phase-down	30,000	30,000
Mexico	A6.2: Preparation of a project for enhancing energy efficiency in RAC manufacturing in the context of HFC phase-down	45,000	45,000
	Subtotal for A6	75,000	75,000
	Agency support costs	5,250	5,250
	Total for A6	80,250	80,250
SECTION B: ACTIVITIES RECOMMENDED FOR INDIVIDUAL CONSIDERATION			
B1: Project preparation for enhancing energy efficiency in the context of HFC phase-down in the RAC manufacturing sector (decision 94/60)			
Bangladesh	Preparation of a project for enhancing energy efficiency in RAC manufacturing in the context of HFC phase-down	35,000	*
	Subtotal for B1	35,000	*
	Agency support costs B1	2,450	*
	Total for B1	37,450	*
	Total for A1, A2, A3, A4, A5, A6, B1	1,559,118	1,524,118
	Agency support costs for A1, A2, A3, A4, A5, A6, B1	113,038	110,588
	Grand total	1,672,156	1,634,706

* Individual consideration

[a] UNEP as lead implementing agency

SECTION A: ACTIVITIES RECOMMENDED FOR BLANKET APPROVAL

A1: Renewal of institutional strengthening projects

Project description

2. UNIDO submitted requests for the renewal of institutional strengthening (IS) projects for the countries listed in section A1 of table 1. The description for these projects is presented in annex I to the present document.

Secretariat's comments

3. The Secretariat reviewed the requests for the renewal of the three institutional strengthening projects submitted by UNIDO on behalf of the Governments concerned against the guidelines[3] and relevant decisions

[3] Decision 91/63: (b) to approve the revised format for terminal reports and requests for the extension of IS funding and the corresponding performance indicators; and (c) to request Article 5 countries, through the bilateral and

regarding eligibility and funding levels. The requests were cross-checked against the original work plans for the previous phase, country programme (CP) and Article 7 data, the latest report on implementation of their HCFC phase-out management plans (HPMPs), the agency's progress report, and any relevant decisions of the Meetings of the Parties. It was noted that all three countries have submitted their 2025 CP report, two submitted 2025 Article 7 data and North Macedonia has submitted 2024 Article 7 data. All three countries are in compliance with the control targets under the Montreal Protocol and have reported annual HCFC and HFC consumption that do not exceed the annual maximum allowable consumption indicated in their HPMP and KIP Agreements with the Executive Committee. Furthermore, all the requests submitted included an assessment of performance indicators, project risk and sustainability, and achievement of the institutional strengthening objectives, in accordance with decision 91/63(b).

Secretariat's recommendation

4. The Secretariat recommends blanket approval of the institutional strengthening renewal requests for Ecuador, Montenegro, and North Macedonia at the levels of funding indicated in section A1 of table 1 of the present document. The Executive Committee may wish to express to the aforementioned Governments the comments presented in annex II to this document.

A2: Project preparation for a Kigali HFC implementation plan

Project description

5. UNIDO submitted a request for the preparation of stage I of the KIP for one country as the cooperating agency with UNEP as the lead implementing agency, as shown in section A2 of table 1.

6. UNEP as the lead implementing agency for Saint Kitts and Nevis has requested US $65,000, plus agency support costs of US $8,450, and provided a description of the activities required for the preparation of the KIP and the corresponding costs of each activity in its 2026 work programme;[4] the Secretariat's comments are also included therein.

Secretariat's recommendation

7. The Secretariat recommends blanket approval of project preparation for stage I of the Kigali HFC implementation plan for Saint Kitts and Nevis at the level of funding shown in section A2 of table 1.

A3: Technical assistance to prepare verification reports on HFC and/or HCFC consumption

Project description

8. In line with decision 61/46(c)[5] the Secretariat drew a sample of low-volume consuming (LVC) Article 5 countries for the purpose of verifying compliance with their HCFC phase-out management plan (HPMP) Agreements. UNIDO as lead implementing agency is requesting funding for the verification of stage II of the HPMPs for Guatemala and Honduras, as shown in section A3 of table 1.

9. In line with decision 96/22(a)[6] the Secretariat prepared the list of countries for verification of

implementing agencies, to use the revised format referred to in subparagraph (b) above for all requests for IS renewal as of the first meeting of the Executive Committee in 2023.

[4] Document UNEP/OzL.Pro/ExCom/98/15

[5] The Secretariat was requested to provide, at the first meeting of each year, a list representing 20 per cent of countries with an HCFC consumption baseline of up to 360 metric tonnes, and with an approved HPMP, to approve funding for them for the purposes of verification of that country's compliance with the HPMP Agreement for that year.

[6] The Secretariat was requested to provide, at the first meeting of each year, the list of countries with average HFC consumption in servicing, in the baseline years, of 360 metric tonnes (mt) and below that had scheduled a tranche of

compliance with their KIP Agreements. UNIDO, as the lead/designated implementing agency, is requesting funding for the verification of stage I of the KIPs for Armenia, Bosnia and Herzegovina and Niger.

10. In line with decision 96/22(b),[7] UNIDO as designated implementing agency is also requesting funding for the combined verification of stage II of the HPMP and stage I of the KIP for Montenegro.

11. In line with the relevant decisions, UNIDO submitted requests for technical assistance to prepare a verification report on HFC and/or HCFC consumption for six countries as the lead/designated implementing agency, as shown in section A3 of table 1.

Secretariat's comments

12. The Secretariat noted that the funding requests were consistent with the funds approved for similar verifications in previous meetings and it further noted that the verification reports must be submitted at least 10 weeks prior to the applicable Executive Committee meeting where the next funding tranche for the HPMP or KIP is being sought.

Secretariat's recommendation

13. The Secretariat recommends blanket approval for technical assistance to prepare verification reports as indicated below at the level of funding shown in section A3 of table 1, on the understanding that the verification reports must be submitted at least 10 weeks prior to the applicable Executive Committee meeting where the next funding tranches for the HPMPs or KIPs are being sought:

(a) HCFC consumption for stage II of the HCFC phase-out management plans (HPMP) for Guatemala and Honduras;

(b) HFC consumption for stage I of the Kigali HFC implementation plans (KIPs) for Armenia, Bosnia and Herzegovina, and Niger; and

(c) HCFC consumption for stage II of the HPMP and HFC consumption for stage I of the KIP for Montenegro.

A4: Preparation of pilot projects to maintain and/or enhance energy efficiency (decision 91/65)

Project description

14. UNIDO submitted requests for the preparation of pilot projects to enhance energy efficiency in the context of HFC phase-down in five[8] Article 5 countries, as the designated implementing agency, as shown in section A4 of table 1. The submissions were made in line with decision 91/65. UNIDO confirmed that all projects will be submitted by the 100th meeting.

their KIPs during the following year and that had not previously received funding to undertake such verifications, and to include also, those countries with an average HFC consumption in the servicing sector, in the baseline years, above 360 mt that had opted to be funded as low-LVC countries, in line with decision 92/36(c).

[7] To maintain the level of funds recommended for the verification of HFC consumption for countries with consumption of up to 360 mt in servicing in the baseline years at level of up to US $30,000, or US $45,000 when combined with verification of HCFC consumption

[8] The submission included project preparation funding requests for eight countries. However, upon discussion, two requests related to energy efficiency in data centres, and one request for enhancing energy efficiency in mortuaries, were removed and the work programme was revised to include requests for five countries.

A4.1 Preparation of a project to enhance energy efficiency in the commercial refrigeration sector in Armenia

Project description

15. The project to be prepared in the commercial refrigeration sector in Armenia will demonstrate the use of R-744 in centralized refrigeration systems in supermarkets, and R-290-based heat pumps in public building. Preparation activities will include: assessing HFC use in the supermarket sector through data collection and analysis; providing technical support for the selection of low-global-warming-potential (GWP) and energy-efficient alternative technologies for selected pilot supermarkets; and developing the pilot project proposal. In addition, a project will be prepared to demonstrate R-290-based heat pump systems in public buildings. This will include evaluating technical feasibility, energy performance, and market readiness, and identifying suitable pilot sites and defining the project implementation method.

Secretariat's comments

16. On the need for preparatory funding and how the analysis of the retail sector will differ from the sectoral survey conducted under the KIP, UNIDO explained that the KIP primarily focused on servicing capacity and refrigerant management, while the energy efficiency preparatory project will conduct a more detailed assessment of the energy consumption of existing equipment, including the impact of refrigerant leakage on system efficiency and overall energy use. It was also clarified that the requested preparatory funding is intended to support a structured, evidence-based project design. This will ensure the appropriate sizing of system capacities and the selection of technological configurations and enabling effective implementation through the identification and validation of eligible beneficiaries.

17. UNIDO initially submitted request for US $45,000 for this preparation. Upon discussion, it was revised to US $30,000, plus agency support costs.

A4.2 Preparation of a project to enhance energy efficiency in the commercial refrigeration sector in the Plurinational state of Bolivia

Project description

18. The project to be prepared in the commercial refrigeration sector will demonstrate low-GWP refrigeration systems based on R-290 and R-744 in a major supermarket chain. It will also demonstrate the energy efficiency gains achieved through structured leak reduction and preventive maintenance under the Zero Leaks programme model in existing R-507A systems. Preparation activities will include the design of the demonstration, technical specifications of the systems, and the development of a Zero Leaks approach for existing systems. The project will involve conducting a regulatory analysis for minimum energy performance standards (MEPS), and the preparation of the pilot project proposal.

19. The country has an approved project in line with 91/65 to enhance institutional coordination and energy efficiency training capacity.[9]

Secretariat's comments

20. Upon request, UNIDO elaborated that the demonstration project is expected to focus on commercial refrigeration systems used in supermarkets, particularly condensing units and distributed refrigeration systems for medium- and low-temperature applications, based on R-290 and/or R-744. The project is expected to include approximately two to three pilot installations within one or more national supermarket chains and results will demonstrate both the energy-saving advantage from using new low-GWP systems and from improved maintenance of existing systems under the Zero Leak component. The preparation phase will define the final number of installations, as well as the technical scope and associated investment costs

[9] Decision 93/79

based on detailed technical assessments, beneficiary selection, baseline analyses, and co-financing discussions with participating enterprises.

21. The Secretariat noted that a project under decision 91/65 was approved for Plurinational State of Bolivia at the 93rd meeting which included a component in supermarket in identifying leakage and training of technicians on low-GWP technologies and preventive maintenance and leak detection. UNIDO explained that the demonstration project would be complementary to the activities currently under implementation including additional activities to maintain energy efficiency in the refrigeration servicing sector as part of the HPMP, under which MEPS are being strengthened for RAC equipment and the project to enhance energy efficiency of replacement technologies and equipment in the context of HFC phase-down under decision 91/65, under which a training module for maintaining and enhancing energy efficiency of commercial refrigeration equipment using R-744 technology is being developed, and training on leak prevention is planned. While existing approved activities on energy efficiency focus primarily on general capacity building and servicing practices, this pilot will operationalize Zero Leaks at the system level within a real commercial installation, integrating leak prevention, monitoring, and performance-based maintenance into the design and operation of the system.

A4.3 Preparation of a project to enhance energy efficiency in the industrial refrigeration sector in Brazil

Project description

22. The project to be prepared will demonstrate energy-efficient and low-GWP solutions among selected ends users in the industrial refrigeration sector, with primary focus on agricultural, pharmaceutical, and food processing enterprises. Supportive policies such as MEPS exploration and energy efficiency labelling, and the identification of financing options would be included in a complementary component of the full project. Preparation activities will include gathering and validating data on market conditions and energy consumption patterns to inform policy and interventions; identifying strategic end users across key industrial sectors to implement pilot projects; developing a plan for strengthening national technical and institutional capacities to support the development and enforcement of MEPS; and preparing a comprehensive project proposal.

Secretariat's comments

23. In justifying the need for preparatory funding, UNIDO emphasized that Brazil has one of the largest industrial refrigeration sectors in the region, supporting critical industries such as agribusiness, food processing, pharmaceutical and others. The sector is diverse, ranging from modular units to large plants, with high leakage rates contributing significantly to HFC use. While ammonia dominates large systems, many medium-sized plants still use R-404A, HFC-134a, and R-410A. Given the reliance on the high-GWP HFCs, the sector has been prioritized under stage I of the KIP, which has been submitted to the present meeting.

24. Noting that industrial refrigeration equipment is generally custom-made and not usually subject to MEPS, upon request, UNIDO informed that Brazil already has a legal framework for mandatory MEPS on industrial electric motors, which drive open-type refrigeration compressors. The project will explore how international frameworks on MEPS can be adapted to industrial refrigeration equipment in the Brazilian context, e.g., by looking at component-level or hybrid approaches. The preparation project will also evaluate pathways to integrate low-GWP refrigerant criteria into the PROCEL Seal[10] requirements.

[10] The PROCEL Seal in Brazil is a certification that indicates the energy efficiency of air conditioners and other appliances.

25. UNIDO initially submitted request for US $95,000 for this preparation. Upon discussion, it was revised to US $40,000, plus agency support costs.

A4.4 Preparation of a project to enhance energy efficiency in data centres in Mexico

Project description

26. The project to be prepared in the data centres will demonstrate energy efficiency enhancements while phasing down HFCs to achieve high energy efficiency levels in data centres. The project preparation activities include a policy study with national authorities on regulatory controls for data centre energy use; sector surveys to identify pilot sites; and pre-feasibility studies with standardized monitoring, reporting and verification to measure the impact of the pilot; stakeholder engagement through workshops and consultations, and development of the pilot project proposal.

27. A previous project was approved[11] in line with decision 91/65 at the 93rd meeting focusing on MEPS and safety standards, demonstration of low-GWP and energy-efficient equipment in AC for commercial building, and training and support in the supermarket and convenience store sector.

Secretariat's comments

28. UNIDO explained that Mexico has a growing data centre market and has emerged as the second largest market in the region with 140 identified data centres, most of which use traditional air-conditioning systems relying on HFC-134a and R-410A. Some alternative technologies have emerged in data centres in Mexico including systems based on HFOs and R-454B.

29. The Secretariat had detailed discussions with UNIDO, sharing the concern that the sector had not been highlighted as a priority under the KIP, and that its linkage to the servicing sector and HFC phase down is not fully known. The Secretariat noted that two preparatory projects approved at the 96th meeting for UNIDO for improving energy efficiency in data centres for Egypt and North Macedonia have not been submitted yet, which would support in building experience with this type of project.

30. On linkages with the servicing sector, UNIDO stated that the linkage relates to the potential future growth of installation, maintenance, refrigerant handling, and servicing activities associated with large cooling systems used in data centres, which are experiencing significant growth.

31. Clarification was sought on whether this sector was identified under the KIP as a high HFC-consuming sector and, if not, the rationale for the project and why it is undertaken now rather than under stage II of the KIP to ensure a holistic approach. UNIDO responded that while the data centre sector was not specifically identified as a separate sub-sector under Mexico's KIP Stage I, the preparation project is expected to support Mexico in conducting an initial assessment of the data centre cooling sector, including cooling technologies, potential future HFC demand, and opportunities for low-GWP and energy-efficient alternatives. The linkage with the KIP is exploratory in nature, as the activity would help Mexico better understand whether this rapidly expanding sector could become relevant for future KIP implementation and long-term HFC demand management. The rationale for this preparatory activity is further linked to the rapid pace of the sector's expansion, with additional capacity announced over the next five years and many facilities still in planning or early development stages, creating an opportunity to avoid long-term lock-in of high-GWP cooling technologies. The Government considers that postponing this assessment until KIP stage II could reduce the preventive value of the intervention, as major ongoing investments may already adopt conventional technologies with long operational lifetimes.

[11] Decision 93/83

32. On policies and regulations, UNIDO stated that given that this is an emerging sector the preparatory project includes an assessment of the applicable regulations, and the subsequent development of the corresponding regulations will be done during the project.

33. UNIDO explained that the demonstration project would not overlap and would be complementary to the activities currently under implementation including the energy-efficiency strategy for the Kigali HFC implementation plan for Mexico approved in line with decision 91/65.

34. UNIDO initially submitted request for US $65,000 for this preparation. Upon discussion, it was revised to US $30,000, plus agency support costs.

A4.5 Preparation of a project to enhance energy efficiency in data centres in Viet Nam

Project description

35. The project to be prepared in data centres will demonstrate two models to enhance energy efficiency while phasing down HFCs in data centres. One would be in small- and medium-scale data centres, including public facilities, telecommunications infrastructure, and existing data centres and the other would partner with a large-scale private data centre. The project would explore different low-GWP, energy-efficient solutions depending on the scale of the data centre. Project preparation activities include an assessment of energy use and HFC consumption in selected data centres; data collection and analysis; technical support and evaluation of cooling technologies; and development of the pilot project proposal.

Secretariat's comments

36. UNIDO explained that data centres have been expanding rapidly in Viet Nam. They rely heavily on energy-intensive air-conditioning technologies that use high-GWP HFCs. Due to Viet Nam's hot, humid tropical climate, cooling systems are among the most energy-intensive components of data centre operations. Viet Nam has established a regulatory framework, including provisions on energy efficiency in infrastructure and refrigerant management. However, effective implementation remains ongoing, particularly in emerging sectors such as data centres.

37. The Secretariat shared concerns similar to those of Mexico regarding the data centre preparation proposal, including, inter alia, the prioritization of the sector, its linkages to the HFC phase-down, and its connections with the servicing sector. UNIDO elaborated that the preparatory project for Viet Nam will develop a demonstration project for energy-efficient, low-GWP cooling technologies in selected data centres, including an assessment of suitable cooling configurations. The project aims to identify feasible alternatives, reduce energy use and emissions, demonstrate integration of advanced technologies, and generate knowledge for replication. It is linked to the KIP through its focus on reducing dependence on high-GWP HFC systems and supporting alternative technologies, servicing activities, and refrigerant management. It is also relevant to the servicing sector because data centres require specialized installation, maintenance, leak management, refrigerant handling, and energy optimization practices. The demonstration project is expected to contribute practical experience and technical information relevant to future servicing-sector capacity-building activities under stage I of the KIP.

38. On policies and regulations, UNIDO mentioned that the project preparation is expected to generate technical recommendations and implementation experience that could inform future policy discussions related to energy-efficient cooling technologies, refrigerant transition pathways, and sustainable cooling practices in data centres.

39. As a cross-cutting issue for the two project preparation proposals for data centers in Mexico and Viet Nam, it was discussed with UNIDO that the project proposals for data centre projects, including the previously approved preparations for similar projects in Egypt and North Macedonia, should, where feasible,

incorporate diversity in the types of data centre targeted and the alternative technologies selected across the four projects. This approach will enrich the understanding of the issues and limitations associated with different technologies in this emerging sector. It was also strongly recommended that the project design include the development of national policies and/or standards for energy-efficient and low-GWP technologies in the data centre sector across the four countries.

Secretariat's recommendation

40. The Secretariat recommends blanket approval for the preparation of pilot projects to improve energy efficiency in the commercial refrigeration sector in Armenia and Plurinational State of Bolivia, in the industrial refrigeration sector in Brazil and in data centres in Mexico and Viet Nam in the context of HFC phase-down, at the levels of funding shown in section A4 of table 1.

A5: Preparation of a regional project to maintain and/or enhance energy efficiency under decision 91/65

Project description

41. The project will be implemented in Eswatini, Rwanda, Somalia, Uganda, Zambia, and Zimbabwe which are all part of the Common Market for Eastern and Southern Africa (COMESA) region, and would demonstrate energy-efficient, R-290 monoblocs in cold chains. It also plans to incorporate a growing Cooling-as-a-Service (CaaS) model that addresses the high upfront equipment costs for cooling in certain sectors. Preparation activities include surveys and data collection; technical assessments; stakeholder consultations; selection of demonstration sites; the regional harmonization of MEPS and safety standards; development of an awareness strategy; CaaS model viability assessment; and preparation of a regional pilot project proposal.

42. Uganda has an approved project in line with 91/65 to demonstrate R-290 commercial refrigeration in a supermarket chain, while Rwanda has an approved preparation project, in line with 91/65, to assess its installation and assembly sector and support energy efficiency, training, supply chain improvements, and local innovation, which has not yet been submitted.[12]

Secretariat's comments

43. On the regional approach, UNIDO explained that this would enable pilot projects to offer a multitude of benefits, especially in the context of advancing sustainable technologies. By fostering collaboration across borders, regional initiatives facilitate the sharing of resources, expertise, and best practices, and contribute to more efficient and impactful project implementation. This approach promotes harmonized standards and regulatory frameworks, reducing barriers to market entry for low-GWP and energy-efficient equipment and supports consistent quality and safety outcomes. In addition, regional pilot projects can leverage economies of scale, making investments more cost-effective and accelerating technology adoption.

44. On the CaaS model, UNIDO mentioned that the project outcome is expected to support long-term financing models through this emerging approach, which enables users to pay for cooling services instead of purchasing equipment. Existing initiatives by international companies have implemented such models in the COMESA region, while no local enterprises have been identified, indicating the potential for the project to support their development. By deploying R-290 monoblocs through a CaaS business model (where applicable) across COMESA cold chains, the project will demonstrate innovative financing and low-GWP, energy-efficient technology that meets urgent market needs.

[12] Decision 95/82 and decision 96/26 respectively.

45. On regulations, it was noted that the project preparation stage will identify the standards to be harmonized and methodologies for their adoption in the different countries. The actual harmonization and adoption will take place during project implementation.

46. UNIDO submitted a funding request for this preparation at US $75,000. Upon discussion, the funding request was revised to US $60,000.

Secretariat's recommendation

47. The Secretariat recommends blanket approval for the preparation of a regional project to improve energy efficiency in cold chains in Eswatini, Rwanda, Somalia, Uganda, Zambia, and Zimbabwe in the context of HFC phase-down, at the level of funding shown in section A5 of table 1.

A6: Project preparation for enhancing energy efficiency in the context of HFC phase-down in the RAC manufacturing sector (decision 94/60)

Project description

48. UNIDO submitted preparatory funding request for two projects to enhance energy efficiency in the manufacturing of refrigerators in the context of HFC phase-down in Ecuador and Mexico, as shown in section A6 of table 1. The submissions were made in line with decision 94/60.

A6.1 Preparation of a project for enhancing energy efficiency in the RAC manufacturing in the context of HFC phase-down for Ecuador

Project description

49. The project preparation request would focus on energy efficiency improvements to be implemented in one manufacturing enterprise which is using R-600a for domestic refrigerators and R-290 for commercial refrigeration manufacturing. The enterprise has implemented technology conversion processes under the Montreal Protocol and has received technical and financial assistance from the Multilateral Fund.[13] The enterprise produces a wide range of equipment in the domestic and commercial refrigeration sectors and has a sizable share of the domestic market.

50. The project preparation activities include collecting and analysing the enterprise's technical, production, and market data alongside existing regulations; assessing feasible energy-efficiency improvements through technical evaluation and stakeholder consultations; and preparing a project document outlining the baseline, upgrade options, costs, feasibility, and relevant regulatory considerations.

Secretariat's comments

51. The Secretariat has reviewed the request for preparatory funding to enhance energy efficiency in the manufacturing of refrigeration equipment and notes that the project is in line with the criteria set out in decision 94/60 and that this enterprise has converted to low-GWP technologies earlier.

52. On MEPS, UNIDO informed that Ecuador currently has an established MEPS and labelling framework for domestic refrigeration equipment, but no equivalent MEPS framework is yet in force for stand-alone commercial refrigeration equipment. However, due to the conversion of this enterprise to low-GWP technologies, the sector already has an important technological basis that could facilitate the future development of MEPS for commercial refrigeration equipment. During the preparation phase, consultations

[13] The enterprise received assistance, approved at the 91st meeting, for the conversion of the manufacturing of domestic and commercial refrigerators from HFC-134a to R-600a and R-290 at a total cost of US $265,687. Additionally, the enterprise had previous been assisted to transition away from CFCs.

will be carried out with the relevant national authorities responsible for energy efficiency and technical regulation to assess possible pathways for the future establishment of such MEPS.

53. The Secretariat also noted that the activities included in the preparatory funding request, as described above, are consistent with the activities required for formulating the energy efficiency component pursuant to decision 95/87.

54. UNIDO had initially requested US $40,000 for the project preparation for Ecuador. However, upon discussion with UNIDO, in line with paragraph 72 (b) of the document UNEP/OzL.Pro/ExCom/95/87, UNIDO revised the request to US $30,000.

A6.2 Preparation of a project for enhancing energy efficiency in RAC manufacturing in the context of HFC phase-down for Mexico

Project description

55. The project preparation request would focus on energy efficiency improvements to be implemented in seven manufacturing enterprises in the domestic and commercial refrigeration sectors. Out of these seven, three enterprises implemented technology conversion processes to non-HFC technology with technical and financial assistance from the Multilateral Fund[14], and others with their own funds.

56. The project preparation activities include conducting surveys and data collection to gather detailed information on production capacities, production lines, energy efficiency levels, and refrigerant use, feasibility analysis and investment planning; carrying out technical feasibility studies to assess existing systems and identify opportunities for integrating energy-efficient technologies and low-GWP refrigerants; assisting enterprises in preparing robust business plans to enhance energy efficiency; and drafting a comprehensive investment project proposal.

Secretariat's comments

57. The Secretariat has reviewed the request for preparatory funding to enhance energy efficiency in the manufacturing of refrigeration equipment and notes that the project is in line with the criteria set out in decision 94/60 and that the enterprises have converted to low-GWP technologies earlier.

58. On MEPS, UNIDO mentioned that MEPS exists for refrigeration and air-conditioning equipment.

59. The Secretariat also noted that the activities included in the preparatory funding request, as described above, are consistent with the activities required for formulating the energy efficiency component pursuant to decision 95/87.

60. UNIDO had initially requested US $220,000 for the project preparation for enhancing energy efficiency in RAC manufacturing for Mexico. However, upon discussion with UNIDO, in line with paragraph 72 (b) of the document UNEP/OzL.Pro/ExCom/95/87, UNIDO revised the request to US $45,000 plus agency support costs.

Secretariat's recommendations

61. The Secretariat recommends blanket approval for the requests for project preparation to enhance energy efficiency in the manufacturing of refrigeration and air-conditioning equipment in Ecuador and Mexico at the levels of funding shown in section A6 of table 1.

[14] Decisions 81/64, 81/65 and 92/35.

SECTION B: ACTIVITIES RECOMMENDED FOR INDIVIDUAL CONSIDERATION

B1: Project preparation for enhancing energy efficiency in the context of HFC phase-down in the refrigeration manufacturing sector (decision 94/60)

Project description

62. The project preparation will focus on energy efficiency improvements to be implemented in 20 manufacturing enterprises in the domestic refrigeration and residential air-conditioning (AC) manufacturing sector. Of these, 11 enterprises have already transitioned to low-GWP technologies, including four residential AC manufacturers and seven domestic refrigeration manufacturers.

63. The preparatory activities include collecting and analysing data from manufacturing enterprises, such as production, energy and refrigerant use, and servicing practices; stakeholder consultations; technical feasibility studies and cost assessments; identification of energy-efficient solutions; and development of a project proposal.

Secretariat's comments

64. The Secretariat reviewed the request for preparatory funding to enhance energy efficiency in the manufacturing of RAC equipment and notes that the project is in line with the criteria set out in decision 94/60.

65. On the conversion of enterprises, the Secretariat noted that out of the 20 proposed enterprises, 11 had converted to non-HFC technology. However, the status and timeline of the conversions in the remaining enterprises was not available. UNIDO mentioned that the remaining nine manufacturing enterprises are likely to convert to low-GWP technologies under the framework of Bangladesh's Kigali HFC Phase-down Management Plan.

66. The Secretariat inquired if these enterprises, which are still using HFCs, will be included in stage I of the KIP project or not. UNIDO replied that the KIP preparation is still ongoing, so it is not yet known whether enterprise conversion projects would be included in stage I of the KIP. However, as stated by UNIDO, stage I of the KIP is likely to be submitted to the 99th meeting and this energy efficiency project is planned to be submitted to the 101st meeting, and hence, the details of enterprise conversion will be available to UNIDO, and the project will be prepared accordingly.

67. The Secretariat noted that the preparation project for stage I of the KIP was approved at the 90th meeting with UNDP as the lead implementing agency and UNEP as the cooperating implementing agency and that stage I of the KIP for the country has not yet been submitted. It was also noted that the KIP preparation request did not include funding for a KIP investment project. Although the project was consistent with decision 94/60, there was uncertainty concerning the timeline for conversion of the manufacturing enterprises. Also, in the absence of an approved KIP, the Secretariat could not verify the status of sectoral conversion or policies relating to the adoption of specific refrigerant technologies.

68. The Secretariat requested further information to better understand the synergies with the future KIP, particularly whether energy-related baseline data for different product models were collected during the KIP preparation activities and, if not, the reasons for this. UNIDO responded that the energy-consumption baseline data were not collected during the KIP preparation phase because the two projects had different focuses, energy performance and HFC consumption. In addition, collecting energy consumption baseline data would have required an assessment of MEPS and model-level efficiency measurements, which were beyond the scope of the KIP preparation activities.

69. The Secretariat recalled paragraph 75 of the document UNEP/OzL.Pro/ExCom/95/87, which states that the implementation of HFC phase-down activities should be integrated with activities to enhance energy-efficiency, which would result in cost-effective project implementation and would maximize opportunities, and that energy efficiency projects need to be designed in such a way as to ensure the adoption of an integrated approach to implementing both the energy efficiency components and the HFC phase-down components. UNIDO responded that coordination will be facilitated by the national ozone unit to ensure complementarity between the KIP and the proposed energy efficiency project preparation activities, avoid duplication of efforts, and maximize synergies in the manufacturing sector.

70. UNIDO had initially requested US $210,000 for the project preparation for Bangladesh. However, upon discussion with UNIDO, in line with paragraph 73 of the document UNEP/OzL.Pro/ExCom/95/87, UNIDO revised the request to US $35,000 plus agency support costs.

Secretariat's recommendation

71. The Executive Committee may wish to consider approving preparation project for enhancing energy efficiency in the context of HFC phase-down in the RAC manufacturing sector for Bangladesh (decision 94/60), in the amount of US $35,000, plus agency support costs of US $2,450 for UNIDO.

Annex I

INSTITUTIONAL STRENGTHENING PROJECT PROPOSALS[1]

Ecuador: Renewal of institutional strengthening

Summary of the project and country profile			
Implementing agency:			UNIDO
Amounts previously approved for institutional strengthening (US $):			
	Phase I	Mar-93	170,673
	Phase II:	Jul-99	109,949
	Phase III:	Apr-04	190,060
	Phase IV	Mar-07 and Nov-08	190,060
	Phase V:	Nov-09	167,565
	Phase VI:	May-16	202,531
	Phase VII:	Jul-21	241,104*
	Phase VIII:	Jun-23	501,244
		Total:	1,773,186
Amount requested for renewal (phase IX) (US $):			468,452
Amount recommended for approval for phase IX (US $):			468,452
Agency support costs (US $):			32,792
Total cost of institutional strengthening phase IX to the Multilateral Fund (US $):			501,244
Date of approval of country programme:			1992
Date of approval of HCFC phase-out management plan:			2011
Date of approval of Kigali HFC implementation plan:			2023
Baseline consumption of controlled substances (ODP tonnes/CO_2-eq tonnes):			
(a) Annex B, Group III (methyl chloroform) (average 1998-2000)			2.0
(b) Annex C, Group I (HCFCs) (average 2009-2010)			23.5
(c) Annex E (methyl bromide) (average 1995-1998)			66.2
(d) Annex F (HFCs) (average 2020-2022 plus 65% of HCFC baseline)			3,179,294
Latest reported ODS consumption (2025) (ODP tonnes) as per Article 7:			
(a) Annex B, Group III (methyl chloroform)			0.00
(b) Annex C, Group I (HCFCs)			6.81
(c) Annex E (methyl bromide)			0.00
		Total:	6.81
(d) Annex F (HFCs) (CO_2-eq tonnes) as per Article 7			2,730,306
Year of reported country programme implementation data:			2025
Amount approved for projects (as at December 2025) (US $):			12,540,249
Amount disbursed (as at December 2024) (US $):			11,337,495
ODS to be phased out (as at December 2025) (ODP tonnes):			901.8
ODS phased out (as at December 2024) (ODP tonnes):			727.1

* Funds for phase VII approved at the 83rd meeting were transferred from UNEP to UNIDO at the 87th meeting as per the change of implementing agency (decision 87/21(e)).

1. Summary of activities and funds approved by the Executive Committee:

Summary of activities	Funds approved (US $)
(a) Investment projects:	7,853,040
(b) Institutional strengthening:	1,773,186
(c) Project preparation, technical assistance, training and other non-investment projects:	2,914,023
Total:	12,540,249
(d) HFC activities funded from additional voluntary contributions	180,000

[1] Data as at December 2024 are based on document UNEP/OzL.Pro/ExCom/97/15.

Progress report

2. During phase VIII, Ecuador strengthened Montreal Protocol implementation through updated regulatory controls, institutional coordination, capacity-building, awareness-raising and regional cooperation. The national ozone unit (NOU), within the within the Ministry of Production, Foreign Trade and Investments Exterior e Inversiones, supported HCFC phase-out and implementation of the Kigali Amendment through implementation of the licensing and quota system, coordinating with customs, monitoring controlled substances, and submitting Article 7 and country programme data on time. Five of the seven objectives were achieved, based on the performance indicators, with two partially achieved. The NOU also carried out training and outreach for technicians, public officials, industry, academia and the wider public, including activities on energy efficiency, alternative refrigerants, World Refrigeration Day, World Ozone Day and women's participation in the refrigeration and air-conditioning (RAC) sector.

Plan of action

3. In phase IX of the institutional strengthening project, Ecuador will maintain HCFC phase-out compliance and support implementation of its commitments under the Kigali Amendment through continued NOU coordination of stage II of the HCFC phase-out management plan (HPMP) and stage I of the Kigali HFC implementation plan (KIP). Activities will include strengthening import controls, the licensing and quota system, customs coordination and trade data verification, and supporting timely Article 7 and country programme reporting. Import controls will be extended to equipment using or containing controlled substances by 2027, beginning with air-conditioning equipment. The project will promote low-GWP technologies in the RAC and foam sectors, while expanding outreach to decision makers, industry, academia and the public. An integrated communication strategy will coordinate activities across IS, HPMP and KIP activities and target both technical and non-technical audiences. Cooperation with training institutions, universities and regional networks will be strengthened, with emphasis on gender mainstreaming, sex-disaggregated data collection and South-South cooperation.

Sustainability and risk assessment

4. Ecuador has established the institutional and regulatory frameworks required for effective implementation of the Montreal Protocol, including a licensing and quota system for controlled substances and close coordination with customs authorities. The continued operation of the NOU within the Ministry of Production, Foreign Trade and Investments provides a stable institutional basis for project implementation. However, potential risks include institutional turnover, loss of institutional memory, increased responsibilities linked to the Kigali Amendment and emerging refrigeration and climate-related policy areas, and limited knowledge of the Montreal Protocol outside specialized technical sectors. These risks will be mitigated through strengthened inter-institutional coordination, systematic documentation of activities, reporting processes and coordination mechanisms, knowledge transfer, expanded awareness-raising activities, and continued engagement with regional ozone networks and the implementing agency. These measures will help ensure the sustainability of project outcomes and continued compliance with the obligations of the Montreal Protocol.

Montenegro: Renewal of institutional strengthening

Summary of the project and country profile		
Implementing agency:		UNIDO
Amounts previously approved for institutional strengthening (US $):		
Phase I	Mar-07 & Jul-08	86,607
Phase II:	Jul-10	62,721
	Total:	149,328
Amount requested for renewal (phase III) (US $):		180,000
Amount recommended for approval for phase III (US $):		180,000
Agency support costs (US $):		12,600

Summary of the project and country profile	
Total cost of institutional strengthening phase III to the Multilateral Fund (US $):	192,600
Date of approval of country programme:	2007
Date of approval of HCFC phase-out management plan:	2011
Date of approval of Kigali HFC implementation plan:	2024
Baseline consumption of controlled substances (ODP tonnes/CO_2-eq tonnes):	
(a) Annex A, Group I (CFCs) (average 1995-1997)	104.9
(b) Annex A, Group II (halons) (average 1995-1997)	2.3
(c) Annex B, Group II (carbon tetrachloride) (average 1998-2000)	1.1
(d) Annex B, Group III (methyl chloroform) (average 1998-2000)	0.0
(e) Annex C, Group I (HCFCs) (average 2009-2010)	0.8
(f) Annex E (methyl bromide) (average 1995-1998)	0.0
(g) Annex F (HFCs) (average 2020-2022 plus 65% of HCFC baseline)	155,854
Latest reported ODS consumption (2025) (ODP tonnes) as per Article 7:	
(a) Annex A, Group I (CFCs)	0
(b) Annex A, Group II (halons)	0
(c) Annex B, Group II (carbon tetrachloride)	0
(d) Annex B, Group III (methyl chloroform)	0
(e) Annex C, Group I (HCFCs)	0
(f) Annex E (methyl bromide)	0
Total:	0
(g) Annex F (HFCs) (CO_2-eq tonnes) as per Article 7:	145,764
Year of reported country programme implementation data:	2025
Amount approved for projects (as at December 2025) (US $):	2,340,683
Amount disbursed (as at December 2024) (US $):	1,571,353
ODS to be phased out (as at December 2025) (ODP tonnes):	12.8
ODS phased out (as at December 2024) (ODP tonnes):	5.9

*Excluding US $240,000 approved for IS incorporated into stage I of the HPMP for Montenegro for the period July 2012 to June 2020, and US$ 212,500 in stage II of the HPMP for the period July 2020 to June 2025. These amounts do not include support costs or adjustments.

5. Summary of activities and funds approved by the Executive Committee:

Summary of activities	**Funds approved (US $)**
(a) Investment projects:	1,528,044
(b) Institutional strengthening:	149,328
(c) Project preparation, technical assistance, training and other non-investment projects:	663,310
Total:	2,340,683
(d) HFC activities funded from additional voluntary contributions	50,000

Progress report

6. Based on IS activities implemented within the stage II HPMP framework, Montenegro achieved six of the seven objectives, as assessed against the performance indicators, with one partially achieved. The NOU, based in the Environmental Protection Agency, oversees Montreal Protocol activities, including implementation of stage II of the HPMP, stage I of the KIP, the ODS inventory project and energy-efficiency activities. Montenegro achieved zero HCFC consumption in 2025 following the HCFC import ban that entered into force on 1 January 2025. The HFC quota system is fully operational, with 2026 quotas issued to registered importers, and the national equipment inventory system is active. The NOU contributed to the drafting of the Law on Climate Change, which that entered into force on 25 December 2025, and strengthens ODS and HFC controls, provides the legal basis for eco-fees on ODS and F-gas imports, enhances technician training and certification requirements, and requires enabling regulations to be adopted within 18 months of its entry into force. The NOU also integrated the Multilateral Fund gender policy into awareness-raising activities and training sessions. Montenegro is an active participant in meetings of the Regional Ozone

Network for Europe and Central Asia and in Montreal Protocol meetings, and the country's NOU Manager was elected to the Implementation Committee under the Non-Compliance Procedure for the Montreal Protocol for a two-year term beginning on 1 January 2025.

Plan of action

7. Montenegro will continue IS activities as a standalone project. The NOU remains committed to building national capacity to ensure compliance with HFC phase-down targets. Through the new standalone IS phase, ongoing regulatory efforts will be further strengthened, with a focus on proposing, drafting and supporting the enforcement of policies and legislation related to HFC restrictions, the certification scheme, and the management of ODS and F-gases. The NOU will support coordination with relevant institutions and training providers to facilitate implementation of the new technician examination and certification requirements. Attention will be given to cooperation with customs authorities to prevent illegal trade, as well as continued cooperation with the RAC Association. The IS phase will also support the implementation of stage I of the KIP, in close cooperation with industry and relevant government authorities. The NOU will continue working with energy-efficiency authorities in relation to the energy-efficiency project and the National Energy and Climate Plan, in which stage I of the KIP is incorporated as one of the measures. Cooperation with safety standards authorities will also continue, particularly in relation to the safe use of low-GWP and flammable refrigerants. A structured awareness and communication approach will be developed, including activities targeting the RAC servicing sector, importers, enforcement officers, policy makers and the general public, while continuing to encourage women's participation in RAC-related training and stakeholder activities.

Sustainability and risk assessment

8. During previous years of implementation of Montreal Protocol projects in Montenegro, the Environmental Protection Agency, as the competent government authority, has strengthened cooperation with relevant stakeholders, including ministries, government administrations, institutes, chambers, customs authorities, the RAC sector and industry. These institutional arrangements, together with the continued operation of the NOU, will support the sustainability of project implementation as Montenegro transitions from IS support embedded in the HPMP to a standalone IS phase and places increasing emphasis on HFC phase-down under the Kigali Amendment. The NOU remains committed to implementing the provisions of the Montreal Protocol and sustaining compliance through continued coordination, capacity-building, awareness-raising and enforcement support.

North Macedonia: Renewal of institutional strengthening

Summary of the project and country profile			
Implementing agency:			UNIDO
Amounts previously approved for institutional strengthening (US $):			
	Phase I:	Oct-96	172,752
	Phase II:	Mar-00	115,202
	Phase III:	Dec-01	115,202
	Phase IV:	Apr-04	142,273
	Phase V:	Apr-06	141,062
	Phase VI:	Apr-09	142,227
	Phase VII:	Dec-21	180,787
	Phase VIII:	Dec-23	375,213
		Total:	1,384,719
Amount requested for renewal (phase IX) (US $):			350,666
Amount recommended for approval for phase IX (US $):			350,666
Agency support costs (US $):			24,547
Total cost of institutional strengthening phase IX to the Multilateral Fund (US $):			375,213
Date of approval of country programme:			1995

Summary of the project and country profile	
Date of approval of HCFC phase-out management plan:	2010
Date of approval of Kigali HFC implementation plan:	2023
Baseline consumption of controlled substances (ODP tonnes/CO_2-eq tonnes):	
(a) Annex A Group I (CFCs) (average 1995-1997)	519.7
(b) Annex A Group II (halons) (average 1995-1997)	32.1
(c) Annex B Group II (carbon tetrachloride) (average 1998-2000)	0.1
(d) Annex B Group III (methyl chloroform) (average 1998-2000)	0.0
(e) Annex C, Group I (HCFCs) (average 2009-2010)	1.8
(f) Annex E (methyl bromide) (average 1995-1998)	12.2
(g) Annex F (HFCs) (average 2020-2022 plus 65% of HCFC baseline)	397,843
Latest reported ODS consumption (2024) (ODP tonnes) as per Article 7:	
(a) Annex A Group I (CFCs)	0
(b) Annex A Group II (halons)	0
(c) Annex B Group II (carbon tetrachloride)	0
(d) Annex B Group III (methyl chloroform)	0
(e) Annex C, Group I (HCFCs)	0
(f) Annex E (methyl bromide)	0
Total:	0
(g) Annex F (HFCs) (CO_2-eq tonnes) as per Article 7:	253,091
Year of reported country programme implementation data:	2025
Amount approved for projects (as at December 2025) (US $):	8,497,908
Amount disbursed (as at December 2024) (US $):	7,553,026
ODS to be phased out (as at December 2025) (ODP tonnes):	590.4
ODS phased out (as at December 2024) (ODP tonnes):	590.4

9. Summary of activities and funds approved by the Executive Committee:

Summary of activities	**Funds approved (US $)**
(a) Investment projects:	5,390,073
(b) Institutional strengthening:	1,384,719
(c) Project preparation, technical assistance, training and other non-investment projects:	1,723,117
Total:	8,497,908
(d) HFC activities funded from additional voluntary contributions	95,000

Progress report

10. During phase VIII, North Macedonia remained in compliance with its obligations under the Montreal Protocol and the Kigali Amendment. The NOU achieved all seven objectives, based on the performance indicators, and supported the transition from regulatory preparation to the implementation and enforcement of Kigali Amendment-related measures. Key achievements included the adoption of the Ordinance for Restricting the Import of HFCs, the operational allocation of HFC import quotas for 2024–2026, and the timely submission of Article 7 and country programme data. The NOU also supported the registration and labelling of more than 1,270 pieces of equipment, training of customs officers and environmental inspectors on the prevention of illegal trade, and development of standard operating procedures for border and internal market controls. The NOU continued to integrate the MLF gender mainstreaming policy into project activities, including through the collection of sex-disaggregated data, participation of women in inter-institutional meetings and workshops, and preparation of more structured gender activities for the RAC sector.

Plan of action

11. Phase IX of the IS project will focus on supporting implementation of the HFC phase-down and strengthening the technical and regulatory framework for refrigerant management. Planned activities include the adoption of rulebooks related to leak detection and reporting, the development of regulations on specific HFC-containing equipment, and the upgrading of national legislation to include provisions on refrigerant recovery, recycling and reclamation. The NOU will continue to maintain the licensing and quota systems through the EXIM platform, including data cross-checking with customs and importers, while strengthening coordination with relevant stakeholders through awareness-raising activities, including activities related to energy efficiency, and through a planned gender gap analysis of the RAC sector. The NOU will also support implementation of standard operating procedures for border and internal market controls and finalize and disseminate the communication and awareness strategy. The plan also includes targeted support through two scholarships for female students at the Faculty of Mechanical Engineering at Ss. Cyril and Methodius University in Skopje, aimed at promoting gender balance and supporting academic advancement in technical disciplines relevant to sustainable technologies and environmental protection. The results of the gender gap analysis will inform training, certification and awareness activities under phase IX.

Sustainability and risk assessment

12. The institutional framework for Montreal Protocol implementation in North Macedonia is sustainable, supported by the integration of the NOU within the Ministry of Environment and Physical Planning, and a consistent track record of compliance. The Government has identified no potential risks to achieving project objectives or meeting compliance obligations, and UNIDO assessed the project as low risk, noting that existing systems and institutional arrangements are capable of supporting implementation in the next phase. Long-term implementation will continue to be supported by established coordination with relevant institutions and stakeholders, including through the National Committee for Chemicals and Waste Management. The continued operation of the recovery and recycling scheme, together with mandatory licensing in the RAC sector, will further support the sustainability of ODS phase-out and HFC phase-down activities.

Annex II

DRAFT VIEWS EXPRESSED BY THE EXECUTIVE COMMITTEE ON RENEWAL OF INSTITUTIONAL STRENGTHENING PROJECTS SUBMITTED TO THE 98TH MEETING

Ecuador

1. The Executive Committee reviewed the report submitted with the request for the renewal of the institutional strengthening project for Ecuador (phase IX) and noted with appreciation that Ecuador had continued to meet its reporting obligations under the Montreal Protocol, including the timely submission of Article 7 and country programme data, and that Ecuador remained in compliance with the control measures of the Montreal Protocol and its Kigali Amendment. The Committee noted progress in strengthening the regulatory and institutional framework, including the modernization of the electronic licensing and quota system for HCFCs, HFCs and pre-blended polyols, and the issuance of updated regulatory instruments to support implementation of the Kigali Amendment. It also acknowledged strengthened coordination with customs authorities and improved monitoring and verification of imports of controlled substances. The Committee noted remaining challenges related to controls on RAC equipment, the need to further formalize inter-institutional coordination mechanisms, and the importance of strengthening institutional memory in the context of potential staff turnover. The Committee acknowledged the efforts of the Government of Ecuador and is therefore hopeful that, during the next three years, Ecuador will continue implementing its institutional strengthening project with success, including by expanding outreach beyond the RAC sector, strengthening circular economy and life-cycle management approaches, and integrating energy-efficiency considerations into its activities, in order to maintain compliance with the Montreal Protocol.

Montenegro

2. The Executive Committee reviewed the report submitted with the request for the renewal of the institutional strengthening project for Montenegro (phase III) and noted with appreciation that Montenegro had reported data under Article 7 of the Montreal Protocol to the Ozone Secretariat and 2025 country programme data to the Fund Secretariat, indicating that the country is in compliance with the Montreal Protocol. The Committee noted that the Government of Montenegro implemented enforcement measures to control ODS imports, including an HCFC import ban effective 1 January 2025, and implemented an HFC licensing and quota system. The Committee further noted the adoption of the Law on Climate Change, which strengthens the regulatory framework for controlling ozone-depleting substances and fluorinated greenhouse gases, and acknowledged that the Government provided comprehensive training to customs officers and refrigeration technicians. The Committee acknowledged the efforts of the Government of Montenegro and is therefore hopeful that, within the next three years, the Government of Montenegro will continue the implementation of activities with success to maintain compliance with the control measures of the Montreal Protocol and its Kigali Amendment.

North Macedonia

3. The Executive Committee reviewed the report submitted with the request for the renewal of the institutional strengthening project for North Macedonia (phase IX) and noted with appreciation that North Macedonia had reported 2024 Article 7 data and 2025 country programme data to the Ozone and Fund Secretariats, respectively, indicating that the country was in compliance with its obligations under the Montreal Protocol. The Committee further noted the efforts of North Macedonia to sustain the phase-out of HCFC consumption and initiate the phase-down of HFCs, including through the adoption, in 2024, of the Ordinance for Restricting the Import of HFCs and the implementation of a licensing and quota system supported by the EXIM electronic platform. The Committee also noted the development of regulatory measures, including draft rulebooks on reporting, leak detection systems and the management of controlled substances, as well as strengthened cooperation with customs and environmental inspection authorities. The Committee further noted North Macedonia's continued efforts to ensure accurate and timely data reporting

through its monitoring and verification system, stakeholder coordination, including engagement with the RAC sector and inter-institutional cooperation through the National Committee for Chemicals and Waste Management. The Committee acknowledged the efforts of the Government of North Macedonia and is therefore hopeful that, within the next three years, the Government of North Macedonia will continue the implementation of activities with success to maintain compliance with the control measures of the Montreal Protocol and its Kigali Amendment.

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO WORK PROGRAMME

Presented to the 98th Meeting of the Executive Committee of the Multilateral Fund

Introduction

The UNIDO Work Programme (WP) for the consideration of the 98th Meeting of the Executive Committee (ExCom) of the Multilateral Fund (MLF) has been prepared following the requests to UNIDO from the Governments of countries eligible for the MLF funding as well as based on ongoing and planned activities. The WP will support the implementation of UNIDO's three-year Rolling Business Plan 2026-2028. The UNIDO WP for the 98th ExCom Meeting is addressing preparatory assistance, verification reports and institutional strengthening requests.

Preparatory assistance for developing the Kigali HFC implementation plan (Stage I), is requested for Saint Kitts and Nevis[1].

Preparatory assistance funding for developing energy efficiency pilot projects under decision 91/65 is requested for Armenia, Bolivia, Brazil, Mexico, Regional[2] and Viet Nam.

Preparatory assistance funding for developing energy efficiency pilot projects under decision 94/60 is requested for Bangladesh, Ecuador and Mexico.

Institutional strengthening extension requests are submitted based on the country requests for Ecuador, Montenegro and North Macedonia.

In line with decision 96/22(a), funding is requested for verification reports for stage I of the KIPs for Armenia, Bosnia and Herzegovina and Niger, for stage II of the HCFC Phase-Out Management Plan for Guatemala and Honduras, and a combined HCFC and HFC verification report for Montenegro.

The UNIDO Work Programme for the consideration of the 98th ExCom Meeting comprises the following:

- **Section 1**: Consolidated list of activities foreseen for the above requests by project types and country; and
- **Section 2**: Project concepts indicating details and funding requirements.

Funding is requested as follows:

- Preparatory assistance funding for developing Kigali HFC Implementation Plan (Stage I) for Saint Kitts and Nevis amounting to US$ 37,450 (including US$ 2,450 representing 7.0 % agency support costs);
- Preparatory assistance funding for developing energy efficiency pilot projects under decision 91/65 for Armenia, Bolivia, Brazil, Mexico, Regional and Viet Nam amounting to US$ 235,400 (including US$ 15,400 representing 7.0 % agency support costs);
- Preparatory assistance funding for developing energy efficiency pilot projects under decision 94/60 for Bangladesh, Ecuador and Mexico amounting to US$ 117,700 (including US$ 7,700 representing 7.0 % agency support costs);
- Requests for verification reports for stage I of the KIPs for Armenia, Bosnia and Herzegovina and Niger, for stage II of the HCFC Phase-Out Management Plan for Guatemala and Honduras, and a combined HCFC and HFC verification report for Montenegro., amounting to US$ 212,550 (including US$ 17,550 representing 9.0 % agency support costs); and
- Institutional strengthening projects for Ecuador, Montenegro and North Macedonia amounting to US$ 1,069,056 (including US$ 69,938 representing 7.0 % agency support costs).

Total: US$ 1,672,156 (including 113,038 agency support cost).

[1] Preparatory funding request is included in the lead agency Work Programme i.e. UNEP.

[2] Six countries in the COMESA region in Africa (Eswatini, Rwanda, Somalia, Uganda, Zambia and Zimbabwe).

SECTION 1

Country	Type	Substance	Sector and Sub-Sector	Title of Project	Total amount USD	A.S.C.	Total (incl ASC) USD	A.S.C. %	P.D.
Funding for preparation of Kigali HFC Implementation Plan (Stage I)									
Saint Kitts and Nevis[3]	PRP	HFC	Servicing	Preparation of Kigali HFC Implementation Plan (Stage I)	35,000	2,450	37,450	7%	24
					35,000	**2,450**	**37,450**		
Funding for preparation of energy efficiency pilot projects under decision 91/65									
Armenia	PRP	HFC	EEF	Preparation of energy efficiency pilot project 91/65	30,000	2,100	32,100	7%	12
Bolivia	PRP	HFC	EEF	Preparation of energy efficiency pilot project 91/65	30,000	2,100	32,100	7%	12
Brazil	PRP	HFC	EEF	Preparation of energy efficiency pilot project 91/65	40,000	2,800	42,800	7%	12
Mexico	PRP	HFC	EEF	Preparation of energy efficiency pilot project 91/65	30,000	2,100	32,100	7%	12
Regional	PRP	HFC	EEF	Preparation of energy efficiency pilot project 91/65	60,000	4,200	64,200	7%	12
Viet Nam	PRP	HFC	EEF	Preparation of energy efficiency pilot project 91/65	30,000	2,100	32,100	7%	12
SUBTOTAL					**220,000**	**15,400**	**235,400**		
Funding for preparation of energy efficiency pilot projects under decision 94/60									
Bangladesh	PRP	HFC	EEF	Preparation of energy efficiency pilot project 94/60	35,000	2,450	37,450	7%	24
Ecuador	PRP	HFC	EEF	Preparation of energy efficiency pilot project 94/60	30,000	2,100	32,100	7%	24
Mexico	PRP	HFC	EEF	Preparation of energy efficiency pilot project 94/60	45,000	3,150	48,150	7%	24
SUBTOTAL					**110,000**	**7,700**	**117,700**		

[3] Project Concept is included in UNEP Work Programme.

Country	Type	Substance	Sector and Sub-Sector	Title of Project	Total amount USD	A.S.C.	Total (incl ASC) USD	A.S.C. %	P.D.
Verification Reports									
Armenia	PRP	HFC	SEV	HFC Verification report	30,000	2,700	32,700	9%	24
Bosnia and Herzegovina	PRP	HFC	SEV	HFC Verification report	30,000	2,700	32,700	9%	24
Guatemala	PRP	HCFC	SEV	HCFC Verification report	30,000	2,700	32,700	9%	24
Honduras	PRP	HCFC	SEV	HCFC Verification report	30,000	2,700	32,700	9%	24
Montenegro	PRP	SEV	SEV	HCFC and HFC Verification report	45,000	4,050	49,050	9%	24
Niger	PRP	HFC	SEV	HFC Verification report	30,000	2,700	32,700	9%	24
SUBTOTAL					**195,000**	**17,550**	**212,550**		
Institutional Strengthening									
Ecuador	INS	All	SEV	Institutional strengthening project	468,452	32,792	501,244	7%	36
Montenegro	INS	All	SEV	Institutional strengthening project	180,000	12,600	192,600	7%	36
North Macedonia	INS	All	SEV	Institutional strengthening project	350,666	24,547	375,213	7%	36
SUBTOTAL					**999,118**	**69,938**	**1,069,056**		
GRAND TOTAL					**1,559,118**	**113,038**	**1,672,156**		

SECTION 2

PROJECT CONCEPT – ARMENIA

MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL FUNDING REQUEST FOR THE PREPARATION OF ENERGY EFFICIENCY PROJECT (PRP)

Part I: Project information

Project title:	Preparatory assistance for the pilot projects to enhance the energy efficiency of cooling technologies in the retail and public sector in Armenia (Decision 91/65)	
Country:	Armenia	
Lead implementing agency:	UNIDO	
Implementation period:	12 months	
Funding requested:		
Agency	**Sector**	**Funding requested (US $)***
UNIDO	INV - Others	30,000

*Details should be consistent with information provided in the relevant sections below.

Part II: Prerequisites for submission

Item	Yes	No
Official endorsement letter from Government specifying roles of respective agencies (where more than one IA is involved)	☒	☐

A. Information required to support PRP funding (Overarching strategy)

1. **Brief overview of the concept, methodology and approach to be taken for the preparation of the EE Project**

Background

Armenia's refrigeration and air-conditioning (RAC) sector, particularly in the retail and commercial refrigeration subsectors, continues to rely on high-global-warming-potential (GWP) refrigerants, including HCFC-22 and HFC-based alternatives. Supermarkets represent a key segment with significant energy consumption and refrigerant demand, often limited adoption of energy-efficient technologies.

In parallel, Armenia is exploring opportunities to showcase energy-efficient alternative cooling technologies in the public building sector and is updating the green procurement policy by introducing low-GWP heating solutions, such as R-290 (propane)-based heat pumps. These technologies offer significant potential for reducing both direct refrigerant emissions and indirect emissions from energy consumption.

In line with commitments under the Montreal Protocol and its Kigali Amendment, Armenia is seeking to develop targeted interventions that simultaneously address hydrofluorocarbon (HFC) phase-down and energy efficiency improvements. The preparatory project aims to support the development of a comprehensive investment proposal for the commercial refrigeration sector, including a demonstration of low-GWP technologies.

Challenges and opportunities

In Armenia's RAC sector, findings from the KIP preparation survey indicate that alternatives are not yet as widespread as they could be. The use of low-GWP alternatives has so far been limited to a small number of substances and units, even though there are many more viable options. Similarly, the uptake of advanced heat pump technologies remains limited due to technical, financial, and awareness barriers.

At the same time, significant opportunities exist to transition toward energy-efficient and climate-friendly solutions. Alternative technologies, such as centralized R-744 commercial refrigeration units, offer zero-ODP and low-GWP alternatives for commercial refrigeration.

R-290 heat pumps provide an efficient and environmentally sustainable solution for heating applications in public buildings. Demonstration projects in both subsectors can play a critical role in building confidence, strengthening technical capacity, and enabling replication across Armenia and in countries with similar conditions.

Project Objectives
The overall objective of the preparatory project is to develop 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) (decision 91/65) for Armenia.

The preparatory project will consist of two main components.
The first component focuses on assessing HFC consumption in the supermarket subsector through data collection and analysis, while providing technical support and technology assessment for selected pilot supermarkets. This component will support the identification of energy-efficient and low-GWP alternatives and inform the development of the pilot project.

The second component focuses on the assessment and preparation of a demonstration project for R-290-based heat pump systems in public buildings. This includes evaluating technical feasibility, energy performance, and market readiness, as well as identifying suitable pilot sites and implementation modalities.

Expected outcome
The primary outcome of the project is the preparation of a comprehensive, evidence-based project document that serves as a blueprint for implementing energy-efficiency measures and reducing HFC use by demonstrating alternative centralized technologies in Armenia's retail sector and R-290 heat pump systems in public buildings.

The pilot project is envisioned to include the procurement and installation of R-290-based heat pump equipment in selected public buildings for demonstration purposes, the updating of green public procurement policies to incorporate technical specifications for energy-efficient and low-GWP RAC equipment, and the implementation of a demonstration project in the supermarket subsector using alternative centralized technologies such as R744 refrigeration systems. The project will also include training of technicians, proper disposal of replaced equipment, and awareness-raising activities to support broader market transformation.

Project activities
UNIDO will conduct a comprehensive assessment of the existing retail sector for emerging technology adoption and the public sector for heat pump applications, and provide technical support to enhance energy efficiency and phase down HFCs. The study will identify the current state of cooling technologies and refrigerant use, evaluate alternative solutions, and develop a project proposal.

Component 1: Demonstration of alternative centralized technologies for the retail sector
Key tasks include:

1. **Data collection and analysis:**
   - Conduct workshops with selected supermarkets
   - Collect data on energy consumption, cooling systems, and refrigerant use
   - Assess opportunities for alternative cooling technologies
2. **Technical support and technology assessment:**
   - Provide technical assessments for the selected pilot project
   - Evaluate energy efficiency improvements
   - Conduct individual consultations with stakeholders
3. **Project document preparation:**
   - Develop a full project proposal for submission

Component 2: Demonstration of R290 Heat Pump Systems for the public sector
Key tasks include:

4. **Data collection and analysis:**
   - Conduct workshops with selected public entities
   - Collect data on energy consumption, cooling (and heating) systems, and refrigerant use
   - Assess opportunities for alternative cooling technologies
5. **Technical support and technology assessment:**
   - Provide technical assessments for the selected pilot project
   - Evaluate energy efficiency improvements
   - Conduct individual consultations with stakeholders
6. **Project document preparation:**

- Develop a full project proposal for submission

Budget and timeline
The total funding requested for project preparation is USD 45,000. The project duration is estimated to be 12 months. The budget will support data collection, technical assessments, stakeholder consultations, and the preparation of the document for the pilot project.

Conclusion
The preparatory project will provide a strong foundation for improving energy efficiency and transition to low-GWP alternatives in Armenia's retail and public sectors. By supporting both public- and private-sector pilot approaches and introducing advanced cooling technologies, the project will enable scalable solutions.

2. Activities to be undertaken for project preparation and funding

Activity	Indicative funding (US $)	Agency
Technical support and technology assessment will be led by an international consultant, with support from national consultants responsible for data collection and stakeholder engagement. The activity will cover selected retail stores and public buildings identified as potential pilot sites. It will include analysis of energy consumption, system performance, and refrigerant use, as well as targeted consultations to assess energy efficiency improvements and identify suitable low-GWP technologies.	15,000	UNIDO
Workshop for the potential participation (Expression of Interest)	5,000	UNIDO
Drafting a project document (International consultant)	10,000	UNIDO
TOTAL	**30,000**	

PROJECT CONCEPT – BOLIVIA

MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL ENERGY EFFICIENCY EXCOM DECISION 91/65 (EE) PROJECT PREPARATION (PRP)

Part I: Project information

Project title:	Preparatory assistance for a Dual Approach Demonstration and Market Transformation Model in the supermarket sector of Bolivia	
Country:	Bolivia	
Lead implementing agency:	UNIDO	
Implementation period for stage RPR EE:	12 months	
Duration of PRP implementation (i.e., time (in months) from the approval of PRP to submission of the project proposal (please specify): 12 months		
Funding requested:		
Agency	**Sector**	**Funding requested (US $)***
UNIDO	Servicing	30,000 USD

*Details should be consistent with information provided in the relevant sections below.

Part II: Prerequisites for submission

Item	Yes	No
Official endorsement letter from Government, indicating the specifying roles of respective agencies (where more than one IA is involved)	☒	☐

A. Information required for PRP funding request for investment projects/sector plans as part of Energy Efficiency Funding Window

1. Agency:	UNIDO
2. Sector:	Refrigeration
3. HFC consumption in item #2 reported under country programme data?	☒ **Yes**, please specify reported amount and year: 2025 ☐ **No**
4. Does the enterprise commit to phase out the HFC consumption associated with the proposed investment project, if approved by the Executive Committee?	☐ **Yes**, please provide support letter _____ ☐ **No** ☒ **N/A**
5. If the project preparation is requested in advance of the KIP, did the Government provide a written commitment that the consumption associated with these investment projects, once approved, will be deducted from the country's starting point, once established?	☐ **Yes** ☐ **No** ☒ **N/A**
6. Please explain briefly how the investment project would relate to the overarching strategy for the country, and when the final KIP will be submitted (decision 87/50(e))	The proposed project aligns with Bolivia's KIP by accelerating the transition to low-GWP technologies in commercial refrigeration and avoiding HFC lock-in. It complements ongoing KIP and energy efficiency efforts through a targeted supermarket demonstration, combining R-290 systems for new installations with a "Zero Leaks" approach for existing R-507A equipment, while informing future MEPS development. This integrated approach will reduce emissions, strengthen capacity, and generate evidence for scaling-up under the KIP.
7. Background information	
The Plurinational State of Bolivia has demonstrated sustained commitment to the objectives of the Montreal Protocol and the Kigali Amendment, supported by a solid institutional framework led by the Comisión Gubernamental del Ozono (CGO) under the Ministry of Development Planning and Environment. Following the ratification of the Kigali Amendment through Law No. 1248, Bolivia, as an Article 5 Group 1 country, will freeze HFC consumption in 2024 and achieve a 15 per cent	

reduction by 2029, progressing towards an 80 per cent reduction by 2045. This commitment is embedded within a broader national development and climate framework based on the principles of "Vivir Bien" and articulated through key instruments such as the Constitution, the Law of Mother Earth, the Patriotic Agenda 2025, and national energy planning policies, which promote sustainable technologies, energy efficiency, and innovation as key drivers of climate action.

The refrigeration and air conditioning (RAC) sector plays a strategic role in Bolivia's energy and emissions profile, particularly in the commercial refrigeration subsector, where supermarkets represent a high-impact segment due to continuous operation, high refrigerant charge, and growing demand. At the same time, a significant share of emissions from RAC systems is associated with electricity consumption, highlighting the importance of integrating energy efficiency into refrigerant transition strategies.

Bolivia is currently at a critical stage of technological transition. While legacy systems based on HCFC-22 remain in operation, new investments are increasingly shifting towards high-GWP HFCs such as R-507A. This trend poses a risk of long-term lock-in of technologies with high climate impact and suboptimal energy performance. At the same time, the country has recently taken important steps to enable the transition towards low-GWP alternatives, including the opening of the market for hydrocarbon refrigerants such as R-290, and a growing interest in the adoption of CO_2 (R-744) technologies.

In response, Bolivia is already advancing its Kigali Implementation Plan (KIP) and a complementary energy efficiency project, both of which are currently under implementation. These initiatives focus on strengthening technical capacity, promoting alternative refrigerants, and improving energy performance through training and initial demonstration efforts.
Building on this foundation, the proposed project is designed as an additional and complementary intervention, aimed at accelerating the transition towards low-GWP technologies in the commercial refrigeration sector. The project introduces a full-scale demonstration in a major national supermarket chain, using a real investment case to validate the technical, economic, and operational performance of alternative technologies under local conditions.

The demonstration will prioritize the adoption of low-GWP refrigeration solutions, including R-290 and CO_2-based systems, and will generate robust evidence on their performance, costs, and operational implications. This is expected to play a critical role in reducing market uncertainty and building confidence among end-users, suppliers, and technicians, thereby accelerating the uptake of these technologies in Bolivia.

Furthermore, the project will be implemented in collaboration with a **selected national supermarket chain**, providing a structured platform to test and compare the performance of different low-GWP technologies under **real operating conditions**. This includes variations in temperature, altitude, pressure, and humidity across locations, which are particularly relevant in the Bolivian context. This approach will strengthen the **demonstrative nature of the pilot**, generating robust and context-specific evidence on technical performance, energy consumption, and operational feasibility, thereby enhancing confidence among end-users and supporting replication across the sector.

The project introduces a dual approach in the supermarket subsector, combining (i) a demonstration of low-GWP energy efficiency technology in new installations and (ii) the improvement of energy efficiency performance in existing R-507 systems through a structured "Zero Leaks" approach, complemented by a policy component focused on MEPS. This integrated model will generate practical, replicable evidence and support the scaling-up of sustainable solutions under the KIP framework.

While "Zero Leaks" is already referenced under the HPMP and KIP frameworks, the proposed project introduces a targeted and application-specific approach for the supermarket subsector. Unlike existing activities, which focus primarily on general capacity building and servicing practices, this pilot will operationalize Zero Leaks at the system level within a real commercial installation, integrating leak prevention, monitoring, and performance-based maintenance into the design and operation of the system. This will allow for the generation of quantifiable evidence on leakage reduction and its direct link to sustained energy performance, addressing a critical gap between training-based interventions and measurable outcomes in real operating conditions.

Component	Focus	Description	Expected outcome
1. Demonstration of low-GWP technology (new equipment)	New installations	Implementation of a demonstration project in a major national supermarket chain, where new refrigeration systems will be installed using low-GWP technology based on R-290 and R-744. The project will measure energy consumption, operational performance, safety considerations, and cost implications under	Generate real-world evidence, build confidence in R-290/R-744 applications, and accelerate the transition to low-GWP technologies in the sector.

		real conditions. A strong visibility component will be included.	
2. "Zero Leaks" approach (existing systems)	Existing installations (R-507A systems)	Application of a structured leak reduction and preventive maintenance model to existing supermarket systems operating with R-507A, including improved servicing practices, monitoring, and operational protocols.	Achieve reduced leakage rates, improved energy performance, and immediate emissions reduction in the installed base.
3. MEPS development and policy support	Market transformation	Development of a roadmap for MEPS in commercial refrigeration and preparation of a specific MEPS proposal for condensing units used in supermarkets, informed by project results.	Establish minimum performance benchmarks and guide future investments toward higher efficiency technologies.

In the policy component, the project will also consider recent developments in Bolivia, including the introduction of natural refrigerants such as R-290 into the national market and the growing interest in CO_2 technologies. The pilot will provide practical evidence to support the safe, efficient, and scalable adoption of these alternatives, while helping to identify regulatory and market conditions required for their broader deployment. This will be particularly relevant for informing future policy instruments, including MEPS, ensuring that they are aligned with emerging technologies and do not inadvertently constrain their uptake.

8. Activities to be undertaken for preparation of the investment project and funding requested

Activity	Indicative funding (US $)	Bilateral/implementing agency
Demonstration design and technical definition: Based on ongoing KIP and EE work, define the technical design of the demonstration project in a selected supermarket; validate baseline conditions; compare current HFC systems with low-GWP alternatives (R-290 and/or CO_2); define expected energy performance, safety requirements, and develop a preliminary MRV framework.	10,000	UNIDO
Design of Zero Leaks model for existing systems: Develop a tailored Zero Leaks approach for supermarkets operating with R-507A, including protocols for leak reduction, preventive maintenance, and sustained performance; define how this model will be applied and replicated under the investment phase.	6,000	UNIDO
Regulatory and policy analysis: Conduct a preliminary assessment of the legal and institutional framework to support the future introduction of MEPS in commercial refrigeration; identify regulatory gaps, implementation pathways, and institutional requirements; and define the scope and approach for the development of MEPS, including for condensing units used in supermarkets, to be further elaborated during the investment phase.	6,000	UNIDO
Project preparation and structuring: Consolidate all technical inputs; define the integrated project model (technology + Zero Leaks + MEPS linkage); conduct targeted consultations with the supermarket chain and key stakeholders; assess co-financing; prepare and submit the full investment project proposal, including detailed design, cost structure, and implementation arrangements.	8,000	UNIDO
TOTAL	30,000	

PROJECT CONCEPT – BRAZIL

MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL

FUNDING REQUEST FOR THE PREPARATION OF ENERGY EFFICIENCY PILOT PROJECT UNDER DECISION 91/65

Part I: Project information

Project title:	**Preparatory assistance for the Energy Efficiency Project in the Industrial Refrigeration Sector**	
Country:	**Brazil**	
Lead implementing agency:	**UNIDO**	
Implementation period for stage RPR EE:	**12 months**	
Duration of PRP implementation (i.e., time (in months) from the approval of PRP to submission of the project proposal (please specify): 12 months		
Funding requested:		
Agency	**Sector**	**Funding requested (US $)**
UNIDO	**INV - REF**	**40,000 USD**

*Details should be consistent with information provided in the relevant sections below.

Part II: Prerequisites for submission

Item	Yes	No
Official endorsement letter from Government, indicating the specifying roles of respective agencies (where more than one IA is involved)	☐	☐

A. Information required for PRP funding request for investment projects/sector plans as part of Energy Efficiency Funding Window

1. Agency:	UNIDO
2. Sector:	Industrial Refrigeration
3. HFC consumption in item #2 reported under country programme data?	☒ **Yes**, please specify reported amount and year: 2024 ☐ **No**
4. Does the enterprise commit to phase out the HFC consumption associated with the proposed investment project, if approved by the Executive Committee?	☐ **Yes**, please provide support letter _____ ☐ **No** ☒ **N/A**
5. If the project preparation is requested in advance of the KIP, did the Government provide a written commitment that the consumption associated with these investment projects, once approved, will be deducted from the country's starting point, once established?	☐ **Yes** ☐ **No** ☒ **N/A**
6. Please explain briefly how the investment project would relate to the overarching strategy for the country, and when the final KIP will be submitted (decision 87/50(e))	The project will advance the discussion and action on energy efficiency in the industrial refrigeration sector in Brazil, mainstreaming energy performance improvements and the use of low-GWP refrigerants while elevating these topics to national and industry technical levels.
7. Background information	

Brazil is well positioned to pursue an integrated approach that aligns its national HFC phase-down strategy with energy-efficiency objectives, particularly in the industrial refrigeration sector (IR).

As one of the largest industrial economies in the region, Brazil relies heavily on industrial refrigeration systems to support critical value chains such as agribusiness, logistics, food processing, beverages, pharmaceuticals, plastics and

seed storage. This segment accounts for a substantial share of national HFC consumption, while also exhibiting high energy demand and long equipment lifetimes, reinforcing the need to enhance energy efficiency measures. With more than 268,000 industrial refrigeration units operating across the country and accounting for approximately 30% of total refrigeration sector emissions (if both manufacturing and servicing activities considered), the sector represents a strategically significant share of the Brazilian refrigeration market.

The country has made substantial progress in establishing the regulatory and institutional conditions required for the implementation of the Kigali Amendment. Through Stage I of the Brazilian HFC Phase-down Program (KIP), Brazil has identified the industrial refrigeration manufacturing segment as a strategic pillar, given its reliance on high-GWP refrigerants and the growing need for modernization. This requires a significant national effort to transition from high-GWP refrigerants (such as R-404A, HFC-134a and R-410A) toward low-GWP refrigerants, notably ammonia (R-717), CO_2 (R-744), hydrocarbons (R-290) and HFO (when needed).

The industrial refrigeration sector still faces structural barriers that constraint the uptake of low-GWP refrigerants and higher energy performance. These include highly customized system designs that complicate the development of MEPS, limited technical capacity for safe handling of alternative refrigerants, substantial investment needs for upgrading to efficient low-GWP technologies, and continued growth in high-GWP HFC consumption. Addressing these barriers needs a combination of technical, regulatory and financial instruments to enable a scalable national intervention.

Complexity of the IR sector

The industrial refrigeration sector in Brazil is highly dispersed geographically with heterogeneous actors and no single interlocutor or coordinated institutional representation. This fragmentation requires a targeted implementation strategy for delivery of cohesive energy-efficiency and low-GWP transition activities.

Unlike the commercial and domestic sectors, industrial refrigeration in Brazil is technical diverse with systems ranging from modular industrial monoblocks units to large-scale centralized refrigeration plants. These installations exhibit annual leakage rates of approximately 35%, significantly contributing to national HFC consumption. Although ammonia remains the dominant refrigerant for large-scale facilities, thousands of medium-sized plants continue to operate on R-404A, HFC-134a and R-410A. In 2024, it was estimated that the IR manufacturing sector consumed 363.4 tonnes of HFC, equivalent to nearly 1 Mt CO_2-eq emissions, highlighting the urgency for rapid modernization.

The IR sector is expected to expand significantly in the coming years, driven by increased demand for refrigerated logistics, food processing, and export-oriented agribusiness. Without intervention, this growth will result in a proportional increase in both HFC consumption and energy demand, making the dual objective of refrigerant transition and energy efficiency improvement not only complementary but economically necessary for the sector's competitiveness.

Building National Capacity for Low-GWP Technologies

Brazil, under its Kigali Implementation Plan for HFC Phase-down - Stage I, proposes a structured effort to strengthen national capacity in the IR sector, with activities such as:

- Industrial Conversion Projects for three manufacturers producing chillers, monoblocks, split units and racks, enabling a transition to low-GWP refrigerants;
- Technical Assistance and Demonstration Projects showcasing innovative sustainable technologies such as low-charge ammonia systems, and high-temperature heat pumps for waste heat recovery; and
- Training and workforce qualification, particularly for technicians handling ammonia, CO_2 and flammable refrigerants, addressing one of the sector’s most pressing gaps.

These activities aim to ensure that Brazilian manufacturers and service providers remain competitive as global markets adopt more enhanced environmental and safety requirements.

Current Status of MEPS for the industrial refrigeration sector in Brazil

Since most of IR equipment is designed to meet the specific processes and layouts of end users, this equipment has generally not been subject to minimum energy performance standards (MEPS). Having said that, Brazil has a relevant foundation to build on. Procel, a national Electric Energy Conservation Programme, within the industrial sector, currently manages voluntary efficiency labelling for electric motors up to 500 HP, as well as centrifugal pumps and motor-pump sets with power ratings up to 25 HP. Since 2001, Brazil has established a legal framework for mandatory MEPS for machinery and equipment, with a strategic focus on industrial electric motors. Decree 4.508/2002

introduced MEPS for three-phase motors, which are critical for driving systems industrial equipment including open-type refrigeration compressors. This Decree was subsequently updated in 2017 to cover a power range from 0.16 to 500 HP and increase efficiency levels required for commercialization.

With appropriate support, Brazil can leverage these existing Procel standards and labelling programmes to explore, where applicable, how international frameworks such as Ecodesign or/and ASHRAE 90.1 could be used for the IR sector.

It is therefore proposed to develop a full scale project that will propose a roadmap for enhancing energy efficiency in the sector while phasing down HFC, including technical assistance, identification of funding options for upgrading, and policy recommendations

Project Objectives

This PRP aims to support for strengthening energy efficiency in the Brazil's IR sector by:

1. Gathering and verifying data on the current IR sector landscape, end users, energy consumption patterns of the IR sector to inform the development of technical eligibility guidelines for selection of pilots. The data collection will be done within the context of sector mapping to be conducted earlier on during KIP Stage I, Tranche 1 implementation. Brazil KIP Stage I is submitted for the consideration of ExCom98. Tranche 1 will be implemented from 2026-2028
2. Developing technical eligibility criteria to guide the selection of end users from the specific industry subsectors to address energy-efficiency and design replication frameworks for low-GWP pilot projects for real-scale data generation during the full-scale project implementation.
3. Reviewing legal and policy frameworks that support the energy efficiency in the industrial refrigeration sector and identifying gaps, as well as reviewing existing financial instruments that may support the investment into the IR sector energy efficiency.
4. Formulating and preparing a comprehensive project document for outlining the roadmap for enhancing energy efficiency in the sector, including technical assistance through pilots, policy recommendations and financial instruments mobilization for supporting investment of energy efficiency activities in IR sector while phasing down HFC.

Replicability

By generating regulatory outputs, building technical and institutional capacity, establishing a verified evidence base, and demonstrating viable financing models, the full project will lay the groundwork for replication across Brazil's industrial refrigeration sector and across Latin America more broadly.

Budget and Timeline

A detailed budget is outlined in the table below. The preparatory project duration is estimated to be 12 months. The follow-on energy efficient project is estimated to be implemented in 36 months.

8. Activities to be undertaken for preparation of the investment project and funding requested

Activity	Indicative funding (US $)	Bilateral/implementing agency
Review legal policy frameworks, in coordination with the national authorities, to identify minimum energy performance requirements in the industrial refrigeration sector.	10,000	UNIDO
Review funding options to identify existing financial instruments that will support future upgrades of industrial refrigeration (IR) installations.	10,000	UNIDO
Organize a technical workshop for consultation and engagement with stakeholders on potential ways to support energy efficiency in the sector.	5,000	UNIDO
Prepare a comprehensive project document for energy efficiency improvements in the IR sector.	15,000	UNIDO
TOTAL	**40,000**	

PROJECT CONCEPT – MEXICO

MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL

FUNDING REQUEST FOR THE PREPARATION OF ENERGY EFFICIENCY PILOT PROJECT UNDER DECISION 91/65

Part I: Project information

Project title:	**Preparatory assistance for the pilot project to enhance the energy efficiency of cooling technologies in data centers in Mexico**	
Country:	**Mexico**	
Lead implementing agency:	**UNIDO**	
Implementation period for stage RPR EE:	**12 months**	
Duration of PRP implementation (i.e., time (in months) from the approval of PRP to submission of the project proposal (please specify): 12 months		
Funding requested:		
Agency	**Sector**	**Funding requested (US $)***
UNIDO	**INV - Others**	**30,000 USD**

*Details should be consistent with information provided in the relevant sections below.

Part II: Prerequisites for submission

Item	Yes	No
Official endorsement letter from Government, indicating the specifying roles of respective agencies (where more than one IA is involved)	☒	☐

A. Information required for PRP funding request for investment projects/sector plans as part of Energy Efficiency Funding Window

1. Agency:	UNIDO
2. Sector:	Refrigeration and Air-Conditioning
3. HFC consumption in item #2 reported under country programme data?	☒ **Yes**, please specify reported amount and year: _2023_ ☐ **No**
4. Does the enterprise commit to phase out the HFC consumption associated with the proposed investment project, if approved by the Executive Committee?	☐ **Yes**, please provide support letter _____ ☐ **No** ☒ **N/A**
5. If the project preparation is requested in advance of the KIP, did the Government provide a written commitment that the consumption associated with these investment projects, once approved, will be deducted from the country's starting point, once established?	☐ **Yes** ☐ **No** ☒ **N/A**
6. Please explain briefly how the investment project would relate to the overarching strategy for the country, and when the final KIP will be submitted (decision 87/50(e))	The project will significantly contribute to the energy efficiency improvement in air-conditioning and refrigeration manufacturing and service sectors in Mexico.
7. Background information	
The increasing demand for data storage and processing has driven rapid growth in data center development worldwide. These facilities host critical digital infrastructure and require robust cooling systems to maintain safe operating temperatures for servers and equipment. As the number and scale of data centers grow, their energy consumption and is becoming a major concern. Traditional cooling methods in data centers often rely on energy intensive technologies that use refrigerants with high global warming potential such as hydrofluorocarbons. The Kigali Amendment to the Montreal Protocol promotes the phase down of these substances and reinforces the need to adopt cooling solutions that are energy efficient and	

environmentally responsible. Alternatives such as liquid cooling, evaporative cooling, and free air cooling, along with optimized data center design and server layout, can significantly reduce cooling demand and emissions.

The scale of the sector highlights the relevance of these challenges. The global data center market reached USD 213.6 billion in 2024 and is projected to reach USD 494.5 billion by 2033 with an annual growth rate of 9.29%. A 2025 analysis by McKinsey & Company estimates that by 2030 companies will invest nearly USD 7 trillion in capital expenditures in data center infrastructure. Data centers currently consume close to 3% of the world's electricity and up to 40% of that energy is used for cooling.

Within this context, Mexico is emerging as a key data center hub in Latin America. The country ranks second in the region in market size driven by the rapid adoption of cloud services, which grew by more than 30% in Latin America in 2023.

Mexico's growth is supported by its geographic location, connectivity with the United States and the rest of the region, competitive costs, availability of renewable energy, and a developing ecosystem of specialized talent and supportive policies. The country is expected to receive more than USD 18.1 billion in direct investment by 2030 and indirect investment could exceed USD 54.426 billion in the same period.

Currently, Mexico has 140 identified data centers, reflecting the magnitude of the sector. Of these, 65 are officially registered, and 34 are affiliated with the Mexican Data Center Association (MEXDC). The table below presents the geographical distribution of the registered data centers in the country.

Market/City/State	**Number of Data Centers**
Querétaro	18
Mexico City	15
Guadalajara, Jalisco	8
Nuevo León	7
Mérida, Yucatán	5
Guanajato	2
Toluca, Edomex	2
Hermosillo, Sonora	1
Tijuana, B.C.	1
Leon, Gto.	1
San Luis Potosi	1
Durango	1
Celaya, Gto.	1
Manzanillo, Col	1
Nogales, Sonora	1
Total	**65**

Querétaro is consolidating its position as the primary investment hub, hosting approximately 27% of the registered data centers. At the same time, the market is led by Telmex, which held a 45.3% share of the colocation market in 2023. Its five data centers are located in Querétaro, Monterrey, Mexico City, Guadalajara, and Cancún.

Most air conditioning and refrigeration systems currently used in Mexico's data centers are direct expansion systems that use refrigerants such as HFC 410A and HFC 134a in chillers and large equipment. Newer technologies using R 454B and HFO refrigerants such as R 1234yf and R 1234ze are also emerging as lower GWP alternatives.

Existing data centers in Mexico employ a range of cooling technologies, with a mix of traditional and more modem systems. There is a growing recognition of the need to transition to sustainable cooling solutions to align with international climate commitments, the Kigali Amendment, and Mexico's own sustainability goals. Based on a general desk research, Mexico has a mix of data center types. This includes:

- Smaller facilities associated with telecom companies and local businesses.
- Larger, carrier-neutral data centers.
- Increasing investment in larger-scale and hyperscale facilities (often driven by cloud providers).

As stated before, 34 of the registered data centers are affiliated with the Mexican Data Center Association. According to the association's latest survey, these affiliates account for 235 MW in operation, 74 MW under construction, and more than 1,500 MW announced for the next five years through 2030. This represents an increase of nearly 50% compared to previous projections. This rapid expansion implies a parallel increase in demand for refrigeration

technologies and reinforces the importance of guiding the sector toward low GWP solutions to avoid locking in high emission technologies over the next decade.
Despite this growth, the sector faces structural challenges. Limitations in electrical grid capacity and slow expansion of power distribution infrastructure to hyperscale sites are creating bottlenecks that affect construction timelines and competitiveness. High energy costs, long connection times to the power grid, slow deployment of 5G networks, and environmental concerns related to water use for cooling are additional constraints.
The expansion of the sector will also have an important impact on employment. By 2030 the data center industry in Mexico is expected to generate more than 96,500 jobs across construction and operation phases, including 20,758 direct and 75,812 indirect jobs.
Given the described circumstances, Mexico must ensure that this critical infrastructure is designed and implemented from its inception under high energy efficiency standards and the use of low-GWP refrigerants, ensuring long term sustainability, and guaranteeing full alignment with the country's international environmental commitments.
The adoption of energy-efficient cooling technologies, along with liquid cooling, evaporative cooling, and free air cooling, can significantly reduce the environmental impact of data centers in Mexico. Optimizing data center design and airflow management are also crucial. By embracing sustainable cooling practices, Mexico can support the growth of its digital infrastructure while mitigating environmental impact.
Consequently, this preparatory project is proposed:

Preparatory Project Objectives

The project aims to assess energy consumption and HFC use in Mexico's data center sector through sectoral analysis and site level data collection, support the identification and pre feasibility assessment of four to five candidate sites, develop a project proposal, and evaluate policy alternatives to promote energy efficiency in data centers.

Expected Outcome

The primary outcome of this preparatory project is to deliver a comprehensive and evidence-based project document that serves as a blueprint for synergistic activities in implementing energy efficiency projects while phasing down HFCs to achieve the highest energy efficiency levels in data centers in Mexico.

Key Deliverables

In addition to the Project Proposal, the following key deliverables will contribute to achieving the preparatory project's overarching outcome:

- Sector assessment and pilot design: expert analysis of survey data and identification of gaps in technology and financing.
- Policy alternatives assessment: expert analysis conducted with the national regulatory agency to determine feasible pathways to promote energy efficiency in data centers.

8. Activities to be undertaken for preparation of the investment project and funding requested

Activity	Indicative funding (US $)	Bilateral/implementing agency
Regulatory and policy analysis: Develop a study in coordination with the Secretaría de Energía and through the Comisión Nacional para el Uso Eficiente de la Energía (CONUEE) to analyze policy alternatives to control energy consumption in data centers and define a feasible proposal.	8,000	UNIDO
Sector assessment and pilot design: Conduct sectoral survey and site-level data collection; identify candidate sites; prepare pre-feasibility studies (technical/financial, energy and HFC savings, payback, safety screening); develop a standardized MRV framework aligned with KIP.	12,000	UNIDO
Stakeholder engagement and proposal development: Organize at least one national workshop with data centers; conduct bilateral consultations with suppliers and data centers.	3,000	UNIDO
Drafting a project document: prepare and submit full project proposal with cost components, co-financing commitments, and implementation arrangements. (International consultant)	7,000	UNIDO
TOTAL	**30,000**	

PROJECT CONCEPT – REGIONAL

MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL

FUNDING REQUEST FOR THE PREPARATION OF ENERGY EFFICIENCY PILOT PROJECT UNDER DECISION 91/65

Part I: Project information

Project title:	Preparatory assistance for a regional pilot project to promote energy-efficient HC-290 monobloc units in commercial refrigeration using the cooling as a service business model	
Country:	Six countries in the COMESA[4] region in Africa. Initial participation of Eswatini, Rwanda, Somalia, Uganda, Zambia and Zimbabwe.	
Lead implementing agency:	UNIDO	
Implementation period for stage RPR EE:	2026-2027	
Duration of PRP implementation (i.e., time (in months) from the approval of PRP to submission of the project proposal (please specify): 12 months		
Funding requested:		
Agency	**Sector**	**Funding requested (US $)***
UNIDO	INV - Others	60,000

*Details should be consistent with information provided in the relevant sections below.

Part II: Prerequisites for submission

Item	Yes	No
Official endorsement letter from Government, indicating the specifying roles of respective agencies (where more than one IA is involved)		x

A. Information required for PRP funding request for investment projects/sector plans as part of Energy Efficiency Funding Window

9. Agency:	UNIDO
10. Sector:	Refrigeration
11. HFC consumption in item #2 reported under country programme data?	☒ **Yes**, please specify reported amount and year: 2023 ☐ **No**
12. Does the enterprise commit to phase out the HFC consumption associated with the proposed investment project, if approved by the Executive Committee?	☐ **Yes**, please provide support letter _____ ☐ **No** ☒ **N/A**
13. If the project preparation is requested in advance of the KIP, did the Government provide a written commitment that the consumption associated with these investment projects, once approved, will be deducted from the country's starting point, once established?	☐ **Yes** ☐ **No** ☒ **N/A**
14. Please explain briefly how the investment project would relate to the overarching strategy for the country, and when the	The regional project will make different contributions to the overarching strategies of each country involved. These actions will enable participating countries to meet their obligations under the Kigali Amendment with clear, verifiable outcomes

[4] COMESA, The Common Market for Eastern and Southern Africa (COMESA) is a regional bloc of 21 African nations aiming for economic integration, including Burundi, Comoros, Djibouti, Egypt, Kenya, Libya, Madagascar, Malawi, Mauritius, Rwanda, Seychelles, Somalia, Sudan, Tunisia, Uganda, Eswatini, Ethiopia, DRC, Zambia, and Zimbabwe, plus Eritrea. They work on free trade, customs unions, and easier movement for people and goods, forming a major African market. The project will cover select countries.

final KIP will be submitted (decision 87/50(e))	and climate mitigation through energy efficiency improvements and avoiding emissions of high GWP substances.

- **Background information:**

The refrigeration sector plays a critical role in economic development, public health, and the wellbeing of communities across Africa. From food preservation and security to transportation, pharmaceutical storage and agricultural value chains, reliable refrigeration is indispensable. In the Common Market for Eastern and Southern Africa (COMESA) region, the demand for reliable and sustainable cold chain solutions is rapidly increasing due to population growth, urbanization, and expanding trade networks. Traditional refrigeration methods often fall short due to high energy costs, maintenance requirements, and environmental concerns.

A monoblock refrigeration unit is a self-contained, all-in-one system that combines all major refrigeration components—including the compressor, condenser, and evaporator—into a single housing. This design simplifies installation compared to traditional "split" systems, which require separate indoor and outdoor units connected by extensive piping. Eliminating pipework on site also reduces the risk of leakage and refrigerant emissions. Monoblocks are compact and easy to install, making them suitable for applications like small walk-in coolers, display cases, and refrigerated rooms, where they provide a "plug-and-play" cooling solution.

The environmental impact of traditional low-efficiency refrigeration technologies—especially their contribution to greenhouse gas emissions and ozone depletion—remains a major concern for the COMESA region. Historically, refrigeration units have relied on hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs). There is also a concern that the lack of efficiency standards and strict regulation leads to the proliferation of second-hand units and those based on obsolete technology. HC-290 monoblocs use low GWP refrigerants, are energy-efficient, are suitable for diverse climatic conditions, and are compliant with updated environmental standards.

Cooling-as-a-Service (CaaS) shifts customers from buying equipment to buying outcomes. Farmers, cooperatives, and traders can pay for the cooling they need on a pay-as-you-go or subscription basis. Specialist providers handle design, installation, maintenance, and operations, which can improve reliability and lower technical and financial risk for users. Partnering with established enterprises providing CaaS services enables the deployment of the technology on a wider scale while providing co-financing where needed and project sustainability. CaaS providers operate on a build-own-and rent space to producers' model, or build-own-and buy product from producers for distribution. Both models can be backed by a digitised system providing updated information to users.

The regional aspect of the project provides depth to the energy saving efforts and serves as a basis for increased awareness.

By deploying HC-290 monoblocs through CaaS business models (where applicable) across COMESA cold chains, the project effectively demonstrates innovative technology that meets urgent market needs. This approach,

- Accelerates the adoption of climate-friendly technologies,
- Enables scalable, rapid deployment across diverse markets,
- Supports environmental and economic sustainability.

The project ensures that requested funding is both sustainable and scalable for the future.

Challenges and opportunities

Effective, reliable cold chains are foundational to resilient African food systems. Yet across much of the continent, the high upfront cost of equipment, compounded by volatile energy prices and limited technical capacity, keeps essential infrastructure out of reach for those who need it most.

There are substantial opportunities. By embracing market transformation initiatives and leveraging regional project funding, COMESA countries can save on power generation, reduce both direct and indirect emissions, boost consumer awareness, encourage assemblers and installers to implement best practices, and drive widespread adoption of monobloc units. By introducing HC-290 monoblocs to CaaS solutions, the project offers an innovative answer to the challenges while capitalizing on the opportunities. Users benefit from access to advanced technology without the burden of upfront capital costs, while CaaS providers can maintain and upgrade equipment to ensure optimal performance and compliance with environmental standards. While the main focus is on CaaS, other applications where refrigeration is needed will also be explored.

Key challenges to deploying energy efficient monobloc refrigeration units in the COMESA region include limited technical capacity, regulatory barriers, safety concerns regarding flammable refrigerants, and market hesitancy. These challenges be addressed through:

- Comprehensive training and capacity building;
- Clear regulatory guidelines and standards;
- Rigorous safety protocols and incident response plans;
- Stakeholder engagement and consumer education.

In addition, the implementation of CaaS business models is still quite limited globally and in the region though there are interesting innovative initiatives in COMESA around such business models. CaaS also requires quite careful planning, implementation, and expertise especially in the legal enforcement of contracts. On the other hand, there are many innovative start-ups in this space in Africa dealing with constraints to access to energy solutions and capital thus enabling an innovative environment in the region.

A regional approach to pilot projects offers a multitude of benefits, especially in the context of advancing sustainable technologies. By fostering collaboration across borders, regional initiatives enable the sharing of resources, expertise, and best practices, and facilitating more efficient and impactful project implementation. This approach promotes harmonised standards and regulatory frameworks, reducing barriers to market entry and supporting consistent quality and safety outcomes. In addition, regional pilot projects can leverage economies of scale, making investments more cost-effective and accelerating technology adoption. By engaging a diverse set of stakeholders and tapping into collective innovation, regional efforts enhance resilience and adaptability, ultimately amplifying the capacity to address pressing environmental and economic challenges on a larger scale.

Project Objectives

This preparatory project aims to lay the groundwork for strengthening energy efficiency in the COMESA region's commercial refrigeration sector using HC-290 monoblocs technology application by:

- **Capacity Building:** Provide comprehensive training to key stakeholders, including government officials, industry representatives, and technicians, on MEPS implementation, enforcement, and monitoring.
- **Data Collection and Verification:** Gather and verify data on the current market landscape, energy consumption patterns, and existing appliance stock to inform policy development and future interventions.
- **Inclusivity:** Consult relevant stakeholders
- **Business model application:** Identify a viable business model with the potential of promoting energy efficiency
- **Project Document Development:** Prepare a comprehensive project document outlining a detailed roadmap for enhancing energy efficiency in the commercial refrigeration sector, including technical assistance, financial mechanisms, and policy recommendations.

Expected Outcome

The primary outcome of this project is to deliver a comprehensive and evidence-based **Project Document** that serves as a blueprint for achieving higher energy efficiency levels in the region’s refrigeration sector. This document will be instrumental in securing additional funding and guiding the implementation of comprehensive energy efficiency measures, ultimately leading to the following:

The primary outcome of this project is to deliver a comprehensive and evidence-based project document on the promotion of monobloc HC-290-based units in the COMESA region supported by a viable energy efficiency enhancing business model.

The eventual project will be instrumental in securing additional funding and guiding the implementation of comprehensive energy efficiency measures, ultimately leading to the following:

- Successful demonstration of efficient HC-290 monobloc units in diverse applications, especially related to CaaS solutions;
- Investment Security: The CaaS model transforms cooling infrastructure from a capital expense to an operational one, which can attract more investors and facilitate broader adoption. Sustainability and scalability further ensure that investments remain viable over time;
- Enhanced national and regional policies supporting the use of energy efficiency standards and HC-290 in refrigeration;

- Increased number of trained and certified refrigeration technicians across participating COMESA member states;
- Greater market penetration and, possibly, the introduction of local manufacturing of HC-290 systems;
- Improved stakeholder awareness and consumer confidence in the adoption of energy efficiency units working with natural refrigerants;
- Reduction in greenhouse gas emissions and ozone-depleting substances in the refrigeration sector.
- A study on energy efficient and low GWP alternative technologies for commercial refrigeration in the COMESA region

Key Deliverables of the project document

- *Component 1*: suggestions on steps for the harmonisation of standards and regulatory framework on the safe adoption of HC-290-based units in commercial refrigeration.
- *Component 2*: a description of a pilot project on energy-efficient monobloc HC-290 units with a focus on CaaS solutions for food preservation and optimization of energy and resources.
- *Component 3:* additional input on related technician training and awareness raising activities related to the selected technology and its application.
- *Component 4:* Study on alternative technologies for commercial refrigeration in the COMESA region

Project Activities.

During the Project Preparation.

- Technical data and mapping on existing and planned commercial refrigeration services in participating COMESA countries will be collected for evaluation and determination of the type and number of monoblocs needed to be procured;
- Assessments and consultations with countries will determine the final selection of sites for demonstration of the R290 monoblocs technology
- An awareness and advocacy strategy on energy efficiency savings from monoblocs using Hydrocarbon refrigerants will be discussed and formulated for implementation after the project approval;
- Regional MEPS and safety standards on commercial refrigeration in the COMESA will be evaluated;
- A desktop viability study will be carried out for the CaaS business model application and its energy and resources optimization potentials;
- A comprehensive project document that outlines a clear roadmap for achieving energy efficiency goals in the sector will be developed.

Budget and Timeline

A detailed budget is outlined in the table below. The project duration is estimated to be 24 months.

15. Activities to be undertaken for preparation of the investment project and funding requested

Activity	Indicative funding (US $)	Bilateral/implementing agency
Survey and data collection on current use, energy efficiency levels, and servicing needs of the commercial refrigeration sector	15,000	UNIDO
Consultation workshops with stakeholders in select countries	15,000	UNIDO
Preparation of harmonised energy efficiency standards and adaptation of safety standards	10,000	UNIDO
Drafting a project document	20,000	UNIDO
TOTAL	60,000	

PROJECT CONCEPT – VIET NAM

MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL

FUNDING REQUEST FOR THE PREPARATION OF ENERGY EFFICIENCY PILOT PROJECT UNDER DECISION 91/65

Part I: Project information

Project title:	Preparatory assistance for the pilot project to enhance the energy efficiency of cooling technologies in data centres in Vietnam	
Country:	Vietnam	
Lead implementing agency:	UNIDO	
Implementation period for stage RPR EE:	12 months	
Duration of PRP implementation (i.e., time (in months) from the approval of PRP to submission of the project proposal (please specify): 12 months		
Funding requested:		
Agency	**Sector**	**Funding requested (US $)***
UNIDO	**INV - Others**	**30,000 USD**

*Details should be consistent with information provided in the relevant sections below.

Part II: Prerequisites for submission

Item	Yes	No
Official endorsement letter from Government, indicating the specifying roles of respective agencies (where more than one IA is involved)	☒	☐

A. Information required for PRP funding request for investment projects/sector plans as part of Energy Efficiency Funding Window

Agency:	UNIDO
Sector:	Refrigeration, Air-Conditioning
HFC consumption in item #2 reported under country programme data?	☒ **Yes**, please specify reported amount and year: 2023 ☐ **No**
Does the enterprise commit to phase out the HFC consumption associated with the proposed investment project, if approved by the Executive Committee?	☐ **Yes**, please provide support letter ☐ **No** ☒ **N/A**
If the project preparation is requested in advance of the KIP, did the Government provide a written commitment that the consumption associated with these investment projects, once approved, will be deducted from the country's starting point, once established?	☐ **Yes** ☐ **No** ☒ **N/A**
Please explain briefly how the investment project would relate to the overarching strategy for the country, and when the final KIP will be submitted (decision 87/50(e))	The project will significantly contribute to the energy efficiency improvement in air-conditioning and refrigeration manufacturing and service sectors in Vietnam.

Background information

The increasing demand for data storage, processing, and digital services has led to a rapid global expansion of data centres. These facilities host critical digital infrastructure and require continuous and reliable cooling systems to maintain safe operating conditions for servers and associated equipment. As data centre capacity expands, the associated energy consumption and environmental footprint, particularly from cooling systems, are becoming significant concerns.

In Viet Nam, the data centre sector is experiencing rapid growth, driven by digital transformation, cloud computing, e-government services, and increasing demand for artificial intelligence (AI) infrastructure. The growing digital economy,

combined with increasing connectivity and data demand, is expected to further accelerate the development of data centres across the country.

Due to Viet Nam's hot and humid tropical climate, cooling systems represent one of the most energy-intensive components of data centre operations. In particular, AI-oriented data centres are expected to significantly increase cooling demand due to higher power density, potentially several times higher than traditional configurations.

From a policy perspective, Viet Nam has established a relatively comprehensive regulatory framework, including provisions related to energy efficiency in infrastructure and refrigerant management aligned with the Kigali Amendment. However, effective implementation of these regulations is still ongoing, particularly in emerging sectors such as data centres.

Traditional data centre cooling systems rely heavily on energy-intensive air-conditioning technologies and often use hydrofluorocarbons (HFCs) with high global warming potential (GWP). The Kigali Amendment to the Montreal Protocol requires a gradual phase-down of HFC consumption, creating a strong need to promote energy-efficient and climate-friendly cooling solutions.

1. Global context on data-centre energy demand and cooling transition

Global electricity use by data centres is projected to reach about 945 TWh by 2030, more than double the 2024 level, with cooling and ancillary infrastructure accounting for roughly one fifth of the net increase.[5] Growth is being driven by cloud services, AI workloads and higher-density computing. In practical terms, thermal management now affects how quickly new capacity can be deployed, how efficiently it operates, and how refrigerant-related emissions are managed.

Recent global developments show increasing adoption of clean cooling solutions based on natural refrigerants, including R-744 (CO_2), R-290 and R-600a (hydrocarbons), and R-717 (ammonia). These technologies are increasingly being applied in industrial and commercial cooling applications and are now emerging in the data centre sector. Modular air-cooled chillers in the range of 100–200 kW are particularly suitable for small- and medium-scale data centres and can be deployed in scalable configurations. Early deployments of natural refrigerant-based systems in Europe, North America, and Asia demonstrate their potential for high energy efficiency and low environmental impact.

Within ASEAN, installed data-centre capacity was estimated at about 1.8 GW in 2023 and regional supply is projected to rise sharply by 2030.[6] Singapore, Malaysia and Indonesia are driving much of that growth, while Viet Nam remains an emerging market within the regional system. For tropical economies, cooling strategy is a more immediate constraint than in temperate markets because high ambient temperatures and sustained humidity limit free cooling and increase dependence on mechanical systems and effective airflow control.

Recent developments in the region also illustrate the direction of technological change. Singapore's Green Data Centre Roadmap sets a Power Usage Effectiveness (PUE) target of 1.3 or lower for supported facilities and reports a 2–5 per cent reduction in air-cooling energy use for every 1°C increase in operating temperature.[7] In Thailand, ST Telemedia Global Data Centres commissioned direct-to-chip liquid cooling at STT Bangkok 1 in April 2025 for live AI workloads at rack densities of at least 150 kW, and reported cooling-energy savings of 20–30 per cent relative to traditional air cooling.[8]

2. National regulatory framework, market development and investment pipeline

National regulatory framework

For the purposes of this preparatory assistance, the national framework can be included in two connected parts: refrigerant management and energy performance in digital infrastructure.

On the energy-performance side, Decision No. 1132/QĐ-TTg approving the Digital Infrastructure Strategy through 2025, with an orientation towards 2030, identifies data infrastructure as one of the four pillars of national digital infrastructure and sets objectives for AI-supporting and green data centres.[9] The Strategy requires newly developed data centres to meet green standards aligned with international benchmarks, with PUE not exceeding 1.4, and it encourages investment in

[5] International Energy Agency (IEA), Energy and AI: Energy demand from AI, 2025
[6] HSBC Global Research, Data centre frenzy, real or artificial, September 2024
[7] Infocomm Media Development Authority (Singapore), Charting green growth for data centres in SG / Green Data Centre Roadmap, May 2024
[8] ST Telemedia Global Data Centres, Direct-to-chip liquid cooling showcase in Thailand, April 2025
[9] Decision No. 1132/QD-TTg dated 09 October 2024 approving the Digital Infrastructure Strategy through 2025, with an orientation towards 2030

hyperscale and AI-supporting capacity.

On the refrigerant side, Decree No. 06/2022/ND-CP on the mitigation of greenhouse-gas emissions and the ozone layer protection provides the domestic legal basis for managing controlled substances under the Montreal Protocol and its Kigali Amendment. It sets obligations relating to transition planning, leak monitoring, recovery and reclamation, and the move towards lower-GWP alternatives across the refrigeration and air-conditioning sector. Decree No. 119/2025/ND-CP later amended and supplemented parts of Decree 06/2022 in line with updated international schedules and domestic implementation experience. In addition, Decision No. 496/QĐ-TTg translates these obligations into a national roadmap with substance-specific targets, sector timelines and defined responsibilities.

The investment framework has also become more open. The Law on Telecommunications No. 24/2023/QH15 raised the permissible foreign ownership ceiling in data-centre and cloud-computing segments to 100 per cent from 1 January 2025.[10] This is expected to facilitate additional investment, technology entry and stronger technical standards in the sector.

Market development and investment pipeline

Viet Nam has a growing number of data centres supporting telecommunications operators, government institutions, financial services, and private sector enterprises. The sector includes small- and medium-scale facilities, carrier-neutral data centres, and emerging large-scale facilities driven by cloud service providers.

In early 2025, commercial data-centre capacity in Viet Nam was estimated at around 51 MW in operation, with additional capacity under construction and in the planning pipeline. At national level, aggregate capacity reported in March 2025 was about 182 MW, against a 2030 target of 870 MW.[11] Recent projects such as Viettel Hoa Lac, Viettel Cu Chi and the CMC hyperscale project indicate the scale and pace of development now under way.

Commercial market data points to broad-based expansion rather than growth concentrated in a single niche. The colocation market was valued at USD 148 million in 2024 and is projected to reach USD 673 million by 2030, with around 28 facilities operating, 13 more identified as upcoming and utilized IT power projected at about 400 MW by 2030.[12] By August 2025, 41 active data centres with a combined 221 MW had been identified, with investors including Viettel IDC, VNPT, FPT Telecom, CMC Telecom, NTT DATA and ST Telemedia Global Data Centres.[13] This points to a market that is no longer dominated only by domestic telecom operators. Viet Nam's data-centre cooling market was valued at USD 69.28 million in 2024 and is projected to reach USD 273.05 million by 2034, with a compound annual growth rate of 14.7 per cent over 2025-2034.[14] Current market analysis indicates that room-based cooling still accounts for the largest share of the installed base, while row-based and rack-based approaches are expanding as increasing power densities push beyond the practical limits of conventional room-level air distribution.

The Government is also directly involved in operating data centres. The Ministry of Agriculture and Environment operates facilities in the Northern and Central regions. In particular, an existing data centre in the North is planned for expansion due to increased data demand resulting from the integration of multiple management sectors, including land, agriculture, climate, and hydrometeorology. This creates a strong opportunity for piloting energy-efficient cooling solutions in public-sector facilities with high replication potential.

This public-sector context complements the potential for a private-sector pilot and supports a two-track approach to project preparation, combining a practical government demonstration case with a market-facing pilot pathway.

The exact number and typology of data centres will be confirmed during the project preparation stage. However, the sector is expanding rapidly, and demand for data centre capacity is expected to increase significantly in the coming years.

3. Cooling infrastructure in Viet Nam data centres

The current installed base in Viet Nam includes several cooling architectures, and the most appropriate transition pathway will depend on the configuration in place at each site. Existing data centres in Viet Nam employ a range of cooling

[10] UNCTAD Investment Policy Monitor, Viet Nam allows full foreign ownership in the data centre, cloud computing and OTT sectors, 24 November 2023
[11] VnExpress International, Vietnam's CMC to build USD 250 million hyperscale data centre, 14 July 2025; includes Ministry of Science and Technology figures on 182 MW current capacity and 870 MW target by 2030
[12] Arizton, Vietnam Data Center Colocation Market – Supply & Demand Analysis 2025–2030, updated August 2025
[13] U.S. Commercial Service, Vietnam Data Centers, Market Intelligence, 26 August 2025
[14] Expert Market Research / ResearchAndMarkets, Vietnam Data Centre Cooling Market Size and Share Outlook – Forecast Trends and Growth Analysis Report (2025–2034), June 2025

technologies, including conventional air-conditioning systems and chilled water systems, with varying levels of efficiency and system optimization. The use of advanced cooling technologies and low-GWP refrigerants remains limited. At least three cooling configurations appear relevant to the Vietnamese market:

- **Precision air-conditioning and direct-expansion (DX) room cooling** remain common in smaller, older or modular facilities. For example, the FPT data-centre in Ha Noi has around 1,700 kW of precision cooling arranged in 17 unit clusters, using underfloor air delivery to maintain stable temperature and humidity at outdoor conditions of up to 45°C. In DX cooling systems, refrigerant circulates through indoor cooling coils and associated piping rather than through a central chilled-water loop, which increases flexibility for incremental deployment but also increases the number of refrigerant-containing components and joints that must be monitored and maintained.[15]
- **Chilled-water systems** are generally preferred for larger colocation, telecom and hyperscale facilities where scalability, plant redundancy and long-term expandability matter more. A documented facility in Ho Chi Minh City, designed to Tier III standards and offering 10,000 m² of IT space with capacity for 1,200 racks, uses Vertiv Liebert PCW chilled-water units presented as providing high energy savings and low total cost of ownership.[16] In this architecture, refrigerant charge is concentrated in fewer central chiller packages, which can simplify leak management at circuit level.
- **Liquid cooling** is not yet widely documented in the Vietnamese installed base, but it is directly relevant to AI-ready applications and other higher-density workloads. Direct-to-chip and immersion systems use liquid rather than air as the primary heat-transfer medium inside the facility and place greater emphasis on mechanical integration, commissioning quality and maintenance capability. These solutions may become increasingly relevant where very high heat flux is concentrated at the rack or chip level.

Information on specific refrigerants and system configurations is not consistently available and will be further assessed during the project preparation stage. Initial findings indicate limited application of energy-efficient and environmentally friendly cooling solutions.

There is growing recognition among stakeholders of the need to transition to sustainable cooling technologies to align with national policies and international commitments under the Kigali Amendment.

Refrigerant transition pathways

No quantified national refrigerant inventory is available for the Vietnamese data-centre sector. The available supplier information and published cooling topologies do, however, allow a provisional view of the refrigerants most likely to be present in the installed base.

For DX precision cooling, R-410A appears to be the main reference refrigerant in mission-critical product specifications for the Vietnamese market.[15] With a GWP of 2,088, even moderate annual leakage can materially affect a facility's direct-emissions profile, especially where charge is distributed across many room-level units. For larger chiller plant, HFC-134a (GWP: 1,430) remains the principal legacy reference refrigerant.

Table 1. Indicative refrigerant reference points for data-centre cooling pilot design in Viet Nam

Refrigerant	Reference application (Viet Nam context)	GWP	Safety class / transition implication
R-410A	DX precision cooling (existing installed base)	2,088	A1 - high baseline for leakage accounting in distributed DX units
HFC-134a	Chiller applications	1,430	A1 - retrofit or replacement target in larger plant
R-513A	R-134a replacement; chillers, precision AC	630	A1 (non-flammable) - near-drop-in for R-134a contexts; preserves existing fire-safety protocols
R-454B	R-410A replacement; new-	466	A2L (mildly flammable) - requires

[15] Mitsubishi Electric Vietnam, IT Cooling Systems / DX systems / chillers for data centres; Mitsubishi Electric DX cooling FAQ indicating R410A use; accessed 2026

[16] https://www.vertiv.com/48ecea/globalassets/documents/case-studies/case-study----cmc-telecom.pdf

	build equipment only		new-equipment design and technician re-qualification
HFO-1234ze	Large chillers; purpose-built facilities	<1	A2L - lowest GWP option; suitable only for purpose-built plant
R-717 (Ammonia)	Air-cooled Chiller applications, purpose-built facilities	0	B2L – Natural Refrigeration; toxicity and flammability; suitable only for purpose-built air-cooled plant
R-290 (Propane)	Air-cooled Chiller applications, purpose-built facilities	3	A3 - Natural Refrigeration; high flammability; suitable only for purpose-built air-cooled plant
Sources: U.S. EPA Technology Transitions GWP Reference Table (February 2026); Honeywell Solstice R-513A product information; Chemours Opteon XL41 (R-454B); Mitsubishi Electric Vietnam data-centre portfolio. GWP values per IPCC AR6 100-year characterization. Safety classes per ASHRAE 34.			

The safety classification of these refrigerants is operationally significant because it affects what can be done with existing equipment and what changes in service practice or facility design may be required before a transition can proceed safely. R-513A may be considered for retrofit in compatible chiller platforms, while R-454B, R-717 and R-290 imply additional safety, commissioning and training requirements. For selected applications, the combination of chilled-water plant and direct-to-chip cooling with free cooling by air cooler may also merit assessment as a means of reducing refrigerant use and improving cooling-system energy efficiency.[17]

At present, three broad intervention pathways can be identified for Viet Nam. The most appropriate option will depend on the type of facility, the age and condition of the installed equipment, and the workload requirements of the site:

- **Operational optimisation of existing systems:** improved airflow management, leak-detection upgrades and close-control tuning for legacy DX and older chilled-water facilities. This option can reduce energy use and refrigerant loss without requiring equipment replacement or refrigerant conversion, and it is often the most realistic first step before larger capital measures are considered.
- **Lower-GWP retrofit** is relevant where equipment compatibility and maintenance capability support conversion. In many cases it would involve A1-class options such as R-513A for chiller-plant applications, allowing a meaningful reduction in the direct-emissions profile while largely preserving existing fire-safety and service arrangements.
- **Future-ready system redesign larger, higher-density or AI-supporting facilities:** in these cases, chilled-water plant, liquid cooling and A2L, B2L or A3 refrigerants may imply different safety requirements, commissioning standards, maintenance routines and operator training needs. This option is most relevant to the hyperscale and AI-ready projects now moving through the Vietnamese pipeline. The combination of chilled-water plant and Direct-to-chip cooling with free cooling by air cooler is also a good solution for implementation in reducing use of refrigerants and improving cooling system energy efficiency.

4. Project orientation, barriers, evidence gaps and rationale for preparatory assistance

Project orientation

The project will consider two complementary pilot approaches to address the diverse needs of the data centre sector in Viet Nam.

The first approach focuses on small- and medium-scale data centres, including public facilities, telecommunications infrastructure, and existing data centres requiring upgrades or expansion. These facilities represent a significant share of the current market and offer strong potential for replication. The project will assess suitable cooling technologies, including modular and energy-efficient systems, and identify optimal solutions for retrofit or expansion.

The second approach targets large-scale and private-sector data centres, particularly those incorporating artificial intelligence and high-density computing. These facilities are expected to experience significantly higher cooling demand

[17] Chemours, Opteon™ XL41 (R-454B) product information, accessed 2026

and therefore require advanced and highly efficient cooling solutions. The project will explore opportunities to pilot innovative and low-GWP technologies in collaboration with private sector operators.

Based on initial findings, cooling demand in AI-oriented data centres can increase significantly due to high power density. Piloting advanced, energy-efficient and HFC-free cooling solutions in this segment could therefore have important strategic value. A private-sector partner with concrete demand and willingness to participate would be identified during the later stages of project preparation in order to meet the submission timeline.

Specific pilot sites and partners will be identified during the project preparation stage, based on technical feasibility, willingness to participate, and replication potential.

Challenges and opportunities

- **Technical barriers:** Market expansion is moving faster than the available evidence on actual site-level cooling performance and refrigerant-management practice. New AI-ready projects are also likely to require rack densities, control systems and, in some cases, liquid-cooling capability beyond the present experience of many domestic operators and much of the RAC service sector.
- **Awareness and skills barriers:** Familiarity with lower-GWP refrigerant options, leak-management practice and the operational implications of the Kigali phase-down schedule remains uneven among data-centre operators, facility managers and RAC service technicians in Viet Nam. This is particularly important for A2L, B2L and A3 as well as refrigerants such as R-454B, R-717 or R-290. Safe use in mission-critical environments depends on technicians with the right qualifications, compatible tools and updated service procedures.
- **Financial and investment barriers:** efficiency upgrades, refrigerant conversion, monitoring systems and liquid-cooling readiness all require upfront expenditure. In a market where the immediate commercial driver is capacity growth, operators may have limited incentive to invest in transition unless there are credible local case studies, clear technical guidance and a persuasive operating business case.

At the same time, the country has strong opportunities, including a supportive policy framework, rapid sector growth, government involvement in data centre infrastructure, and access to international expertise and technologies. These factors provide a strong foundation for introducing energy-efficient and low-GWP cooling solutions.

- A national digital-infrastructure strategy with a binding PUE ceiling of 1.4 for new facilities, giving the energy-performance requirement the force of government policy rather than voluntary industry guidance.
- A more open investment regime that permits full foreign ownership in data-centre and cloud-computing segments and may therefore raise the technical level of new entrants and their ability to adopt higher-efficiency cooling configurations from the outset.
- Regional and international cooperation, including experience from other ASEAN markets, equipment suppliers and Multilateral Fund implementation frameworks, which can help combine refrigerant transition with energy-performance improvement and support credible measurement and verification in this sector.

Project objectives

The project will assess energy consumption and HFC use by collecting and analyzing data from selected data centres, provide technical support and technology assessments focusing on energy efficiency improvement, and develop a comprehensive project document based on the findings and outcomes of the preparatory activities.

Expected outcome

The primary outcome of the project is the preparation of a comprehensive and evidence-based project document that serves as a blueprint for implementing energy efficiency measures and reducing HFC use in data centres in Viet Nam.

The resulting proposal is expected to address both a public-sector pilot track and a private-sector pilot track, subject to technical feasibility, partner confirmation and the findings of the preparatory phase.

Project activities

This preparatory assistance project will conduct a comprehensive assessment of existing data centres and provide technical support to enhance energy efficiency while phasing down hydrofluorocarbons (HFCs). The study will identify the current state of cooling technologies and refrigerant use, evaluate alternative solutions, and develop a project proposal.

The assessment will also consider the feasibility of modular air-cooled chillers and other natural-refrigerant-based systems for selected pilot applications, where these are technically appropriate and consistent with safety requirements.

Key tasks include:

a. Data collection and analysis:

- Conduct workshops with selected data centre stakeholders
- Collect data on energy consumption, cooling systems, and refrigerant use
- Assess opportunities for alternative cooling technologies

b. Technical support and technology assessment:

- Provide technical assessments for selected pilot data centres
- Evaluate energy efficiency improvements
- Conduct individual consultations with stakeholders

c. Project document preparation: Develop a full project proposal for submission

Budget and timeline

The total funding requested for project preparation is USD 30,000. The project duration is estimated to be 12 months.

Conclusion

This preparatory project will provide a strong foundation for improving energy efficiency and reducing environmental impact in Viet Nam's rapidly growing data centre sector. By supporting both public and private sector pilot approaches and introducing advanced cooling technologies, the project will enable scalable solutions aligned with national climate objectives and the Kigali Amendment.

Activities to be undertaken for preparation of the investment project and funding requested

Activity	Indicative funding (US $)	Bilateral/implementing agency
Technical support and technology assessment by an international consultant for selected data centre(s) on the energy efficiency enhancement on their current system and analysis of the data received from them, including webinar and individual consultations.	15,000	UNIDO
Workshop for the selected data centre(s)	5,000	UNIDO
Drafting a project document (International consultant)	10,000	UNIDO
TOTAL	**30,000**	

PROJECT CONCEPT – BANGLADESH

MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL

ENERGY EFFICIENCY EXCOM DECISION 94/60 (EE) PROJECT PREPARATION (PRP)

Part I: Project information

Project title:	**Preparatory assistance for the Energy Efficiency Project in the Refrigeration and Air-Conditioning Sector**	
Country:	**Bangladesh**	
Lead implementing agency:	**UNIDO**	
Implementation period for stage RPR EE:	**24 months**	
Duration of PRP implementation (i.e., time (in months) from the approval of PRP to submission of the project proposal (please specify): 24 months		
Funding requested:		
Agency	**Sector**	**Funding requested (US $)***
UNIDO	**INV - Others**	**35,000.00 USD**

*Details should be consistent with information provided in the relevant sections below.

Part II: Prerequisites for submission

Item	Yes	No
Official endorsement letter from Government, indicating the specifying roles of respective agencies (where more than one IA is involved)	☒	☐

A. Information required for PRP funding request for investment projects/sector plans as part of Energy Efficiency Funding Window

1. Agency:	UNIDO
2. Sector:	Refrigeration, Air-Conditioning
3. HFC consumption in item #2 reported under country programme data?	☒ **Yes**, please specify reported amount and year: 2024 ☐ **No**
4. Does the enterprise commit to phase out the HFC consumption associated with the proposed investment project, if approved by the Executive Committee?	☐ **Yes**, please provide support letter ☐ **No** ☒ **N/A**
5. If the project preparation is requested in advance of the KIP, did the Government provide a written commitment that the consumption associated with these investment projects, once approved, will be deducted from the country's starting point, once established?	☐ **Yes** ☐ **No** ☒ **N/A**
6. Please explain briefly how the investment project would relate to the overarching strategy for the country, and when the final KIP will be submitted (decision 87/50(e))	The project will significantly contribute to the energy efficiency improvement in air-conditioning and refrigeration manufacturing and service sectors in Bangladesh and the region.
7. Background information	
Bangladesh's Refrigeration and Air Conditioning (RAC) sector has been expanding rapidly over the past decade, driven by rising household incomes, urbanization, and increasing demand for cooling in both residential and commercial applications. Market studies project continued strong growth, with demand for air conditioners and refrigerators expected to at least double over the next 20–25 years. The Government of Bangladesh has initiated national efforts to guide this growth towards sustainable cooling, including the preparation of a National Cooling	

Action Plan (NCAP) and the progressive introduction of Minimum Energy Performance Standards (MEPS) for household appliances.

The RAC sector in Bangladesh consists of both a substantial local manufacturing base—covering refrigerators, freezers, and room air conditioners—and significant imports of higher-capacity commercial and industrial equipment. In parallel, the servicing sector plays a critical role, supporting both locally produced and imported equipment. As the Government strengthens MEPS requirements and moves to align them with international best practice, it is essential that domestic manufacturers upgrade production capabilities, adopt higher-efficiency refrigerants and components, and maintain competitiveness with global brands. Similarly, building national capacity to extend MEPS into commercial sectors, training technicians to guide consumers in selecting energy-efficient equipment, and raising consumer awareness on environmentally friendly technology will be central to ensuring long-term sustainable market transformation.

As of August 2025, a total of over 20 key manufacturers across Domestic Refrigeration, Commercial Refrigeration, Residential and Commercial Air Conditioning subsectors have been identified for participation in this project. A brief overview of these companies is provided below. In addition, several medium-sized refrigerator and RAC assemblers already applying MEPS labels to their equipment will be further assessed for eligibility during the preparatory phase.

A. Residential AC: Bangladesh's Residential AC sector includes more than 13 key companies, with a mix of large-scale domestic manufacturers and joint ventures with international brands.

1. **Walton Hi-Tech Industries PLC:** Founded in 1977, Walton is Bangladesh's largest home-appliance manufacturer headquartered in Gazipur, operating dedicated RAC production alongside other product lines. Current models primarily use HFC-32, with selected units adopting HC-290 and legacy models using R-410A. Walton is fully Bangladeshi-owned, employs over 30,000 people according to company disclosures, and exports to 40+ countries.
2. **Singer Bangladesh Ltd (Arçelik Group):** With a heritage dating back to 1905 and majority ownership by Arçelik (Turkey), Singer assembles and markets RACs nationwide. Product lines include inverter/non-inverter splits. The company operates a large retail footprint and benefits from international technology transfer, supporting sustainable refrigerant transitions.
3. **Fair Electronics Ltd (Samsung JV):** Established in 2017 in partnership with Samsung, Fair operates a modern facility producing Samsung-branded RACs. Its residential AC lines predominantly use HFC-32, with some earlier models using R-410A. As a licensed JV, Fair integrates high-efficiency components aligned with global OEM specifications.
4. **ElectroMart Ltd / Trade International Industries (Gree Bangladesh):** A long-standing partner of Gree, ElectroMart assembles and distributes Gree RACs domestically. The portfolio includes inverter splits transitioning from R-410A to HFC-32. The company maintains nationwide sales and after-sales networks, supporting market uptake of efficient RACs.
5. **Haier Bangladesh / Butterfly Group:** Through local partnership, Haier RACs are manufactured/assembled in Bangladesh. Newer residential split models primarily use HFC-32, while legacy stock may include R-410A. The collaboration brings OEM process control and energy-efficiency features into local production.
6. **Jamuna Electronics & Automobiles Ltd:** A major local appliance producer manufacturing RACs for the domestic market. Current product literature indicates R-410A and HFC-32 models, with a gradual shift toward higher-efficiency refrigerant platforms. Jamuna's nationwide channels support broad consumer reach.
7. **Minister Hi-Tech Park Electronics Ltd:** A fast-growing Bangladeshi brand producing split RACs at its manufacturing park. Published specifications show R-410A on established lines, with HFC-32 adoption expanding in new launches. Minister's in-house capabilities and retail coverage position it well for MEPS-driven upgrades.
8. **Vision (PRAN-RFL Group):** Part of PRAN-RFL, Vision offers locally produced/assembled RACs serving mass-market needs. Portfolio information indicates R-410A and HFC-32 offerings, with continued movement toward higher-efficiency products.

9. **Elite Hi-Tech Industries Ltd:** A Bangladeshi RAC assembler supplying split units to the domestic market. Publicly available information shows predominant R-410A usage, with HFC-32 introduction underway. Elite previously received Multilateral Fund support under Bangladesh's HPMP, strengthening readiness for future initiatives.
10. **Supreme Air-Conditioning Co.:** A local producer/assembler active across residential and light-commercial AC. Product lines have R-410A models with progressive HFC-32 rollout. Supreme previously benefited from HPMP support, demonstrating capacity to align with sustainable refrigerant transitions.
11. **AC Bazar Industries Ltd:** A domestic assembler and supplier of RACs. The company offers entry-level and mid-range split models using R-410A and HFC-32. AC Bazar's prior involvement under Bangladesh's HPMP indicates experience with Montreal Protocol compliance.
12. **Simplex Corporation:** Local assembler/distributor serving residential AC demand with value-segment offerings. Public information points to R-410A models and increasing availability of HFC-32 variants.
13. **Transcom:** A diversified Bangladeshi group distributing/assembling international RAC brands (e.g., Japanese/other OEMs). Market listings show R-410A and HFC-32 models in the residential segment, supported by nationwide service coverage.

B. Domestic Refrigeration: Bangladesh's Domestic Refrigeration sector comprises 7 prominent companies specializing in the production of refrigerators and freezers:

1. **Walton Hi-Tech Industries PLC:** Walton began domestic refrigerator and freezer production in the early 2000s at its Gazipur facilities and is the largest producer in Bangladesh. The company operates multiple production lines manufacturing refrigerators, freezers, and beverage/display coolers. Walton primarily uses R-600a for domestic refrigerators and freezers, while HFC-134a remains in use for some display coolers. Walton is fully Bangladeshi owned.
2. **Singer Bangladesh Ltd (Arçelik Group):** Singer has been active in refrigerator manufacturing and assembly for several decades, with operations strengthened after its acquisition by Turkey's Arçelik. Its refrigerator production lines primarily use R-600a refrigerant. Singer benefits from international technology transfer through Arçelik and is positioned to support future energy efficiency initiatives.
3. **Fair Electronics Ltd (Samsung JV):** Established in 2017 as a joint venture with Samsung, Fair Electronics manufactures refrigerators and freezers at its state-of-the-art plant in Narsingdi. Its lines predominantly use R-600a. As part of Samsung's global production network, Fair Electronics integrates advanced efficiency and refrigerant technologies consistent with international best practice.
4. **ElectroMart Ltd / Trade International Industries:** A long-standing Bangladeshi company, ElectroMart assembles and distributes refrigerators and freezers under the Gree and Konka brands. The company's refrigerator lines primarily use R-600a refrigerant. ElectroMart has a significant retail and after-sales presence, enhancing its role in the domestic refrigeration market.
5. **Jamuna Electronics & Automobiles Ltd:** A major local producer, Jamuna manufactures refrigerators, chest freezers, and upright freezers at its production facilities. Current lines use R-600a refrigerant. Fully Bangladeshi-owned, Jamuna has expanded rapidly to serve the growing domestic market.
6. **Minister Hi-Tech Park Electronics Ltd:** Minister manufactures refrigerators and freezers as part of its broad home appliance portfolio. Production lines primarily use R-600a refrigerant. Minister has been expanding production capacity in recent years and participates actively in Bangladesh's domestic refrigeration market.
7. **Vision (PRAN-RFL Group):** Vision is part of the PRAN-RFL Group and manufactures refrigerators and freezers in Bangladesh. Its lines predominantly use R-600a refrigerant,

consistent with national market trends. Vision benefits from PRAN-RFL's strong retail distribution channels, ensuring wide consumer reach.

Current Status of MEPS in Bangladesh

- Residential Air Conditioners (RAC): SREDA Standard and Labelling (Appliances & Equipment) Regulation-2018: This regulation is a key policy instrument that sets the framework for prescribing MEPS and labeling appliances based on their energy efficiency. The goal is to provide consumers with information to make informed, energy-efficient choices. MEPS and labelling for RAC units are already established under Bangladesh Standards and Testing Institution (BSTI). However, enforcement remains weak due to the absence of a robust monitoring, reporting, and verification (MRV) framework. The current standards include EER (Energy Efficiency Ratio) and have been updated to reflect SEER (Seasonal Energy Efficiency Ratio) in line with international practice. Energy Efficiency and Conservation Master Plan (EECMP): This master plan, which guides the country's energy efficiency initiatives, includes the promotion of an "EE Labeling Program" to target energy-consuming equipment in residential and commercial sectors
- Domestic Refrigerators: MEPS and labelling for domestic refrigerators and freezers are established and implemented by BSTI. Similar to RAC, the system lacks a comprehensive MRV mechanism to ensure compliance across the market.

Challenges and Opportunities

Improving energy efficiency in Bangladesh's refrigeration and air conditioning (AC) sector faces a complex set of challenges, spanning policy, economics, and consumer behavior. While the government has established a regulatory framework through bodies like the Sustainable and Renewable Energy Development Authority (SREDA) and the Bangladesh Standards and Testing Institution (BSTI), significant barriers impede widespread adoption of more efficient technologies.

- **Policy and Regulatory Challenges**
    - Enforcement of Standards: While Minimum Energy Performance Standards (MEPS) and labeling regulations exist, a key challenge is the consistent and rigorous enforcement of these rules. BSTI is responsible for monitoring the market and phasing out non-compliant products, but this can be a difficult and resource-intensive task.
    - Weak Auditing and Monitoring: For the industrial and commercial sectors, there is a need for proper enforcement of energy audit regulations. Simply generating data on energy use is not enough; there's a need for a system that sets clear, verifiable energy-saving targets and prescribes corrective measures for underperforming businesses.
    - Competing Priorities: The government often faces competing pressures in the power sector, with a primary focus on expanding generation capacity and improving transmission and distribution systems. Energy efficiency, while crucial for demand management and energy security, can sometimes take a secondary role.
- **Institutional Challenges**
    - Limited Capacity: SREDA and other government bodies responsible for promoting energy efficiency may face capacity constraints, including limited funding and a need for more trained personnel to conduct awareness campaigns, energy audits, and market monitoring.
    - Data and Information Gaps: There can be a lack of reliable data on the energy consumption patterns of different appliances and sectors. This makes it difficult to set effective, evidence-based policies and measure the success of energy efficiency initiatives.
- **Technical and Market Challenges**
    - High Upfront Costs: Energy-efficient appliances, particularly those with advanced technologies like inverters, are generally more expensive than their less-efficient counterparts. For many consumers, especially in a developing economy with rising inflation, the initial cost is a major barrier to purchasing a new, efficient appliance.

- Inadequate Incentives: While there is a recognized need for financial incentives to accelerate the transition to efficient appliances, such programs (like low-interest loans, subsidies, or preferential taxation) are not always robust or widely available. In some cases, government policies, like higher import duties on inverter compressors, can even make efficient appliances more expensive.
- Lack of Competitive Market: The market may not have a wide range of high-quality, efficient products, and there can be information asymmetry where consumers are not aware of the true energy performance of different brands.
- Imported vs. Locally Manufactured Products: A significant portion of the appliance market relies on imported components or completely built-up units. Ensuring that these products meet local efficiency standards and are not being "dumped" in the market is an ongoing challenge.

- **Awareness and Behavioural Challenges**
  - Low Consumer Awareness: Despite the existence of energy labels, many consumers in Bangladesh lack a proper understanding of what the ratings mean and how they translate into long-term savings. The immediate focus is often on the purchase price, not the lifetime operating cost.
  - Wastage and Inefficient Use: Even when people purchase efficient ACs or refrigerators, they may not use them in an energy-conscious manner. For example, some people set AC temperatures to very low levels (e.g., below 25°C) without realizing the significant impact on energy consumption.
  - Cultural and Social Norms: In some segments of society, there's a limited demand for chilled or frozen food, especially in the fishery, livestock and dairy sectors. This affects the business case for investing in energy-efficient cold chain solutions and infrastructure.

Bangladesh has significant opportunities to improve energy efficiency in its refrigeration and air conditioning sector, which can help address energy shortages, reduce import bills, and mitigate climate change. The main opportunities lie in a conducive policy environment, technological adoption, and consumer behavior change.

- **Policy and Regulatory Framework**
  - Climate Leadership: With its export to more than 40 countries, Bangladesh can demonstrate its commitment to climate action by taking the lead in energy efficiency in the region.
  - Bangladesh has established the Sustainable and Renewable Energy Development Authority (SREDA) as the lead agency for promoting energy efficiency. This provides a strong institutional foundation. The country's Energy Efficiency and Conservation Master Plan (EECMP) sets clear targets, aiming to reduce energy intensity by 20% by 2030. The following are key opportunities stemming from this framework:
  - Enforcement of MEPS and Labeling: The existing Minimum Energy Performance Standards (MEPS) and labeling regulations (managed by BSTI) can be strictly enforced to phase out low-efficiency appliances from the market. This creates a market for better products and ensures consumers can make informed decisions.
  - Green Building Codes: Implementing and enforcing a robust green building code can significantly reduce the need for mechanical cooling in new constructions. This includes promoting passive cooling design, such as proper insulation, reflective roofing, and natural ventilation, which are highly effective in Bangladesh's climate.

- **Technological Advancement**
  - The market is shifting towards more efficient technologies, offering a significant opportunity for Bangladesh to leapfrog older, inefficient systems.
  - Inverter Technology: Promoting the use of inverter technology in ACs and refrigerators is a major opportunity. Inverter compressors adjust their speed to match the cooling load, leading to substantial energy savings compared to conventional, single-speed compressors.

- Natural Refrigerants: Bangladesh can transition to refrigerants with lower Global Warming Potential (GWP), in line with the Kigali Amendment to the Montreal Protocol. This not only improves energy efficiency but also contributes to global climate goals.
- Local Manufacturing and R&D: Encouraging local manufacturers to produce high-efficiency, energy-saving appliances will reduce import reliance and stimulate local economic growth. The government can provide R&D grants to facilitate the development of new, efficient cooling technologies tailored to the local market.

- **Economic Benefits and Market Transformation**
  - Promoting energy-efficient appliances can stimulate local manufacturing, create jobs, and reduce the cost of electricity for consumers. As the government of Bangladesh has begun to promote energy efficiency through standards and labelling, companies have invested heavily in modernizing their production facilities to meet the growing demand for higher-efficiency products. For example, to manufacture inverter compressors, which are crucial for energy-efficient cooling, companies can expand their factories and invested in new machinery. This expansion directly translates into new job opportunities for technicians, engineers, and factory workers, as well as a wider ecosystem of suppliers and distributors. The widespread adoption of energy-efficient appliances directly benefits consumers by lowering their electricity bills. An energy-efficient refrigerator, for instance, can consume 60% less energy than a conventional one. For a typical household in Bangladesh, this can result in savings of several hundred Taka per month, which adds up to substantial savings over the appliance's lifespan. These savings can then be used by households for other expenses, boosting the local economy.
  - Cold Chain Development: Improving the energy efficiency of the commercial cold chain (refrigerated trucks, warehouses, and retail refrigeration) is a huge opportunity to reduce food waste and save a significant amount of energy, which is particularly relevant for the agricultural sector. This also supports the growth of the economy by improving food security and reducing post-harvest losses.
  - Public Awareness Campaigns: Large-scale campaigns can educate consumers about the direct link between appliance efficiency, electricity bills, and environmental impact. The focus should be on explaining how higher-rated appliances, despite their initial cost, provide a positive return on investment through lower electricity bills over their lifetime

Project Objectives

This preparatory project aims to lay the groundwork for strengthening energy efficiency in Bangladesh's RACHP sector by:

5. **Data Collection and Verification:** Gather and verify data on the current market landscape, energy consumption patterns, imported equipment, and existing appliance stock, including the servicing sector, to inform policy development and future interventions.
6. **Awareness Raising and Sensitization:** Provide comprehensive information to key stakeholders, including government officials, industry representatives, and technicians on energy efficient technologies in both the residential and commercial sectors, as well as on MEPS implementation, enforcement, and monitoring.
7. **Project Document Development:** Prepare a comprehensive project document outlining a detailed roadmap for enhancing energy efficiency in the sector, including technical assistance, financial mechanisms, and policy recommendations while phasing down HFCs.

Expected Outcome

The primary outcome of this project is to deliver a comprehensive and evidence-based project document that serves as a blueprint for synergistic activities in implementing energy efficiency projects while phasing down HFCs to achieve the highest energy efficiency levels in Bangladesh’s RACHP manufacturing sector. This document will be instrumental in securing additional funding and guiding the implementation of comprehensive energy efficiency measures, ultimately leading to the following:

- **Clear Roadmap for Energy Efficiency:** The project document will provide a detailed action plan, encompassing technical assistance, financial mechanisms, and policy recommendations tailored to the specific needs and challenges of the Bangladeshi RAC sector.
- **Enhanced Manufacturing Practices:** By implementing the highest energy efficiency standards, the RAC manufacturing sector in Bangladesh will experience a significant transformation, producing appliances with superior energy performance so that the government can progressively advance current MEPS for domestic appliances and to develop MEPS for commercial air conditioning and refrigeration appliances.
- **Reduced Energy Consumption and Emissions:** The widespread adoption of energy-efficient RAC equipment will result in substantial energy savings at both the household and commercial buildings; yielding significant national levels energy savings. This in turn will contribute to reduced greenhouse gas emissions and a more sustainable energy landscape.
- **Strengthened Local Capacity:** The project activities, particularly the workshops, will empower national policymakers, private sector entities, and other stakeholders with the knowledge and skills necessary to drive energy efficiency improvements in the RAC sector.
- **Investment Attraction:** The well-structured project document, backed by robust collected data and analysis, will serve as a compelling tool for attracting additional funding from investors, enabling the scale-up of energy efficiency initiatives in Bangladesh.
- **Potential for Regional Impact:** Bangladesh's leadership in energy efficiency conversion through this project will create a path for regional impact through supporting neighbouring countries and exporting higher performance equipment by elaborating of the possible regional centre of excellency for the energy efficiency in Bangladesh.

Key Deliverables

In addition to the Project Document, the following key deliverables will contribute to achieving the project's overarching outcome:

- **Comprehensive Survey Data:** Detailed information on the energy efficiency levels of RAC products manufactured and imported in Bangladesh, providing a baseline for future improvements and calculating investment needed.
- **Technical Analysis and Gap Assessment:** Expert analysis of the survey data and identification of key gaps in technology, financing, and policy, including the absence of accredited national testing laboratories and limited MRV capacity, to guide the formulation of targeted interventions.
- **Capacity Building and Knowledge Transfer:** Successful completion of workshops, empowering stakeholders to actively contribute to the advancement of energy efficiency in the sector.

Project Activities

- **Data Collection and Analysis:** Collect and analyse data on the current market, imported equipment, potential beneficiaries, energy consumption patterns, appliance stock, and servicing sector practices to identify key challenges and opportunities.
- **Stakeholder Consultations:** Engage with industry representatives, government officials, and other relevant stakeholders to gather input and ensure broad support for the project document.
- **Awareness raising workshops:** Conduct targeted training sessions on MEPS compliance and best practices for energy-efficient RACHP equipment, targeting both manufacturers and importers, for relevant private and public sector stakeholders.
- **Project Document Development:** Prepare a comprehensive project document that outlines a clear roadmap for achieving energy efficiency goals in the sector.

Budget and Timeline

A detailed budget is outlined in the table below. The project duration is estimated to be 36months.

Conclusion

This preparatory project is essential for building the foundation for successful and sustainable energy efficiency interventions in Bangladesh's refrigeration, air-conditioning, and heat pump manufacturing sector. By investing in data collection and market landscape surveys, capacity building of stakeholders, and possibly building an energy efficiency centre of excellence in Bangladesh, the project can pave the way for significant energy savings, reduced emissions, and a more sustainable future for Bangladesh.

8. Activities to be undertaken for the preparation of the investment project and funding requested

Activity	Indicative funding (US $)	Bilateral/ implementing agency
Survey, Data Collection: Collect data on production capacities, production lines, refrigerant use, HFC consumption, and energy efficiency levels for participating local manufacturers, as well as market and servicing data for imported RACHP equipment. This will lay the foundation for feasibility studies and guide targeted investment strategies.	$5,000	UNIDO
Technical Feasibility Studies: Assess current systems and evaluate the potential to integrate energy-efficient technologies and low-GWP refrigerants for participating companies.	$5,000	UNIDO
Energy Efficiency cost estimation: Develop financing options for energy efficiency upgrades for each company, including potential partnerships with suppliers of additional components.	$5,000	UNIDO
Drafting of Energy Efficiency Project Document	$20,000	UNIDO
TOTAL	35,000	

PROJECT CONCEPT – ECUADOR

MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL

FUNDING REQUEST FOR THE PREPARATION OF ENERGY EFFICIENCY PILOT PROJECT UNDER DECISION 94/60

Part I: Project information

Project title:	Preparatory assistance for the Energy Efficiency Project in the Refrigeration Sector	
Country:	Ecuador	
Lead implementing agency:	UNIDO	
Implementation period for stage RPR EE:	12 months	
Duration of PRP implementation (i.e., time (in months) from the approval of PRP to submission of the project proposal (please specify): 12 months		
Funding requested:		
Agency	**Sector**	**Funding requested (US $)***
UNIDO	**INV - REF**	**30,000.00 USD**

*Details should be consistent with information provided in the relevant sections below.

Part II: Prerequisites for submission

Item	Yes	No
Official endorsement letter from Government, indicating the specifying roles of respective agencies (where more than one IA is involved)	☒	☐

A. Information required for PRP funding request for investment projects/sector plans as part of Energy Efficiency Funding Window

1. Agency:	UNIDO
2. Sector:	Refrigeration
3. HFC consumption in item #2 reported under country programme data?	☒ **Yes**, please specify reported amount and year: 2025 ☐ **No**
4. Does the enterprise commit to phase out the HFC consumption associated with the proposed investment project, if approved by the Executive Committee?	☐ **Yes**, please provide support letter ☐ **No** ☒ **N/A**
5. If the project preparation is requested in advance of the KIP, did the Government provide a written commitment that the consumption associated with these investment projects, once approved, will be deducted from the country's starting point, once established?	☐ **Yes** ☐ **No** ☒ **N/A**
6. Please explain briefly how the investment project would relate to the overarching strategy for the country, and when the final KIP will be submitted (decision 87/50(e))	The project will significantly contribute to the energy efficiency improvement in domestic and commercial self-contained refrigeration manufacturing in Ecuador and the region.
7. Background information	

Sector context and rationale

Ecuador's refrigeration sector includes both a domestic refrigeration segment and a commercial self-contained refrigeration segment, which present different manufacturing, market, and regulatory conditions. The domestic segment is more structured in terms of product typology and national regulation, while the commercial self-contained refrigeration segment is more heterogeneous in equipment configuration, market structure, and manufacturing conditions. This distinction is relevant because the technical pathways for improving energy performance, and the regulatory conditions required to sustain such improvements, are different for the two segments.

For domestic refrigeration equipment, Ecuador has an established national framework through RTE INEN 009 (1R) and RTE INEN 035 (1R), which provide the basis for product conformity, energy performance, test methods, and labelling. However, while this framework provides a national basis for compliance, it is not yet fully comparable to the technical benchmarking and validation frameworks required for broader alignment with international standards and future market expansion. The enterprise indicates that, although it complies with the regulations and market requirements currently applicable to its products, additional strengthening will be required to align testing and validation capacity with standards such as IEC 62552:2015 and NOM-015.
In addition, the practical effect of the existing domestic framework is constrained by enforcement limitations. The enterprise identifies that limited market control over imported products reduces the effective application of MEPS, weakens the capacity of the existing framework to drive technological upgrading, and creates unequal competitive conditions in the market. Under these conditions, the market tends to align with minimum compliance rather than moving toward higher-efficiency differentiation.
The situation is different in the commercial self-contained refrigeration segment. Ecuador does not currently have an equivalent regulatory framework of comparable maturity for the energy performance of this category of equipment. In addition, part of the market is supplied through smaller-scale artisanal assembly of self-contained equipment with non-standardized configurations, which makes it more difficult to apply a uniform regulatory framework comparable to that used for domestic appliances. This has limited the development of a more structured MEPS-based approach for commercial self-contained refrigeration and makes future regulatory development more complex from both technical and market-enforcement perspectives

Industrial profile of INDURAMA
INDURAMA S.A. is the main industrial manufacturer in Ecuador's locally produced refrigeration sector. Established in 1972, the company operates its manufacturing plant in Cuenca, Ecuador, and employs approximately 1,400 workers. The enterprise manufactures both domestic and commercial self-contained refrigeration equipment locally, including top-mount domestic refrigerators, glass-door commercial display cabinets, and chest freezers. Its installed production capacity is approximately 175,000 units per year. Actual production reached 168,000 units in 2023, 166,000 units in 2024, and 193,000 units in 2025.

Its market orientation is predominantly domestic, with approximately 98 per cent of sales directed to the Ecuadorian market and 2 per cent to export markets. The company estimates that it holds around 50 per cent of the national top-mount refrigerator market and approximately 43 per cent of the overall national refrigeration market, considering all refrigeration categories. This market position is particularly relevant for the proposed project, as any improvement in the energy performance of INDURAMA's product portfolio would have a meaningful effect on the efficiency profile of locally manufactured equipment.

The enterprise operates two production lines, which converge into a common refrigerant charging and laboratory testing line. The manufacturing platform is semi-manual, with automated stages in polyurethane foaming, cabinet roll-forming and bending, and door injection. The assembly process also includes automatic line progression and a quality-control carousel in which products are tested prior to final packaging. The current assembly line was installed in 2015, with further upgrades in 2024, including improvements to vacuum pumps and automatic data-analysis systems, while the polyurethane foaming equipment dates from 2009. The existence of two integrated production lines is relevant because it allows the project to assess upgrading opportunities separately for the domestic refrigeration line and the commercial self-contained refrigeration line, while also considering shared process and testing requirements within the same industrial platform

The current product portfolio includes both domestic and commercial self-contained refrigeration equipment manufactured locally. Domestic refrigeration products are based on R-600a, while the commercial line is based on R-290. The domestic segment also shows a more structured basis for energy performance classification, while the commercial segment remains more heterogeneous in design and market conditions.

Previous technology conversion experience
INDURAMA has previous experience in implementing technology conversion processes under the framework of the Montreal Protocol and has received technical and financial assistance from the Multilateral Fund. The company previously benefited from support for the conversion of its foam system and for the transition of its refrigeration manufacturing processes from HFC-based technologies to hydrocarbon refrigerants.

Building on this experience, INDURAMA can pursue additional improvements in the performance of locally manufactured refrigeration equipment. With the refrigerant transition already advanced, further action can focus on improving energy performance through the optimization of key components and manufacturing processes, including compressors, heat exchangers, insulation systems, controls, and testing capacity.

Energy-efficiency baseline and technological opportunities

INDURAMA reports compliance with applicable minimum energy-performance requirements and operates an in-house testing laboratory. The enterprise reports that testing is currently carried out according to NTE INEN 2206 and NOM-022, depending on product type and destination market, and that certifications available include NTE INEN 22006, RETIQ, and RTS, depending on the type of equipment and country of destination. Over the last five years, the enterprise estimates that product energy performance has improved from COP 1.2 to COP 1.6, equivalent to an improvement of approximately 33 per cent.

At the same time, the enterprise reports that, although its current laboratory configuration is adequate for the regulations and markets in which it currently participates, it is not yet sufficient for broader alignment with international and external-market standards. For future market expansion, the company identifies the need for repowering and expanding testing capacity toward IEC 62552:2015 and NOM-015. This is a central point for the project, because it indicates that the current national compliance platform is not yet fully equivalent to the technical validation framework required for wider international comparability and future market expansion.

For the commercial self-contained refrigeration line, the enterprise currently relies on the applicable standards required for the markets in which those products are placed. This confirms that the company already has a testing and compliance basis for its current operations, but also that a broader upgrading strategy will require stronger testing and validation capacity to support future product improvement and external benchmarking.

The enterprise has also identified specific technological pathways for further efficiency improvement. These include the incorporation of compressors with COP 1.8, evaporators with UA-29, condensers with UA-21, improved thermal conservation through increased polyurethane insulation thickness, and further development of controls and connectivity features to support product optimization. These opportunities are relevant for both the domestic refrigeration line and the commercial self-contained refrigeration line, although their technical application and validation requirements may differ between the two categories, which reinforces the need for a differentiated assessment within the same manufacturing facility.

Economic and market barriers

The main barrier to improving the energy performance of locally manufactured refrigeration equipment is economic. The Ecuadorian market remains highly price-sensitive, and purchasing decisions are driven primarily by upfront cost rather than lifecycle operating savings. The enterprise reports an average production cost of USD 258.89 per unit and an average sales price of USD 352, while the technological improvements under consideration would imply an estimated 10 per cent increase in product cost. The company also indicates that the market does not currently recognize higher efficiency through a corresponding price premium. Under these conditions, the incorporation of higher-efficiency technologies faces structural commercial constraints even where technical opportunities are available.

Additional barriers arise from the dependence on imported enabling technologies, particularly compressors, electronic controls, and other components associated with higher-efficiency product platforms. This limits the manufacturer's ability to control costs, availability, and the pace of technological upgrading. The enterprise also identifies the need to strengthen engineering capacity in areas such as system-level optimization, polyurethane application, CFD-based analysis, and advanced simulation, in order to achieve efficiency gains through integrated redesign rather than through component substitution alone.

Regulatory framework for domestic and commercial self-contained refrigeration

Ecuador has an established regulatory framework for domestic refrigeration equipment through RTE INEN 009 (1R) and RTE INEN 035 (1R), which provide the basis for product conformity, energy performance, test methods, and labelling. However, while this framework provides a national basis for compliance, it is not yet fully comparable to the technical benchmarking and validation frameworks associated with broader international standards. In line with this, the enterprise indicates that its current laboratory configuration is adequate for the regulations and markets currently served, but that additional strengthening will be required to align testing and validation capacity with standards such as IEC 62552:2015 and NOM-015 for future market expansion.

At the same time, the effective application of the existing domestic framework is constrained by enforcement limitations. The enterprise indicates that limited post-market control over competing products, particularly imported equipment, reduces the ability of existing MEPS to function as effective drivers of market transformation, weakens

incentives to move beyond minimum compliance, and creates unequal competitive conditions for manufacturers investing in higher-efficiency technologies. Under these conditions, the presence of regulations alone does not necessarily ensure effective implementation or sustained improvement in product efficiency.
The situation is different in commercial self-contained refrigeration. Ecuador does not currently have an equivalent regulatory framework of comparable maturity for the energy performance of this category of equipment. In addition, part of the market is supplied through smaller-scale artisanal assembly of self-contained equipment with non-standardized configurations, which makes it difficult to apply a uniform framework comparable to that used for domestic appliances. This has limited the development of a more structured MEPS-based approach for commercial self-contained refrigeration and makes future regulatory development more complex from both technical and market-enforcement perspectives.

Project objectives
This preparatory project aims to lay the groundwork for improving energy performance in locally manufactured domestic and commercial self-contained refrigeration equipment in Ecuador by:

- **Data Collection and Verification:** Gather and validate data on the current market, enterprise profile, manufacturing configuration, product portfolio, testing practices, and technical opportunities for improving the energy performance of manufactured refrigeration equipment. The work will also assess current performance levels, identify relevant component-level and system-level opportunities, and estimate associated incremental costs, considering commercial factors and the characteristics of the Ecuadorian market.
- **Selection of Opportunities:** Identify and prioritize the most cost-effective options for improving the energy performance of INDURAMA's domestic and commercial self-contained refrigeration product lines, including opportunities related to compressors, heat exchangers, insulation systems, controls, and related manufacturing and testing requirements.
- **Review of Existing MEPS and Regulatory Framework:** Review the existing energy-efficiency and labelling requirements applicable to domestic refrigeration equipment in Ecuador, including the current regulatory framework and existing MEPS-related provisions, and assess the technical and market conditions for future regulatory development in the commercial refrigeration segment, where no equivalent framework is currently in force.
- **Project Document Development:** Prepare a comprehensive investment project document to improve energy performance in the refrigeration manufacturing sector in Ecuador, including the technical rationale, estimated costs, implementation requirements, and regulatory considerations relevant to future investment support under the Multilateral Fund.

Expected outcome
The primary outcome of this project is to deliver a comprehensive, evidence-based investment project document to improve energy performance in Ecuador's refrigeration manufacturing sector. The document will detail specific opportunities for enhancing energy performance in INDURAMA's domestic and commercial self-contained refrigeration product lines, including baseline information on current technical characteristics, identified upgrading options, and indicative costs for cost-effective technological improvements.

Key deliverables
In addition to the project document, the following deliverables will support the achievement of the project's objectives:

- **Comprehensive Baseline Data:** Detailed information on INDURAMA's manufacturing profile, product portfolio, current energy-efficiency performance, testing practices, market participation, and relevant production characteristics for domestic and commercial self-contained refrigeration equipment.
- **Technical Analysis and Gap Assessment:** Expert evaluation of the current product platforms and manufacturing configuration to identify gaps in technology, engineering capacity, testing capability, and financing, and to define targeted opportunities for improving energy performance.
- **Assessment of Cost-Effective Upgrading Options:** Identification and prioritization of feasible technological improvements, including high-efficiency compressors, optimized heat exchangers, improved insulation systems, enhanced controls, and related testing and validation requirements.
- **Technical Assistance to Review Existing MEPS and Regulatory Conditions:** Assessment of the existing domestic refrigeration energy-efficiency and labelling framework, including the applicable regulatory instruments, and analysis of the technical and market conditions relevant to future regulatory development in the commercial refrigeration segment.

- **Investment Project Document:** A complete project document setting out the baseline situation, identified opportunities, cost implications, implementation approach, expected benefits, and supporting justification for future investment support.

Project activities

- **Data Collection and Analysis:** Collect and analyse data of INDURAMA, including product categories, production characteristics, refrigerant use, current energy-efficiency levels, key components, testing practices, and market participation in domestic and commercial self-contained refrigeration. The activity will also include a review of the existing regulatory framework applicable to domestic refrigeration equipment, including existing energy-efficiency and labelling provisions, and an assessment of the regulatory and market conditions affecting the commercial self-contained refrigeration segment.
- **Technical Assessment and Stakeholder Consultations:** Assess the current product platforms and manufacturing configuration to identify feasible options for improving energy performance in locally manufactured domestic and commercial self-contained refrigeration equipment. This will include the evaluation of higher-efficiency components and system improvements, such as compressors, heat exchangers, insulation systems, controls, and related testing requirements, as well as consultations with the beneficiary enterprise and relevant national counterparts to validate findings and align the scope of the proposed intervention.
- **Project Document Development:** Prepare the investment project document, including the technical baseline, identified upgrading opportunities, assessment of technical feasibility, indicative costs, implementation requirements, and the review of existing MEPS and regulatory conditions relevant to the proposed intervention.

Budget and Timeline

A detailed budget is outlined in the table below. The project duration is estimated to be 12 months.

8. Activities to be undertaken for preparation of the investment project and funding requested

Activity	Indicative funding (US $)	Bilateral/implementing agency
Data Collection and Analysis: Collect and analyse data on the current manufacturing profile of the beneficiary enterprise, including product categories, production characteristics, current energy-efficiency levels, key components, testing practices, market participation, and the existing regulatory framework applicable to domestic refrigeration equipment.	$10,000	UNIDO
Technical Assessment and Stakeholder Consultations: Assess the current product platforms and manufacturing configuration in order to identify feasible options for improving energy performance in locally manufactured domestic and commercial self-contained refrigeration equipment, including compressors, heat exchangers, insulation systems, controls, and related testing requirements; and conduct consultations with the beneficiary enterprise and relevant national counterparts to validate findings and refine the scope of the proposed intervention.	$10,000	UNIDO
Project Document Development: Prepare the investment project document, including the technical baseline, identified upgrading opportunities, assessment of technical feasibility, indicative costs, implementation requirements, and the review of existing MEPS and regulatory conditions relevant to the proposed intervention**.**	$10,000	UNIDO
TOTAL	**30,000**	

PROJECT CONCEPT – MEXICO

MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL

FUNDING REQUEST FOR THE PREPARATION OF ENERGY EFFICIENCY PILOT PROJECT UNDER DECISION 94/60

Part I: Project information

Project title:	**Preparatory assistance for the Energy Efficiency Project in the Refrigeration Sector**	
Country:	**Mexico**	
Lead implementing agency:	**UNIDO**	
Implementation period for stage RPR EE:	**12 months**	
Duration of PRP implementation (i.e., time (in months) from the approval of PRP to submission of the project proposal (please specify): 12 months		
Funding requested:		
Agency	**Sector**	**Funding requested (US $)***
UNIDO	**INV - REF**	**$45,000**

*Details should be consistent with information provided in the relevant sections below.

Part II: Prerequisites for submission

Item	Yes	No
Official endorsement letter from Government, indicating the specifying roles of respective agencies (where more than one IA is involved)	☒	☐

A. Information required for PRP funding request for investment projects/sector plans as part of Energy Efficiency Funding Window

1. Agency:	UNIDO
2. Sector:	
3. HFC consumption in item #2 reported under country programme data?	☒ **Yes**, please specify reported amount and year: _2023_ ☐ **No**
4. Does the enterprise commit to phase out the HFC consumption associated with the proposed investment project, if approved by the Executive Committee?	☐ **Yes**, please provide support letter _____ ☐ **No** ☒ **N/A**
5. If the project preparation is requested in advance of the KIP, did the Government provide a written commitment that the consumption associated with these investment projects, once approved, will be deducted from the country's starting point, once established?	☐ **Yes** ☐ **No** ☒ **N/A**
6. Please explain briefly how the investment project would relate to the overarching strategy for the country, and when the final KIP will be submitted (decision 87/50(e))	The pilot project will significantly contribute to maintain and/or enhance the energy efficiency improvement in refrigeration manufacturing and service sectors in Mexico while facing out HFCs.
7. Background information	
Mexico's refrigeration manufacturing sector plays a key role in the country's implementation of the Kigali Amendment. Under the Kigali Amendment to the Montreal Protocol, Mexico is in the implementation stage of its Action Plan for the gradual reduction of HFC consumption and is in a position to meet the first reduction target of 10% by 2029. The RAC sector in Mexico includes both manufacturing and import activities, in addition to a large servicing sector. As the Government moves towards stricter Minimum Energy Performance Standards (MEPS), it is imperative that the	

local manufacturing sector is upskilled to remain competitive with international manufacturers. It is equally important to build local capacity to support the expansion of MEPS in commercial sectors, ensuring that technicians are capable of providing expert advice to consumers on the selection of energy-efficient equipment.

Currently, Mexico has a total of 35 manufacturers in the residential air conditioning, domestic refrigeration, commercial air conditioning, and domestic and commercial refrigeration sectors, 12 of which are domestically owned. Five companies in the refrigeration sector have expressed interest in participating in improving the energy efficiency of their manufactured equipment. A brief overview of each company is provided below. Additionally, those already applying MEPS labels to their equipment will have their eligibility assessed during the preparatory activities.

1. **Domestic Refrigeration:** Mexico's Domestic Refrigeration sector comprises 1 company specializing in the production of refrigerators:

- **Mabe:**

Mabe Plant, located in Celaya, Guanajuato, and Mabe Compressors Plant located in San Luis Potosí, is a leading Mexican company in white goods products in Latin America, including domestic refrigerators, with more than 75 years in the market.
In 2021, the project to convert a domestic refrigerator manufacturing plant from HFC-134a to isobutane (R-600a), along with the conversion of a compressor manufacturing plant, was completed. This project enabled the elimination of HFC-134a across six production lines and improved energy efficiency by approximately 16% through component modifications, in compliance with NOM-015.
A total of 198.0 metric tons (283,140 tCO_2-eq) of HFC-134a were eliminated. The Celaya plant is currently interested in implementing further energy efficiency improvements in its manufacturing equipment. The aim is to support Mabe in technological innovation to increase energy efficiency in its refrigeration equipment, different to previous investments made with this company.

2. **Commercial Refrigeration:** Mexico's Commercial Refrigeration sector is composed of the following leading companies:

- **Imbera**

Imbera is the largest manufacturer of commercial refrigeration appliances in Mexico and is 100% Mexican-owned. Imbera began operations in the commercial refrigeration equipment manufacturing line in 1998. The company was interested in converting to HC-based technology because of the demand for environmentally friendly, high-efficiency coolers among both multinational and domestic beverage enterprises. The company operated two plants:

- Plant 1 Imbera: located in the center of the country in Querétaro. The production capacity is 98 units/hour, and in 2017 the plant produced 35,000 appliances per month. Plant 1 exports an average of 16% of its production to non-Article 5 countries.
- Plant 2 Fersa (now called Torrey), Located in the north of the country in Nuevo León, the production capacity is 14 units/hour, and in 2017 it produced an average of 1,830 appliances per month. Plant 2 exports 7% of its production to non-Article 5 countries.

In 2022, Imbera completed the conversion from HFC-134a and R-404A to propane (R-290) and isobutane (R-600a), eliminating 51.73 mt of HFC-134a and 4.31 mt of R-404A.
Considering the upcoming update of NOM-022 regulating energy efficiency in self-contained commercial refrigeration equipment, the company is interested in improving energy efficiency and testing procedures in accordance with MEPS.

- **Torrey (before called Fersa)**

Established in 1960. For additional information, refer to the information provided under Imbera.

- **Friocima**

Friocima is a 100% Mexican company located in Celaya, Guanajuato, with 25 years of experience. It manufactures commercial refrigeration equipment for the Mexican market using HFCs across three subsectors: centralized systems (for supermarkets), condensing units (for businesses), and self-contained units (such as freezers, display cases, and plug-in beverage coolers). Friocima's products are sold primarily in the Mexican market.

In 2022, Friocima's total production was 14,405 units, including ice cube machines (7,376), freezers (5,257), upright refrigerators (1,246), chest freezers (511), and vertical freezers (15). The conversion of commercial refrigerator manufacturing from HFC-134a to propane was completed in early 2025, eliminating 5.18 metric tons (t) (7,407 CO2 eq) of HFC-134a that were consumed annually in Friocima's commercial refrigerator production line.
In addition, Friocima assumed the energy efficiency component during the conversion, estimated at US$80,000, with its own funds; however, considering the upcoming update of the Official Mexican Standard (MEP) NOM-022 that regulates energy efficiency levels in self-contained commercial refrigeration equipment, the company is interested in increasing the energy efficiency of the equipment it manufactures.

- **Bohn Mexico, Planta Merida and Queretaro**

Bohn Mexico is a Mexican company that began operations in 2024. manufactures commercial and industrial refrigeration equipment at its Mérida plant, meeting the needs of the cold chain. It offers solutions ranging from condensing units and evaporators using synthetic and natural refrigerants such as CO2 and NH3.
Bohn is leader in the manufacture of remote condensers, racks, coils for any application, ice makers, connections, and refrigerated transport equipment. They meet the refrigeration needs of agricultural, fishing, and meat products. The company boasts state-of-the-art research laboratories and cutting-edge technology.
The company has demonstrated technical and institutional capacity to implement refrigerant conversions and is well-positioned to drive improvements in energy efficiency. Their prior experience with phase-out projects for ozone-depleting substances (ODS) and the transition to low global warming potential alternatives, in ongoing collaboration with national authorities, underscores their readiness for this next step.

- **Criotec**

Criotec is a leading Mexican company in commercial refrigeration, founded in 1986 in Santa Catarina, Nuevo León. It specializes in the design and manufacture of upright refrigerators, beverage coolers, upright freezers, freezers, display cases, and refrigerated units. Some of its main clients include Coca-Cola, Oxxo, 7-Eleven, PepsiCo, and Grupo Modelo.
The company has focused on technological innovation and increasing the energy efficiency of its equipment. For this reason, the aim is to develop a project that contributes to technological innovation and energy efficiency in its equipment.

- **Metalfrio**

For 60 years, Metalfrio Solutions has delivered innovation, quality, and reliability to the world's leading food and beverage brands and their businesses. It is located in the city of Celaya, Guanajuato.
Metalfrio Solutions is a global company, originally from Brazil, and is among the world leaders in the commercial refrigeration sector. With a comprehensive product portfolio, it meets the needs of a wide variety of establishments, bringing you and your business the best technology, durability, and lowest energy consumption. The company manufactures beverage coolers, freezers, and display cases.
The development of a project focused on innovation, research, and development of products with greater energy efficiency and quality is being considered.

- **Metaplus**

Metaplus is a Mexican company, located in Mérida, Yucatán with 40 years in the market. It provides refrigeration solutions through the design, manufacturing, and marketing of commercial ice coolers and freezers for the food and beverage industry, utilizing its own technology and adhering to rigorous environmental policies. It has nationwide coverage and exports to the Caribbean, South America, Central America, and North America.
It offers high-quality products. This presents a great opportunity to strengthen innovation and equipment development, particularly in energy efficiency.

- **Refrigeración Ojeda**

Founded in 1948 in Mexico City, the company began as a small refrigerator repair workshop and gradually evolved into a national enterprise dedicated to the design, manufacture, and commercialization of commercial and industrial refrigeration equipment. It currently has more than 70 years of presence nationwide. The equipment it manufactures includes refrigerated display cases, horizontal freezers, vertical freezers, vertical refrigerators, and open refrigerated display cases.
The development of a project focused on innovation, research, and development of products with greater energy efficiency and quality is being considered.

- **Grupo TECSIR**

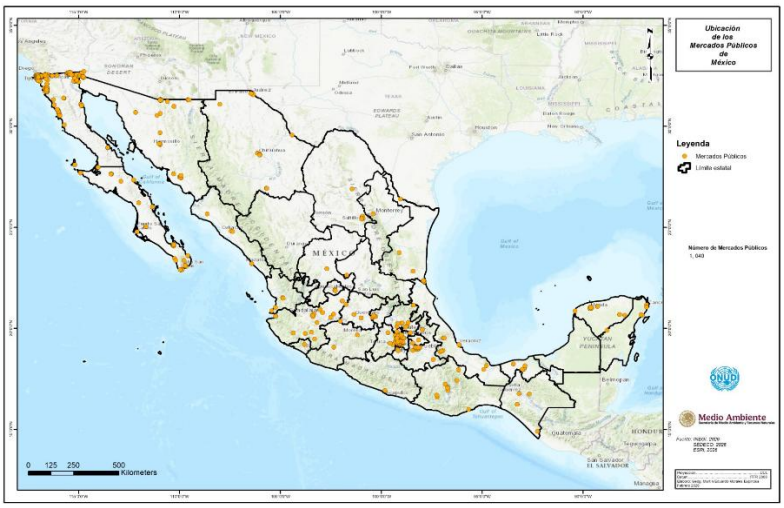
TECSIR Group is a Mexican company, founded in the 1980s. Its headquarters are in Apodaca, Nuevo León, and it has a national presence. It specializes in industrial refrigeration and air conditioning (HVAC), manufacturing chillers (water chillers) and thermal systems for industrial processes, heat pumps, heat recovery systems, and heat exchangers.

Its business focus is on energy efficiency, reduced operating costs, and sustainability (heat recovery, lower CO_2 emissions). The company is developing a project focused on the engineering and design of systems with greater energy efficiency and quality.
There are 12 other transnational companies in the RAC sector that manufacture equipment in Mexico.

3. Informal assembly in commercial refrigeration

Mexico has a high presence of food markets where the assembly and installation of condensing unit systems is carried out in an artisanal or improvised manner, mostly by informal technicians. This understudied segment of the informal assembly sector is largely based on the reuse of components. Research from the NOU indicates that public markets have significant energy consumption, with the average energy use of a typical market reaching 531,360 kWh per year.

The following image shows the mapping of public markets in Mexico and demonstrates a concentration of these markets in the Central Region, particularly in Mexico City, Toluca, Puebla, Pachuca, and Tlaxcala.



There is a need to conduct a study to better understand this informal sector, focused on the Central Region, and identify alternatives to improve assembly practices that affect energy efficiency in food markets.

Challenges and Opportunities

Mexico has made remarkable progress in developing Energy Efficiency Management Systems (MEPS) for refrigeration and air conditioning equipment, with eight MEPS for this sector. However, some challenges remain:

- **Technical Barriers:** The MEPS update for RAC equipment requires a robust MRV and testing methods infrastructure for conformity assessment for all equipment. Additionally, technicians, engineers, and product development teams require specific training to design, test, and validate high-energy-efficiency units.
- **Awareness and Compliance:** Raising awareness among manufacturers, importers, technicians, and consumers about the benefits of energy-efficient appliances and ensuring compliance with MEPS is crucial.
- **Inter-institutional coordination**: Effective coordination with national institutions, including the Ministry of Energy and relevant standards bodies, is required to harmonize energy efficiency standards and labeling policies, which can present institutional and procedural challenges during implementation.
- **Financial Constraints:** Access to financing is essential for capacity building, data collection, and consumer awareness.
- **Efficiency Gap Assessment in commercial refrigeration systems:** Energy authorities and the national electric utility currently face high electricity demand in these key regions, but they just have aggregated consumption data, limiting visibility into the actual energy performance of RAC systems. Specifically, there is a lack of disaggregated information on the efficiency of condensing units (UCs) and centralized refrigeration systems.

However, these challenges also present opportunities

- **Energy savings and emissions reduction:** Improving minimum energy use standards (MEUS) in the residential sector and implementing and enforcing MEUS in the commercial sector can generate substantial energy savings and reductions in greenhouse gas emissions, especially with effective reporting, verification, and commissioning (RV) mechanism.
- **Economic benefits:** Promoting energy-efficient appliances can stimulate local manufacturing, create jobs, and reduce electricity costs for consumers.
- **Climate leadership:** Mexico has demonstrated its commitment to climate action by leading the way in energy efficiency in the region and is firmly committed to continuing to work on updating the applicable MEPS for RAC equipment.

Within this context, this preparatory funding request seeks to define practical and cost-effective pathways for improving energy efficiency in parallel with refrigerant transitions within Mexico's refrigeration manufacturing sector. The initiative will examine opportunities for the introduction of advanced components, including high-performance compressors, heat exchangers, and control systems, while assessing technical feasibility, economic implications, and policy alignment. Close coordination with national institutions, including the Ministry of Energy and relevant standards bodies, will be necessary to ensure harmonization of energy efficiency standards and labeling policies and to inform the development of a comprehensive project proposal for submission to the Multilateral Fund.

Project Objectives

This preparatory project aims to lay the groundwork for improving energy efficiency while phasing down HFCs in the refrigeration sector by:

- **Data Collection and Verification: Gather and validate data on the current market, enterprise landscape, and technical opportunities for improving equipment energy efficiency. Calculate additional component costs, considering commercial factors and the characteristics of domestic companies.**
- **Selection of Opportunities:** Identify and prioritize the most cost-effective options for component upgrades in each company based on the identified opportunities.
- **Project Document Development:** Prepare a comprehensive project document to enhance energy efficiency in the Refrigeration sector.

Expected Outcome

The primary outcome of this preparatory project is to deliver a comprehensive, evidence-based project document to improve energy efficiency levels while phasing down HFCs in Mexico's RAC manufacturing sector. The document will detail specific opportunities for enhancing energy performance for each of the selected manufacturers, including baseline data on current energy efficiency levels and a proposal with costs for cost-effective technological upgrades. This document will be instrumental in securing additional funding and guiding the implementation of comprehensive energy efficiency measures, ultimately leading to the following:

- **Clear Roadmap for Energy Efficiency: The project document will provide a detailed action plan, encompassing technical assistance, financial mechanisms, and policy recommendations tailored to the specific needs and challenges of the Mexico refrigeration sector.**
- **Enhanced Manufacturing Practices:** By implementing the highest energy efficiency standards, the refrigeration manufacturing sector in Mexico will experience a significant transformation, producing appliances with superior energy performance.
- **Reduced Energy Consumption and Emissions: The widespread adoption of energy-efficient RAC equipment will result in substantial energy savings at both the household and commercial buildings; yielding significant national levels energy savings. This in turn will contribute to reduced greenhouse gas emissions and a more sustainable energy landscape.**
- **Strengthened Local Capacity: The project activities, particularly the workshops, will empower national policymakers, private sector entities, and other stakeholders with the knowledge and skills necessary to drive energy efficiency improvements in the RAC sector.**
- **Investment Attraction:** The well-structured project document, backed by robust collected data and analysis, will serve as a compelling tool for attracting additional funding from investors, enabling the scale-up of energy efficiency initiatives in Mexico.
- **Potential for Regional Impact:** Mexico's leadership in energy efficiency conversion through this project will create a path for regional impact through of exporting higher performance equipment.

Key Deliverables

In addition to the project document, the following deliverables will support the achievement of the project's objectives:

- **Comprehensive Survey Data:** Detailed information on the energy efficiency levels of refrigeration products manufactured in Mexico, providing a baseline for future improvements and calculating investment needed.
- **Technical Analysis and Gap Assessment:** Expert analysis of the survey data and identification of key gaps in technology, financing, and policy to guide the formulation of targeted interventions. This activity will implement sub-metering and data analysis to quantify the real contribution of these systems to energy consumption and peak demand, based on their current efficiency levels. It will also enable benchmarking against modern, energy-efficient technologies, identifying the potential for energy savings and demand reduction through system upgrades and technology transition.
- **Capacity Building and Knowledge Transfer:** Successful completion of workshops, empowering stakeholders to actively contribute to the advancement of energy efficiency in the sector.

Project Activities

- Data Collection and Analysis: Collect and analyses data on the current market, potential beneficiaries, energy consumption patterns, and appliance stock to identify key challenges and opportunities.
- Stakeholder Consultations: Engage with industry representatives, government officials, and other relevant stakeholders to gather input and ensure broad support for the project document.
- Training Workshops: Conduct targeted training sessions on MEPS compliance by the manufacturing sector of Mexico for relevant private and public sector stakeholders.
- Project Document Development: Prepare a comprehensive project document that outlines a clear roadmap for achieving energy efficiency goals in the sector.

Budget and Timeline

A detailed budget is outlined in the table below. The preparatory project duration is estimated to be 24 months.

Conclusion

This preparatory project is a critical step towards achieving energy efficiency improvements while phasing down HFC in Mexico's refrigeration manufacturing sector.

8. Activities to be undertaken for preparation of the investment project and funding requested

Activity	Indicative funding (US $)	Bilateral/implementing agency
1. Survey, Data Collection: Collect data on production capacities, production lines, energy efficiency levels, and refrigerant use for participating companies to lay the foundation for feasibility studies and guide investment strategies.	$12,000	UNIDO
2. Technical Feasibility Studies: Assess current systems and evaluate potential for integrating energy-efficient technologies and low-GWP refrigerants for participating companies.	$14,000	UNIDO
3. Preparation of Business Plans: Assist manufacturing companies in developing business plans for new investments or retrofitting existing production lines to incorporate energy-efficient technologies.	$4,000	UNIDO
4. Drafting of Investment Project Document: Prepare a comprehensive investment project document to secure funding for energy efficiency improvements.	$15,000	UNIDO
TOTAL	**$45,000**	UNIDO

Country: ECUADOR

Title: Institutional Strengthening for the implementation of Montreal Protocol in Ecuador

Project Duration: 36 months (July 2026 – June 2029)

Project Budget: 468,452 (excl. 7% Agency Support Costs)

Implementing Agency: UNIDO

Coordinating Agency: National Ozone Unit (NOU)/ Ministry of Production, Foreign Trade, and Investment (MPCEI)

Project Summary

During the reporting period, Ecuador continued strengthening the implementation of the Montreal Protocol through institutional coordination, regulatory support, capacity-building activities, and regional cooperation. The National Ozone Unit (NOU), within the Ministry of Production, Foreign Trade, and Investments, coordinated actions to support the implementation of the HCFC phase-out and the Kigali Amendment, including the operation of the licensing and quota system, collaboration with customs authorities, and monitoring of controlled substances.

Several training and awareness activities were carried out for technicians, public officials, industry representatives, and academia, including events to promote the participation of women in the RAC sector and initiatives aimed at strengthening technical capacities in energy efficiency and alternative refrigerants. Ecuador also participated actively in regional network meetings and international negotiations under the Montreal Protocol and promoted South–South cooperation initiatives. Public awareness activities were conducted during national events such as World Refrigeration Day and World Ozone Day, helping to broaden understanding of the Protocol beyond the technical RAC community.

With the continued support of the institutional strengthening project, Ecuador will maintain its efforts to ensure compliance with the HCFC phase-out schedule and the commitments under the Kigali Amendment. The National Ozone Unit will continue coordinating the implementation of HPMP activities, strengthening the monitoring of imports and use of controlled substances, and supporting the transition toward low-GWP technologies. The plan of action also includes expanding public awareness activities beyond the RAC technical sector to reach industry stakeholders, academia, youth, and decision-makers, reinforcing the link between the Montreal Protocol, climate change mitigation, and sustainable industry. Additional activities will promote gender inclusion in RAC-related initiatives, strengthen cooperation with training institutions and universities, and further develop partnerships with regional networks and international organizations to exchange knowledge and best practices.

Country: MONTENEGRO

Title: Institutional Strengthening for the implementation of Montreal Protocol in Montenegro

Project Duration: 36 months (October 2026 – September 2029)

Project Budget: 180,000 (excl. 7% Agency Support Costs)

Implementing Agency: UNIDO

Coordinating Agency: National Ozone Unit (NOU)/ Environmental Protection Agency

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Project Summary

Montenegro is an active member of the ECA Regional Ozone Network for Europe and Central Asia and participates in COP/MOP, OEWG, and Regional Ozone Network meetings. At the 13th COP/36th MOP, the NOU Manager, as a representative of Montenegro, was elected as a member of the Implementation Committee under the Non-Compliance Procedure for the Montreal Protocol for a two-year period starting on 1 January 2025. Montenegro was also a co-opted member of the Executive Committee and participated in its meetings.

The Environmental Protection Agency / National Ozone Unit of Montenegro is responsible for monitoring and implementing the HPMP, KIP, ODS inventory project, and EE project. The NOU is responsible for initiating and proposing updates to relevant laws and regulations (in accordance with EU legislation requirements); issuing import/export permits for ozone-depleting substances controlled under the Montreal Protocol, as well as for alternative substances (F-gases), and monitoring the import, export, and consumption of ODS/F-gases; licensing companies for the installation, maintenance and/or repair, and decommissioning of products and equipment containing ozone-depleting substances and alternative substances; etc.

During the reporting period, the NOU participated as a member of the working group for drafting the new Law on Climate Change, adopted at the end of 2025, with the aim of further strengthening control, monitoring, and handling of ODS and HFCs to meet Montreal Protocol targets, as well as EU requirements as a candidate country, and improving the training and certification scheme for technicians, including licensing bodies and procedures for issuing certificates.

The NOU is further committed to building capacity at the country level with a view to ensuring compliance with HFC consumption phase-down targets, and it is expected that ongoing regulatory efforts will be further strengthened through the implementation of the new IS phase. The National Ozone Unit of Montenegro will be responsible for proposing, drafting, and enforcing policies and legislation, with a specific focus on HFC restrictions, the certification scheme, etc. Special attention will be given to cooperation with the customs authorities to prevent illegal trade, as well as to cooperation with the RAC Association.

The next phase will also focus on the implementation of KIP Stage I, working closely with industry and administration on its execution. The NOU will continue cooperation with energy efficiency authorities in relation to the EE project and the National Energy and Climate Plan (NECP), where the Kigali Amendment Implementation Plan is one of the measures incorporated into the NECP, and will also continue cooperation with safety standards authorities.

Country:	NORTH MACEDONIA
Title:	Institutional Strengthening for the implementation of Montreal Protocol in North Macedonia
Project Duration:	36 months (July 2026 – June 2029)
Project Budget:	350,666 (excl. 7% Agency Support Costs)
Implementing Agency:	UNIDO
Coordinating Agency:	National Ozone Unit (NOU)/ Ministry of Environment and Physical Planning

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Project Summary

During Phase VIII (July 2023 – June 2026), North Macedonia demonstrated full compliance with its Montreal Protocol and Kigali Amendment obligations. The National Ozone Unit (NOU) achieved all seven objectives, including the pioneering implementation of the Ordinance for Restricting the Import of HFCs and three consecutive cycles of transparent HFC quota allocations for 2024–2026. Key outputs included the timely submission of Article 7 and Country Programme data, the registration and labelling of over 1,270 pieces of equipment, and the successful training of customs officers and environmental inspectors in illegal trade prevention. Furthermore, the NOU successfully integrated the MLF gender mainstreaming policy, achieving significant female representation in inter-ministerial committees and workshops.

Phase IX (July 2026 – June 2029) focuses on accelerating the HFC phase-down and strengthening the technical infrastructure for refrigerant management. Planned activities include the official adoption of Rulebooks for leak detection and reporting, as well as the implementation of regulations for banning specific HFC-containing equipment. The NOU will continue to manage the annual licensing and quota systems through the EXIM platform while launching a national Rulebook on refrigerants recovery, recycling, and reclamation. Coordination efforts will expand through the Public Awareness Campaign on Energy Efficiency in the RAC sector and a dedicated Gender Gap analysis to further enhance women's participation in technical roles.

Country:	ARMENIA
Title:	Verification report of national HFC consumption targets
Project Duration:	24 months
Project Budget:	US$ 30,000 (excl. 9% Agency Support Costs)
Implementing Agency:	UNIDO

Project Summary

Funding requirement for the preparation of verification report of national program is being requested in accordance with decision 96/22(a).

The Kigali HFC Implementation Plan, Stage I for Armenia was approved in May 2024 at the 94th Meeting of Executive Committee of the Multilateral Fund for the implementation of the Montreal Protocol. As per the agreement between the country and the Multilateral Fund, the next tranche request under this project is due at the first meeting in 2027. The verification report will be submitted with the 2027 tranche.

Decision 96/22 (a)(i): *The Executive Committee decided: To request The Secretariat: To provide to the Executive Committee, at the first meeting of each year, starting in 2026, the list of countries with average HFC consumption in servicing, in the baseline years, of 360 metric tonnes (mt) and below that had scheduled a tranche of their Kigali HFC implementation plans (KIPs) during the following year and that had not previously received funding to undertake such verifications, thereby enabling the Executive Committee to approve the list for the purpose of verification of that country's compliance with the related KIP Agreement;*

Country:	BOSNIA AND HERZEGOVINA
Title:	Verification report of national HFC consumption targets
Project Duration:	24 months
Project Budget:	US$ 30,000 (excl. 9% Agency Support Costs)
Implementing Agency:	UNIDO

Project Summary

Funding requirement for the preparation of verification report of national program is being requested in accordance with decision 96/22(a).

The Kigali HFC Implementation Plan, Stage I for Bosnia and Herzegovina was approved in May 2025 at the 96th Meeting of Executive Committee of the Multilateral Fund for the implementation of the Montreal Protocol. As per the agreement between the country and the Multilateral Fund, the next tranche request under this project is due at the first meeting in 2027. The verification report will be submitted with the 2027 tranche.

Decision 96/22 (a)(i): *The Executive Committee decided: To request The Secretariat: To provide to the Executive Committee, at the first meeting of each year, starting in 2026, the list of countries with average HFC consumption in servicing, in the baseline years, of 360 metric tonnes (mt) and below that had scheduled a tranche of their Kigali HFC implementation plans (KIPs) during the following year and that had not previously received funding to undertake such verifications, thereby enabling the Executive Committee to approve the list for the purpose of verification of that country's compliance with the related KIP Agreement;*

Country:	GUATEMALA
Title:	Verification report of national HCFC consumption targets
Project Duration:	24 months
Project Budget:	US$ 30,000 (excl. 9% Agency Support Costs)
Implementing Agency:	UNIDO

Project Summary

Funding requirement for the preparation of verification report of national program is being requested in accordance with decision 96/22(a).

The HCFC Phase-Out Management Plan (HPMP) Stage II for Guatemala was approved in December 2020 at the 86th Meeting of Executive Committee of the Multilateral Fund for the implementation of the Montreal Protocol. As per the agreement between the country and the Multilateral Fund, the next tranche request under this project is due at the second meeting in 2027. The verification report will be submitted with the 2027 tranche.

Decision 96/22 (a)(i): *The Executive Committee decided: To request The Secretariat: To provide to the Executive Committee, at the first meeting of each year, starting in 2026, the list of countries with average HFC consumption in servicing, in the baseline years, of 360 metric tonnes (mt) and below that had scheduled a tranche of their Kigali HFC implementation plans (KIPs) during the following year and that had not previously received funding to undertake such verifications, thereby enabling the Executive Committee to approve the list for the purpose of verification of that country's compliance with the related KIP Agreement;*

Country:	HONDURAS
Title:	Verification report of national HCFC consumption targets
Project Duration:	24 months
Project Budget:	US$ 30,000 (excl. 9% Agency Support Costs)
Implementing Agency:	UNIDO

Project Summary

Funding requirement for the preparation of verification report of national program is being requested in accordance with decision 96/22(a).

The HCFC Phase-Out Management Plan (HPMP) Stage II for Honduras was approved in December 2020 at the 86th Meeting of Executive Committee of the Multilateral Fund for the implementation of the Montreal Protocol. As per the agreement between the country and the Multilateral Fund, the next tranche request under this project is due at the first meeting in 2027. The verification report will be submitted with the 2027 tranche.

Decision 96/22 (a)(i): *The Executive Committee decided: To request The Secretariat: To provide to the Executive Committee, at the first meeting of each year, starting in 2026, the list of countries with average HFC consumption in servicing, in the baseline years, of 360 metric tonnes (mt) and below that had scheduled a tranche of their Kigali HFC implementation plans (KIPs) during the following year and that had not previously received funding to undertake such verifications, thereby enabling the Executive Committee to approve the list for the purpose of verification of that country's compliance with the related KIP Agreement;*

Country:	MONTENEGRO
Title:	Verification report of national HCFC and HFC consumption targets
Project Duration:	24 months
Project Budget:	US$ 45,000 (excl. 9% Agency Support Costs)
Implementing Agency:	UNIDO

Project Summary

Funding requirement for the preparation of verification report of national program is being requested in accordance with decision 96/22(a).

The HCFC Phase-Out Management Plan (HPMP) Stage II for Montenegro was approved in June 2020 at the 85th meeting of Executive Committee of the Multilateral Fund for the implementation of the Montreal Protocol with reduction targets defined for up to 2025. After 2025, there will be no more HCFC consumption in the country and no more HPMP tranches requests. The Kigali HFC Implementation Plan, Stage I for Montenegro was approved in May 2024 at the 94th Meeting of Executive Committee of the Multilateral Fund for the implementation of the Montreal Protocol. As per the agreement between the country and the Multilateral Fund, the next tranche request under this project is due at the first meeting in 2027. The verification report will be submitted with the 2027 tranche.

Decision 96/22 (a)(i): *The Executive Committee decided: To request The Secretariat: To provide to the Executive Committee, at the first meeting of each year, starting in 2026, the list of countries with average HFC consumption in servicing, in the baseline years, of 360 metric tonnes (mt) and below that had scheduled a tranche of their Kigali HFC implementation plans (KIPs) during the following year and that had not previously received funding to undertake such verifications, thereby enabling the Executive Committee to approve the list for the purpose of verification of that country's compliance with the related KIP Agreement;*

Country:	NIGER
Title:	Verification report of national HFC consumption targets
Project Duration:	24 months
Project Budget:	US$ 30,000 (excl. 9% Agency Support Costs)
Implementing Agency:	UNIDO

Project Summary

Funding requirement for the preparation of verification report of national program is being requested in accordance with decision 96/22(a).

The Kigali HFC Implementation Plan, Stage I for Niger was approved in May 2024 at the 94th Meeting of Executive Committee of the Multilateral Fund for the implementation of the Montreal Protocol. As per the agreement between the country and the Multilateral Fund, the next tranche request under this project is due at the first meeting in 2027. The verification report will be submitted with the 2027 tranche.

Decision 96/22 (a)(i): *The Executive Committee decided: To request The Secretariat: To provide to the Executive Committee, at the first meeting of each year, starting in 2026, the list of countries with average HFC consumption in servicing, in the baseline years, of 360 metric tonnes (mt) and below that had scheduled a tranche of their Kigali HFC implementation plans (KIPs) during the following year and that had not previously received funding to undertake such verifications, thereby enabling the Executive Committee to approve the list for the purpose of verification of that country's compliance with the related KIP Agreement;*