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PRELIMINARY REPORT FOR THE SECOND PHASE OF THE EVALUATION OF THE REFRIGERATION SERVICING SECTOR

Background

1. At its 79th meeting, the Executive Committee approved the terms of reference for the evaluation of the refrigeration servicing sector.[1] The evaluation was planned in two stages: stage one consisted of a desk study; and stage two involved nine field visits[2] with respective evaluations reports, a preliminary synthesis report covering the five countries evaluations (Chile, Grenada, India, Oman and Samoa) and the final synthesis report which will be presented at the 82nd meeting. The terms of reference for the second stage of the evaluation, approved at the 80th meeting (decision 80/8), are included in Annex I of this document.

2. At its 80th meeting, the Executive Committee considered the desk study on the progress made in the phase-out of HCFCs in the projects in the refrigeration servicing sector funded by the Multilateral Fund (MLF).[3] It focused on the contribution of specific activities within servicing sector plans to reduce HCFCs, the impact on servicing arising from introduction of low-global warming potential (GWP) alternatives, and on challenges encountered during project implementation.

Objectives

3. The objectives of the second stage of the evaluation are:

(a) To provide a thorough analysis of the project implementation in the refrigeration servicing sector in a sample of countries;

(b) To formulate lessons learned for improving future similar projects; and

[1] UNEP/OzL.Pro/ExCom/79/7/Corr.1
[2] The following countries are being visited by the evaluation teams: Chile, Grenada, India, Kyrgyzstan, Oman, Samoa, Senegal, Turkey and Zimbabwe.
[3] UNEP/OzL.Pro/ExCom/80/10 and Corr.1

(c) To further assess potential issues that could be related to the phasing-down of HFCs in the servicing sector.

4. Furthermore, the evaluation will strive to provide quantitative data on the impacts and the costs of the activities in the servicing sector to the extent possible.

Methodology and scope

5. The countries are visited by consultant who collect data through interviews and discussions with stakeholders, observation at the enterprise and workshop level as well as information gathered from the project documents. Each field visit will yield a country report presenting a detailed analysis of the refrigeration servicing sector. The synthesis report will summarize the findings, lessons learned and potential issues for the phase-down of HFCs in the refrigeration servicing sector.

6. This preliminary report covers only the countries whose field visits have been carried out so far, and presents key conclusions, lessons learned and recommendations, and the main findings for each of the questions in the terms of reference, namely: implementation issues; policy, legal and regulatory frameworks; refrigerant containment (recovery, recycling and reclamation (RRR)); technology-related issues; training; awareness-raising and dissemination of information; funding-related issues; and sustainability.

7. This preliminary report also includes the following annexes:

Annex I Terms of reference for the second stage of the evaluation of the refrigeration servicing sector.

Annex II Status of adoption of regulatory measures

Annex III Complete list of lessons learned

Main findings

8. The preliminary conclusions and lessons learned from the field visits carried out so far are presented below. A complete list of lessons learned as reported by the countries can be found in Annex III.

Project implementation

9. The HPMP implementation has had outstanding results. It has achieved HCFC consumption reductions beyond MP obligations of between 13 and 74 per cent depending on the country[4] and has leveraged MLF resources by building on the institutional, policy/regulatory infrastructure and on the human resources supported during the CFC phase-out. It will in turn reinforce the building blocks for the HFC phase-out by supporting the same infrastructures, namely:

(a) a fully operational institutional framework formed by government institutions, industry associations, technical training institutions and NGOs;

(b) a comprehensive policy and legal framework that constitutes the basis for HFC phase-down related measures; and

[4] More specifically Samoa surpassed its 2013 obligation by more than 63 per cent, Chile by more than 13 per cent, and Grenada by more than 58 per cent. Likewise, 2015 obligations were surpassed in Samoa by more than 74 per cent, in Chile by more than 14 per cent, in Grenada by more than 69 per cent, in Oman by more than 28 per cent, and India by over 35 per cent

(c) human resources within the refrigeration and air-conditioning (RAC) servicing sector, trained in MP-related subjects and practices for servicing and maintenance of RAC equipment. These accomplishments on HCFC consumption reduction beyond the MP obligations may be attributed to the "cascade" effect of all the initiatives implemented within the HPMPs.

10. The demonstration projects for high HCFC consuming sectors such as supermarkets (in Chile) as well as training and awareness activities for technicians and importers[5] (in Grenada, India and Samoa), will facilitate the transition to low-GWP technologies by identifying common barriers to the adoption of new technologies such as: the higher cost, the lack of confidence in the new technology (i.e., safety and security issues in dealing with flammable, toxic or high pressured refrigerant) and the unavailability of equipment and servicing tools in the local market. The promotion of low-GWP alternatives via HPMP is proving effective (e.g., demonstration and investment projects, training activities, awareness raising efforts). Refrigerant and equipment importers and distributors should become specific targets of awareness and information activities as they are important agents of change.

11. The most important strategic partners for HPMP implementation are the local RAC associations and local RAC training schools. They are essential to the identification, contact, training, certification and awareness-raising of local RAC technicians, and even to undertake specific monitoring functions. Such has been the case for all countries but Oman, where there is a strong movement towards sponsoring the creation of a RAC association in order to expedite the HPMP implementation.

12. The main causes for implementation delays in Chile and Grenada are: lengthy and inflexible implementation modalities from the IAs (i.e., absence of a modality to transfer funds to private enterprises and inflexible contracts) and subsequent delays in project start-up and/or fund disbursement; and the slow pace of administrative processes by the Governments (i.e., long agreement review process) as well as need for adequate staffing. Oman identified the lack of cooperation among national key stakeholders as the main reason for delay, Samoa reported delays in transfers of funds and India did not report any delay. Chile identified delays related to the lack of availability of alternatives, equipment, tools and local expertise.

Policy, legal and regulatory frameworks

13. The policy, legal and regulatory frameworks established for the HCFC phase-out will be the basis for the HFC phase-out and, in most cases, only minor changes might be necessary. This is particularly important given the long-time needed for their establishment, as indicated by Grenada (i.e., the establishment of a new standard takes approximately two and a half years). As these frameworks are time-consuming, they must be undertaken as early as possible and should involve technical and financial support, as well as a promotion to the highest levels of Government.

14. The accessibility to such standards is essential for the general adherence of the servicing sector. In some countries this is a problem, as in Chile, where the standards have a high cost, and are thus unaffordable for most service technicians. However, this is not the case for other countries such as Grenada where their costs are accessible to anyone. The cost of standards seems to be related to the way the certification process is structured: formal processes in the hands of independent organizations seem to be harder to access. Increased accessibility of the general RAC community to approved standards and codes of practice could increase the adherence to such standards and consequently, the certification process, which would in turn, ensure a wider adherence to good servicing practices and a more cost-efficient and environmentally-conscious use of refrigerants.

[5] Importers are the most important decision makers for technology selection, as highlighted in Grenada and India.

15. Only Chile reported instances (two) of illegal HCFC imports. Samoa has formed a special team to evaluate compliance with the code of practice, technician licensing and import/export regulations, partially funded under the HPMP. However, these initiatives do not seem to be part of any regulatory framework.

16. Granting technical and/or financial assistance for cost-effective monitoring and enforcement systems might benefit the adoption and adherence to comprehensive policy, legal and regulatory frameworks. The main barriers mentioned to introduce these comprehensive frameworks are the lack of a wider frameworks in legislations, the high costs and associated difficulties of implementation, administration and enforcement, for the organisations and for small enterprises' compliance as identified by Chile and Grenada.

Technology-related issues

17. The main barriers for the adoption of the newest HCFC alternative technologies seem to be: the higher costs involved; the lack of confidence in the new technology (i.e., safety and security issues in dealing with flammable, toxic or high pressured refrigerant); the lack of local expertise; and the unavailability of equipment and servicing tools in the local market, as identified by Chile and Grenada. These barriers also affect the service and maintenance of such equipment. Additionally, as mentioned by all countries, the global market is the main influencer of technology choices since it determines the availability of certain technologies in the local markets and facilitates their choice. In this respect, Grenada notes that awareness and information campaigns should be targeted at refrigerant and equipment importers in order to influence their choice of technology. India mentioned something similar concerning manufacturers of tools being encouraged to come into the market.

18. The adoption of new alternative technologies can be expedited through the adoption of related standards and codes of good practices and increased training on such technologies, coupled with the corresponding awareness campaigns and dissemination of information, in particular for low-GWP, and flammable and toxic alternatives. In this respect, demonstration projects can serve this purpose when targeted to specific sectors and their results are widely disseminated.

19. The HPMP projects were key for the adoption of trans-critical CO_2 in the supermarket sector in Chile, by incrementing confidence in the use of the technology and removing barriers to accelerate its adoption. The demonstration project and training activities in Grenada had similar effects. India considers that the refrigeration servicing sector needs training and specialized tools for adopting new technologies introduced by the manufacturers. However, the choice of new RAC technology by multinationals operating in Article 5 countries can influence the choice of other local enterprises (e.g., as in Samoa). There is the risk that such technologies, however may not be widely available in Article 5 countries, if the enterprises that commercialise them are not initially interested in smaller markets, as indicated by Chile and Grenada.

Retrofitting HCFC-based equipment with flammable alternatives

20. Retrofitting HCFC-based equipment with flammable alternatives is not a common practice in any of the countries visited so far with the exception of Grenada. None of the countries in the study (including Grenada where the practice is common) encourages this practice due to the risks for safety and to the lack of appropriate equipment, tools and training. It is generally perceived that the measures being taken to adopt hydrocarbon (HC)-based technologies (training programmes and establishment of appropriate standards) will be valid for any retrofitting to these technologies. The initiatives to create the necessary conditions for safely working with HC refrigerants was mentioned by all countries and where the practice is done, additional efforts should be put on the establishment of related standards to work safely with HCs, coupled with awareness campaigns, to regulate and increase the safety of this practice.

Demonstration projects for the servicing sector

21. In some countries (Chile, Grenada) demonstration projects are still being implemented and are instruments to educate technicians, importers and end users about energy efficiency issues while

demonstrating the benefits of replacing HCFC-based equipment. For example, the demonstration project in Grenada performs energy efficiency comparisons between HCFC-22, R-410A and R-290 split AC. With the exception of the demonstration projects, changes in energy efficiency due to servicing have not been assessed, due to lack of specific programmes, local expertise and appropriate equipment or tools. In the case of Oman and Samoa, it can happen that equipment parameter do not correspond to the high ambient temperature because of improper installation, maintenance and/or servicing, which also affects energy efficiency. There are, however, no testing facilities on energy efficiency changes due to servicing. India mentioned that information on energy efficiency is given during technician's training, stressing on good refrigerant management practices and proper servicing to allow the equipment to operate at the energy efficiency level for which it was designed.

Energy efficiency

22. In every country in the sample there are specialised agencies in charge of promoting energy efficiency mainly through the establishment of labelling standards and awareness-raising. Most National Ozone Units (NOUs) are involved in these efforts to influence and promote the choice of low-ODP and low-GWP refrigerants.

23. Local efforts to measure changes in energy efficiency outside of demonstration projects have not been carried out, seemingly due to the lack of specific programmes, of local expertise on the subject, and of appropriate equipment or tools. Those projects that include energy efficiency measurements are not yet completed (Chile and Grenada). It has also been pointed out, as in the case of Oman and Samoa, that the design parameters of RAC equipment are often not adequate due to extreme high ambient temperature or improper installation, maintenance, and/or servicing. India mentioned that information on energy efficiency is given during the technicians' training where it is stressed that good refrigerant management practices and proper servicing allows for the equipment to operate at its designed energy efficiency level.

Refrigerant containment (recovery, recycling, and reclamation)

24. The sustainability of RRR systems is challenging due to, *inter alia*, logistic costs (i.e., transport costs to recovery or reclaiming centres), labour costs (i.e., recovery from large installations is time consuming), the lack of availability of ancillary equipment and parts (e.g., refillable cylinders), and the lack of economic incentives due to the low pricing of the virgin refrigerants (when no extra taxes are applied to MP-regulated substances). In this sense, finding a business model for RRR systems that is attractive for the RAC sector is still an ongoing effort (as experienced by Chile, India and Oman).

25. Preliminary data gathered from countries provide an estimated recovery rate of 8 per cent to 15 per cent of annual HCFC consumption for Samoa and Grenada, respectively, and a reclaiming rate of 8 per cent of annual HCFC consumption for Chile. Additionally, Grenada reports that of the 15 per cent of recovered refrigerant, between 80 to 85 per cent is re-used. These figures are from the recovery networks established under the ODS phase-out efforts, but do not include the recovery carried out by enterprises with their own equipment.

26. The cost-effective management of unwanted refrigerants is also an issue for these countries due to logistic and labour costs, the lack of availability of ancillary equipment and parts, the actual cost of the destruction process, and the added challenge for the majority of countries without local destruction facilities. According to the data provided by the countries, destruction fees range from US $10 to US $50, excluding recovery costs and transportation cost to the (mainly foreign) destruction site.

27. Additionally, the supporting measures such as prohibition of venting, mandatory recovery and mandatory refillable cylinders have their own barriers, such as the difficulty and cost of enforcement, and the local unavailability of equipment or tools, due to the absence of interest of international suppliers in smaller markets. In spite of the scarcity of field data it may seem that efforts to promote RRR systems should be sustained given the potential environmental and economic benefits, and more emphasis should

be put into informing on economic benefits at the local level. International efforts should be increased concerning the design of a viable and cost-effective economic model for ODS destruction.

Training and sustainability of training results

28. Training programmes have addressed anywhere from 5 per cent for India and Oman, to 33, 50 and 90 per cent in Chile, Grenada and Samoa, respectively, of the estimated number of RAC technicians. It seems that larger countries with correspondingly large number of technicians can only cover a smaller percentage of them.[6] All countries in the sample have incorporated MP and ODS-related information into the curricula of technical training schools to different degrees of detail depending on the priority of the countries, thus ensuring the sustainability of the training efforts for reducing ODS consumption. The continuous updating of the curricula and trainers remains a challenge for the future since this requires resources not usually available to Article 5 countries. The sustainability of the training results can only be ensured through the establishment of monitoring and enforcement schemes for the corresponding certification system and standards and through codes of good practices for installation, servicing and maintenance of RAC equipment. India faces a particular problem with the small coverage of a very large territory, which makes sustainability even much harder, and is carrying out an extensive follow-up of training effectiveness (discussed in more detail under the monitoring section), which seems to be a one-time effort that cannot be sustained.

29. The certification of technicians has been adopted in Chile and Grenada and a licensing system in Samoa, with a certification rate that ranges from 53 per cent of the technicians trained in Chile, to 73 per cent in Grenada. Certification processes present various characteristics from a very formal and expensive implementation in Chile where only one independent organization is authorised to certify RAC technicians at a steep fee of US $300/technician, to a more flexible and accessible certification scheme in Grenada with four different ways to obtain certification at a seemingly more accessible cost that allows technicians to have several certifications at once.

Awareness-raising and dissemination of information

30. All countries, excepting Oman, reported the use of various channels for awareness raising and dissemination of information and the focus on specific target audiences, such as, *inter alia*, technical workshops, technical magazines, trade shows, posters, TV ads, and information provided by vendors. Trade associations are the most useful dissemination mechanisms for technical information. The main target audiences identified are: RAC technicians and equipment importers and vendors, Customs Departments and the general public. Oman has relied on workshops as well as direct meetings with RAC sector contractors, since the absence of a local trade association has resulted in limited communications. India has implemented innovative means for awareness-raising and communication, such as an application for smartphones to distribute a RAC newsletter.

Funding

31. All countries in the study, except Oman, have reported that the funds approved under the HPMP were less than expected and insufficient for the completion of all planned activities. India has mentioned that the threshold for servicing activities should be increased and the flexibility clause expanded. Some flexibility in fund allocations was exerted in order to complement the activities that were deemed essential (e.g., public awareness activities). Following decision 74/50, additional funding will be provided in all cases to cover equipment and tools needed for HCs.

[6] India has highlighted the need to review the cost-effectiveness threshold of training activities for bigger countries to this effect.

32. All countries, with the exception of Oman[7] and India[8], mentioned that co-funding provided by the Government was substantial and the co-funding afforded by the beneficiary enterprises covered, in most cases, the bulk of the cost of the project. On the other hand, independent sources of co-funding for one specific project seem to be more difficult to obtain. There are some indications that co-funding obtained through separate independent projects with different but related objectives may be more viable, such as in the case of Chile with one project with the Climate Change and Air Coalition (CCAC)[9]; or Grenada with two projects, one with the German Federal Ministry of Environment and another with the European Commission.[10]

Other sustainability-related issues

33. It is foreseen that the HFC phase-down will require significant training efforts, in particular for flammable and toxic alternatives. Also, formal training on energy efficiency, including methods for its improvement, its relation with good maintenance practices, and methods and tools for measurement, will be required. India mentioned that independent technicians trained on good servicing practices have reported important benefits to their practices after training, which was confirmed, during the field mission, by the outcomes of the impact monitoring carried out by the Government of Germany.

Monitoring

34. Most countries carry out extensive monitoring initiatives within the HPMP through independent consultants, in particular for initiatives that involve a large number of activities and beneficiaries, such as training programmes and establishment of recovery and recycling (R&R) systems. Only Samoa implemented a multi-sectorial governmental inspection team to conduct site visits to ensure compliance with the code of good practices, technician licensing and import/export regulations.

35. No other countries mentioned the monitoring of indicators or the follow-up on regulations or codes of practices, besides India which reported an "impact monitoring" to evaluate the effectiveness of training with the following main results:

(a) The number of equipment installed and serviced by trained technicians increased in most of the states;

(b) There has been a growth in practice of recovering HCFC-22 during servicing of room ACs;

(c) Technicians in most of the states surveyed use vacuum pumps for evacuation of the system and in a few states 100 per cent use have been reported post training;

(d) Technicians, in a few states, which were not using recovery units have been using it selectively after training; and

(e) By adopting good servicing practices most of the technicians have reported saving on refrigerant during servicing. This "impact monitoring" is worth exploring, with special attention to ante and post-facto measurements.

Lessons learned and recommendations

36. The following lessons learned and recommendations incorporate a summary of those included in the country field reports. A complete list of lessons learned as reported by the countries can be found in Annex III to the present document.

[7] Oman reported that funds were sufficient and co-funding was not necessary.
[8] This subject was not mentioned in the report.
[9] Project for Cencosud (Jumbo) in the construction of a new supermarket branch using trans-critical CO_2 technology.
[10] Sustainable and Climate Friendly Phase-out of Ozone Depleting Substances (SPODS).

Project implementation

37. The success in HPMP implementation so far suggests that efforts should be increased in strengthening the institutional, policy/regulatory and physical infrastructure as well as the human resources, since they will constitute the support for the continued success of HCFC phase-out and the eventual phase-down of HFCs.

38. The continued strengthening and support of key local strategic partners for HPMP implementation, such as the local RAC associations and local technical RAC training schools, both with training and physical infrastructure or equipment, will result in additional support for the success of HCFC phase-out and the eventual phase-down of HFCs. This is particularly important for countries such as Oman where a RAC trade association does not exist, or India, where more regional chapters of such association need to be opened for increased coverage.

39. The promotion of low-GWP alternatives in all the initiatives within the HPMP (e.g., demonstration and investment projects, training activities and awareness raising efforts) should be kept, as they are proving effective in this respect. Refrigerant and equipment importers and distributors should become specific targets of awareness and information activities as they are important agents of change.

40. The most common reasons for delays in HPMP implementation would be avoided through the streamlining of administrative and contractual procedures both in bilateral and implementing agencies and local governments.

Policy, legal and regulatory frameworks

41. The establishment of comprehensive policy, legal and regulatory frameworks for HCFC and HFC phase out must be undertaken as early as possible since it is usually a time-consuming process. In this respect, some of the most common barriers for such early action could be overcome through promotion at the highest levels of Government, and provision of financial and technical support.

42. There is some indication that providing specific technical and/or financial assistance for improving the accessibility of the RAC industry (i.e., enterprises and technicians) to approved standards and codes of practice could help increase the adherence to such standards and consequently, the certification process. This in turn, would ensure a wider adherence to good servicing practices and a more cost-efficient and environmentally-conscious use of refrigerants.

43. There are also some indications that granting technical and/or financial assistance for the establishment of cost-effective monitoring and enforcement systems might benefit the adoption and adherence to comprehensive policy, legal and regulatory frameworks.

Technology-related issues

44. The adoption of new alternative technologies can be expedited through increased training on such technologies, coupled with the adoption of related standards and codes of good practices and the corresponding awareness campaigns and dissemination of information, in particular for low-GWP, and flammable and toxic alternatives. One important target of related information campaigns should be the importers and manufacturers of RAC technology since they are recognised as important factors of change. These measures can help overcome the most common barriers identified for the adoption of such technologies. In this respect, demonstration projects can also serve the same purpose when targeted to specific sectors and their results are widely disseminated, as concluded during the first stage of this study.

Retrofitting HCFC-based equipment with flammable alternatives

45. Even though the practice of retrofitting HCFC-based equipment with flammable alternatives seems not to be common in the majority of countries, those where the practice is common should increase their

efforts concerning training and the establishment of related standards to work safely with HCs, coupled with awareness campaigns, in order to regulate and increase the safety of the practice.

Energy efficiency

46. National Ozone Offices should be encouraged to become involved in energy efficiency initiatives in their countries in order to influence and promote the choice of low-GWP refrigerants.

47. Consistent measurement of changes in energy efficiency at the country level can only take place if specific programmes, training and tools are included within the HPMP initiatives. Such initiatives would address the absence of local expertise and the lack of appropriate equipment or tools.

Refrigerant containment (recovery, recycling, reclamation)

48. Based on the feedback from the countries so far, it seems like additional technical assistance may be necessary concerning the design of business models adapted to local markets for the sustainability of RRR systems.

49. In spite of the scarcity of field data it may seem that efforts to promote R&R systems should be sustained given the environmental and economic benefits for the countries, and for the individuals, and more emphasis should be put into informing of the individual economic benefits at the local level.

50. International efforts should be increased concerning the design of a viable and cost-effective economic model for ODS destruction.

Training and sustainability of training results

51. Even though the sustainability of the training efforts seems to be ensured through the incorporation of good practices into the curricula of technical training schools, the necessary continuous updating of training installations, curricula and trainers may require additional support from the MLF.

52. The sustainability of the training results or effectiveness, which are ensured through the adoption of standards and codes of good practice for installation, servicing and maintenance of RAC equipment, may require additional assistance from the MLF.

53. Larger countries may need more financial assistance in order to be able to cover a more significant percentage of its population of RAC technicians with the training in good practices.

Awareness-raising and dissemination of information

54. One important channel for awareness raising efforts of a more technical nature is the national trade associations, and in the exceptional cases where it does not exist, such as in Oman, awareness and general information, does not flow regularly and effectively to the RAC sector, which is a situation that must be addressed for the benefit of HPMP implementation.

Funding

55. Although the funding under the MLF is generally considered scarce by the countries in the servicing sector, the flexibility clause has been useful in complementing the funds for initiatives considered essential for the success of the national phase out strategies. The scarcity of funds seems to be more detrimental for the coverage of training activities in larger countries.

56. The co-funding provided by the governments and the beneficiary enterprises has been substantial; however, obtaining external sources for funding for specific projects has been reported to be more difficult. Meanwhile, co-funding obtained through separate projects with different but related objectives (e.g., climate change and energy efficiency) seems to be a line of action worth exploring.

Monitoring

57. Although there seems to be a satisfactory level of monitoring of implementation and results of the initiatives within the HPMP, it appears not to be the same concerning their outcomes or effectiveness once the initiatives have been implemented. For instance, the monitoring of the adherence to lines of conduct dictated by training, codes of good practices, awareness programmes, or even regulations would need additional resources in order to be implemented. In this respect, the experience with "impact monitoring" carried out in India is worth exploring, with special attention to ante and post-facto measurements.

Recommendation

58. The Executive Committee may wish:

(a) To take note of the preliminary report for the second phase of the evaluation of the refrigeration servicing sector contained in document UNEP/OzL.Pro/ExCom/81/7; and

(b) To request the Senior Monitoring and Evaluation Officer to submit the final report of the evaluation of the refrigeration servicing sector to the 82nd meeting, in line with decision 80/8.

Annex I

TERMS OF REFERENCE FOR THE SECOND STAGE OF THE EVALUATION OF THE REFRIGERATION SERVICING SECTOR

Background

1. At its 79th meeting, the Executive Committee approved the terms of reference for the evaluation of the refrigeration servicing sector. The importance of the servicing sector as one of the largest consumer of ODS as well as one that will significantly be affected by the HFC phase down, called attention on the opportunity of such evaluation. The evaluation was planned in two stages: stage one consisted of a desk study, and stage two country evaluations reports following the field visits, which would be based on the findings and recommendations of the desk study.

2. The desk study examined selected projects in the refrigeration servicing sector in both low-volume consuming (LVC) and non-LVC countries[11], in various geographical regions and implemented by various bilateral and implementing agencies (IAs). It concluded that the HCFC phase out management plans (HPMPs) were in majority successfully implemented, with only 2.8 per cent of cases of non-compliance with the Montreal Protocol and levels of consumption well below the control targets of the Montreal Protocol. Smaller ODS consuming countries may need a more focused assistance concerning HCFC consumption monitoring and reporting. The desk study also tackles the causes of delays in project implementation; the institutional strength in the legislative area; the attitude towards safety issues concerning technology based on flammable refrigerants; the impact of demonstration projects and the need for disseminating results; issues related to refrigerant containment in terms of recovery, recycling and reclamation; and energy efficiency.

3. The field visits will focus on key issues stressed in the desk study and will collect updated information about the project implementation, based on direct observation and discussions with various stakeholders.

Objective of the evaluation

4. The objective of the second stage of the evaluation is taking into account the issues identified in the desk study: (a) to provide a thorough analysis of the project implementation in the refrigeration servicing sector in a sample of countries; (b) to formulate lessons learned for improving future similar projects; and (c) to further assess potential issues that could be related to the phasing-down of HFCs in the servicing sector. Furthermore, the evaluation will strive to provide quantitative data on the impacts and the costs of the activities in the servicing sector to the extent possible.

5. The evaluation will address the following issues:

Project implementation

6. It will analyse the main activities in the servicing sector under the HPMPs as well as their impact on HCFC phase out and energy efficiency improvements to the extent possible.

[11] The countries included in the study are: Burkina Faso, Djibouti, Ghana, Nigeria and Senegal in the African region; Bahrain, Kuwait and Saudi Arabia from the Middle East region; Cambodia, China, Fiji, the Islamic Republic of Iran and Maldives from the Asia and Asia-Pacific region; Armenia, Bosnia and Herzegovina and the Former Yugoslav Republic of Macedonia from the Eastern European region; Argentina, Brazil, Chile, Grenada, Mexico, Peru and Uruguay from the Latin American and Caribbean region; and the Cook Islands, Kiribati, the Marshall Islands, the Federated States of Micronesia, Nauru, Niue, Palau, Samoa, the Solomon Islands, Tonga, Tuvalu and Vanuatu all englobed under one single project for the so called Pacific Island Countries (PICs).

7. How did they contribute to the transition to low-global warming potential (GWP) alternatives and what were the key barriers or success factors? How can HFC phase down activities in the servicing sector build on this experience? Were technical assistance and capacity building taken into consideration to address safety issues associated with low-GWP and zero-GWP alternatives and if so, what kind of activities were undertaken and to what extent where they effective?

8. How, if at all, did activities address the risks associated with retrofitting HCFC-based equipment with flammable alternatives?

9. What were the issues related to availability and affordability of spare parts and refrigerants and how have they been addressed?

10. What were the main issues encountered in the project implementation in LVC countries as compared to non-LVC countries?

11. All the countries covered by the desk study presented delays with various causes, such as the reorganization of the Government institutions, complexity of activities, communication with the stakeholders. The field visits will gather more in-depth information about these delays, their causes and how to avoid them in the future.

12. According to the desk study, the refrigeration associations have been key in the design and implementation of all the activities directed to the refrigeration servicing sector. What have been the roles of local refrigeration associations in implementing phase out activities? How did the major stakeholders coordinate and communicate? What can be learned relevant to the phase down of the HFCs?

13. Was reporting on the implementation of activities regularly done? Is the reporting providing relevant information on challenges encountered and lessons learned?

14. How have the tools developed by UNEP CAP for the refrigeration servicing sector been used? Have they proved useful and adaptable locally? What can be learned relevant to the phase down of HFCs?

15. To what extent activities being implemented have contributed or could potentially contribute to HFC phase down in applications not covered in the HPMPs (e.g., domestic refrigeration, commercial refrigeration based on R-404A and R-407C, and mobile air-conditioning)? What could be modified in the project design and implementation to facilitate this?

Policy, legal and regulatory frameworks

16. Countries have adopted various legislative and regulatory measures to control HCFC supply through imports including licensing and quota system for HCFC-based equipment. Several countries have also banned imports of all used HCFC-based equipment, among others. Was there a delay in adopting this legislation and why? Can the enforcement procedures and monitoring tools developed be applied to HFC use and HFC-based equipment?

17. What have been the most common regulatory measures adopted by the countries in relation to the refrigeration servicing sector?

18. To what extent the following measures related to the refrigeration servicing sector have been established and implemented in Article 5 countries as part of the HPMPs: mandatory reporting by refrigerant importers and exporters; bans on “non-refillable” (disposable) refrigerant containers; extension of import/export licensing system to all refrigerants; HCFC emissions control measures (e.g., compulsory recovery); ban on the use of HCFC-141b for flushing systems during servicing; ban on imports of second-hand HCFC based equipment; and, predetermined schedules for leakage check by certified

personnel for systems with charges above certain limit; and large systems record-keeping (e.g., HCFC logbooks and HCFC-based equipment log books)? Which have been the main barriers to introduce these measures?

19. What measures have been taken to enable the safe introduction of low-GWP, flammable or toxic refrigerants and which were the main barriers in introducing them? What were the impacts? Were there interactions with national, regional or international standards setting bodies related to the safe use of flammable or toxic alternatives?

20. Have activities been undertaken to support inspections and certifications, standardized technical testing, and enforceable technical standards for alternative technologies and if so, what was their impact? To what extent can activities for the phase down of HFCs build on these activities?

21. How is the country addressing illegal trade of refrigerants and what can be learned relevant to the phase down of HFCs?

22. Were there new enforcement procedures and monitoring tools developed to control HCFC use in the sector as well as HCFC-based equipment imports? If so, can they be applied to HFC use and HFC-based equipment?

Technology-related issues

23. In each country the evaluation team will inquire about what technology is being implemented and what challenges were encountered to service equipment with alternative technologies? Were alternatives technologies as well as related equipment and tools available in the local markets? Have alternatives to HCFCs that sustain the operation of HCFC-based equipment until the end of life been promoted? If so, which alternatives have been used and what were the results, including on energy efficiency and refrigerant use?

24. Did these projects influence technology selection during the assembly, installation, initial charging and commissioning of new refrigeration equipment by servicing enterprises and technicians? What were the main factors influencing the choice of technology? What can be learned relevant to the project design?

25. What was the role of international companies in introducing alternative technologies and to what extent has this influenced the refrigeration servicing sector, HCFC phase out and introduction of low-GWP alternatives?

26. How does reducing the refrigerant charge size in the design of systems impact the amounts of refrigerants emitted and how does it impact energy efficiency?

Retrofitting HCFC-based equipment with flammable alternatives

27. The desk study implied that for the general public, and even some of the refrigeration servicing sector, the risk of using and servicing equipment containing flammable substances was assumed to be negligible. To what extent is information made available to the end users and relevant stakeholders in the servicing sector on how to manage the risks associated with flammable or toxic substances accessible to the users?

28. How, if at all, did servicing activities address the risks associated with retrofitting HCFC-based equipment with flammable alternatives?

Demonstration projects for the servicing sector

29. How did demonstration projects contribute to the servicing sector? Did they serve as proof of the feasibility of technology solutions under local conditions? What were the lessons learned from demonstration projects?

Energy efficiency

30. What are the initiatives related to obtaining better energy efficiency? Were there improvements of energy efficiency through servicing activities? What were the key factors relevant to achieving these energy efficiency improvements and how were they sustained?

Refrigerant containment (recovery, recycling, reclamation)

31. What activities have been undertaken to promote the recovery of refrigerants and what was their impact? What strategies were developed to enhance recovery, recycling and reclamation? What measures have been taken to sustain these activities in a cost-effective manner? Can recovery and reclamation tools and techniques for HCFCs be transferred to the HFC phase down?

32. Which institutions are responsible for the management of refrigerant containment practice and how were they involved in the activities?

33. Were there refrigerant reclaiming facilities established? Were stockpiles of used or unwanted controlled substances managed cost-effectively?

34. What measures are in place to prevent leakage and are they successful? Can this be emulated to other subsectors?

35. What measures were taken to manage waste recuperation (e.g., empty refrigerant cylinders)? Is it mandatory to use reusable cylinders? If not, what is the percentage of one-time cylinders use?

36. What is the rate of recycling or reclamation? What is the percentage of new refrigerants substituted?

Training and sustainability of training results

37. The evaluation will further inquire on how training programmes for refrigeration technicians have managed to build their own sustainability by ensuring that the curricula of technical training institutions are appropriately modified with such training.

38. How did the Multilateral Fund resources help in enhancing the capacity of national vocational/training centres and other local institutes involved in training of refrigeration technicians?

39. How many technicians were trained since the beginning of the project and what percentage of the total pool of technicians does it represent? To what frequency must the training be renewed, to be effectively up-to-date?

40. Have the curricula of the training programmes been updated regularly? Do they integrate information on safe handling of flammable refrigerants and an understanding of related regulations and standards? Do they address issues related to the consequences of poor installation and servicing of equipment that uses flammable refrigerants? Do training programmes include a module on good practices and standards in refrigeration services? To what extent are they relevant to the phase down of HFCs?

41. Is the importance of low-GWP alternatives emphasized in the training programmes for refrigeration technicians?

42. What types of certification schemes have been established in different Article 5 countries and how effective are they to ensure good practices in refrigeration? Are these made mandatory through regulations? Was there any obstacle in making the certifications mandatory? Is there widespread adoption of formal codes of practices? Were good practices included in the curricula of technical training schools? Are the curricula adapted to address, among other: good practices, proper handling/management of refrigerant including flammable alternatives and low-GWP and zero-GWP alternatives, and mandatory training for technicians?

43. What lessons in training in good practices can be applied for long-term strategies to be implemented?

Awareness-raising and dissemination of information

44. What are the main channels to disseminate updated information on technically and economically feasible alternative technologies to be applied by local refrigeration and air-conditioning manufacturers?

45. How did technical assistance projects address awareness-related challenges? What awareness-raising strategy was used and what were the results?

46. Are there awareness campaign tailored to a specific target audience? How did the servicing community change following these activities?

47. Was there any collaboration with the customs departments in raising awareness on the handling of the new refrigerants?

Funding

48. What was the level of co-funding leveraged by the MLF activities?

49. How did countries identify sources of co-financing? What were the obstacles, opportunities and challenges to identify such sources of co-financing and what lessons can be learned from there? Were there delays due to obtaining co-funding?

50. Related to the adequacy of funding, the evaluation will look into the issue raised by the desk study that some funding was inadequate or excessive.

51. How the flexibility, granted to Article 5 countries through their Agreements with the Executive Committee, was used to optimize the allocation upon implementation of the HPMP?

52. How will the increase in the funding available for the servicing sector under decision 74/50, affect the ongoing projects and acceptance of alternatives to HCFCs and HFCs with low-GWP and zero-GWP?

Other sustainability-related issues

53. The field study will assess the sustainability of activities in the servicing sector, taking into account the findings of the desk-study, and identify the key factors relevant to sustaining the activities' impacts.

54. What activities could be implemented to reduce emissions during the operation of equipment, while maintaining energy efficiency?

55. What was the impact of the project on small servicing businesses?

56. How will the servicing sector be affected by the phase down of HFCs?

57. How did IS, CAP and HPMP activities impact on the HCFC phase out in the servicing sector, and what are the possibilities to increase synergies to effectively address the servicing sector?

58. Have servicing activities contributed to improving the energy efficiency of the equipment? If so, were such improvements in energy efficiency monitored or assessed?

Monitoring

59. What indicators are monitored? What is the leakage rate and reuse of refrigerants? What structures are in pace for continued monitoring?

Methodology

60. A team of consultants will be recruited based on their experience and knowledge of the subject matter and of the functioning of the Montreal Protocol and the Multilateral Fund. The team will analyse the existing documents as well as the conclusions and recommendations of the desk study and collect additional information from field visits. As much as possible, reliable quantitative information will be collected together with qualitative information. Discussions with the Secretariat staff, the National Ozone Unit (NOU) and the bilateral and IAs will be organized as needed.

61. Each field visit will yield a country evaluation report which will be shared with the Secretariat, the bilateral and IAs and the NOU for comments. At the 81st meeting, a short report with key findings from countries visited until this period will be presented. A synthesis report will summarize the findings from the country evaluation reports and formulate lessons learned and recommendations for consideration by the Executive Committee at the last meeting in 2018.

Sample of countries

62. The following countries are proposed to be part of the sample of countries to be visited by the evaluation team, based on geographical area, IAs, and specificity of projects:

(a) Chile (Latin American country with servicing in supermarkets; UNDP, UNIDO and UNEP)

(b) Grenada (Caribbean country with 20 recycling and recovery centres and awareness-raising to promote alternative technologies; UNEP and UNIDO);

(c) India (Asian country with the use of R-290; UNDP; UNEP, and Germany);

(d) Kyrgyzstan (Europe and Central Asian (ECA) region with an innovative approach and a phase out planned for 2020; UNDP and UNEP);

(e) Oman (Middle Eastern country with activities in recovery of refrigerant; UNEP and UNIDO);

(f) Samoa (PIC; UNEP);

(g) Senegal (Western Africa; UNEP and UNIDO);

(h) Turkey (ECA region, demonstration project; UNEP and UNIDO); and

(i) Zimbabwe (Eastern Africa; Germany).

Annex II

STATUS OF ADOPTION OF REGULATORY MEASURES

Measure	Countries				
	Chile	**Samoa**	**Grenada**	**Oman**	**India**
1. Mandatory reporting by refrigerant importers and exporters	Yes	Yes	Yes	Yes	Yes
2. Bans on non-refillable (disposable) refrigerant containers	No	*	No	*	Yes
3. Extension of import/export licensing system to all refrigerants	No	*	No	No	No
4. HCFC emissions control measures (e.g., compulsory recovery)	No	Yes	No	No	Yes
5. Ban on the use of HCFC-141b for flushing systems during servicing	No	*	No	*	No
6. Ban on imports of second hand HCFC-based equipment	Yes	*	No	Yes	Yes
7. Predetermined schedules for leakage check by certified personnel for systems with charges above a certain limit	No	*	No	*	No
8. Large systems record-keeping (e.g., HCFC logbooks and HCFC-based equipment log books)	No	No	No	No	No

* Not said (could be taken as No)

Annex III

COMPLETE LIST OF LESSONS LEARNED

ISSUE: Project implementation	
Country	**Lessons learned**
Chile	• It is estimated that some imported cars contain HFO-1234yf and residential ACs (mainly split units) charged with HFC-32 are entering the market. Therefore, it is recommended to address both sectors in order to get information and be prepared for future trainings for these A2L refrigerants. In general, adequate inventories and strategies should be prepared by sector. • Recovery units are expensive tools and only large and medium size service enterprises own a recovery device. This issue should be revisited and investigated by NOU in view of the implementation of recovery/recycling and reclaim network. • Delays should be addressed through more frequent meetings with IAs. • Some issues to be addressed to improve the training strategy are: promote certification among uninterested technicians due to a high demand job market; hire skilled trainers and Spanish speaking experts through consultation with neighbouring countries; continue evaluating and updating the skills of the domestic staff of trainers; and update trainings centres by providing the necessary tools. • The design of projects should keep in mind the added safety costs when flammable, toxic or high pressure alternatives to HFCs are employed. • At the beginning of HPMP implementation, regulations were the main vehicle for compliance. Other activities create a beneficial environment for the long term compliance.
Grenada	• To prepare adequate strategies covering all RAC sectors. • To expedite activities implementation avoiding delays. • Delays should be addressed through more frequent meetings with IAs and avoid misunderstandings. • Grenadian RAC Association created under the auspice of the NOU has contributed to implementing phase out activities and cooperated in the establishment of sustainable recovery/recycling network. • Grenada is importing all RAC systems and thus the tendency of global market is the main influence, which underlines the importance of trainings and awareness activities carried out by the NOU to importers. • Collaborative work among all stakeholders is vital for success and facilitates implementation of activities.
India	• Proper training of technicians is key to the phasing-out of HCFC-22 and phasing in of zero-ODS, low-GWP and energy efficient equipment. • Mechanisms put in place for the CFC phase-out activities could be used for HCFC-22 phase out with updating as required. This includes development of legislations, customs training, upgrading of training of trainers and subsequently training of technicians. • Training partners from the private sector, who are also practicing RAC installation, commissioning and servicing, ensured that the training was appropriate; provided interaction and feedback between trainees and trainers and feedback to Germany, if changes/additions were needed in the training programmes, are provided. • Germany implemented training programme had a positive impact on the small servicing business. The return on investment increased and some technicians were able to buy some essential tools.

	• A strong national Association with state-wide chapters allows for faster dissemination of information. • Use of information technology, in this case the development of a smart phone app for the dissemination of newsletter and other technical information to technicians, will help in keeping technicians abreast of relevant information. • A strong awareness programme, such as for the Government's Energy Efficiency Star rating programme, has allowed consumers to make informed decisions when procuring room air-conditioners. • For countries with large number of technicians and a substantial consumption in the servicing sector, increasing the cost effectiveness threshold should be considered. • Possible movement of funds between sectors in the HPMP Agreement should be considered, if needed, to enable larger cross section of technicians be trained.
Oman	• Before any further recycling/reclamation centres are proposed and funded, a questionnaire along with a detail explanation on how the centres would operate including costs, time lines, return of refrigerant, and guarantees on the quality of the reclaimed refrigerant, should be sent to the industry. If the results indicate the industry is not interested in using such facilities, the funding should not be provided. Instead, providing servicing tools and recovery machines for large workshops should be considered. • Training for HCs must start quickly, as more and more flammable alternatives enter the country, improper servicing or installation will greatly increase the likelihood of technician injury and possible property damage. In the long-term it would not be sustainable and must be addressed. • Only a small percentage of the industries technicians have been trained in good practices and more workshops need to be organised to increase that percentage in a year or two. Oman has the required trainers and vocational centres in place to accomplish this recommendation in a relatively short period of time. • Mandatory regulations should be adopted to help insure all service technicians play their part as the need to recover refrigerants is a long term requirement not just appropriate for the current HPMP. • Some mandatory Government certification should be issued, indicating that the technician has been trained in good practices along with high pressure refrigerants. This certification would be separate from any apprenticeship certification from the countries vocational centres. Additional certification for servicing and installation of flammable alternatives should also be considered. • Some RAC sector enforcement guidelines needs to be put in place once mandatory recovery and certification schemes are implemented, to help ensure compliance with government regulations. • The industry needs to be encouraged and possibly funded to organise a Trade Association. This would help to ensure a speedy distribution and sharing of information and experiences. • More recovery equipment needs to be purchased and distrusted to RAC servicing enterprises who are large enough.
Samoa	• The amount of equipment containing HC refrigerants being imported into Samoa is increasing rapidly. The need for proper training and licensing on these flammable alternatives needs to be prioritised to ensure technician as well end-user safety. The NOU is aware of this necessity and plans are being made to ensure that mandatory certification and training is completed during the 2018/2019. • There is also a need for more recovery equipment and possibly specific tools related to the servicing of flammable equipment.

	• The disposal of unwanted refrigerant must also be addressed not only in Samoa, but in most Article 5 countries.
ISSUE: Policy, legal and regulatory frameworks	
Country	**Lessons learned**
Chile	• Regulations have a high cost in implementation and control is difficult. • International standards are the basis for establishing local regulations. • Standards need to be widespread and introduced in trainings and certification curricula in order to be effective. • The opening of custom tariffs for HFCs and also for alternative refrigerants need to be done in advance to get reliable data on imports/export and be prepared for future controls. • An updated and equipped National Custom Service is vital for the control of imports/exports.
Grenada	• Advanced planning of regulations is needed. It takes long time to design and enact regulations due to the various actors involved. • Regulations have a high cost in implementation and control is difficult. • Standards need to be widespread and introduced in trainings and certification curricula in order to be effective. • An updated and equipped National Custom Service is vital for the control of imports/exports.
ISSUE: Technology-related issues	
Country	**Lessons learned**
Chile	• HPMP projects influenced technology selection and MLF project sponsorship support was fundamental. Demonstration projects are useful and should be approved at an early stage. • The role of international companies in introducing alternative technologies seems not to be so relevant in Chile. • Apart from the need of financial support, which creates an incentive for the technology adoption, many other barriers still need to be removed. Therefore, actions are needed to remove barriers. • Study tours are useful to evaluate the new technologies in situ. • Trans-critical CO_2 technology costs are reducing with mass production but there is still a significant gap in design, installation and maintenance costs compared to HCFCs and HFCs systems. • Lower-GWP intermediate alternatives to HCFCs that sustain the operation of HCFC-based equipment until the end of life are not readily available yet in Chile.
Grenada	• CO_2 systems have no presence in Grenada. A strong awareness campaign would be needed in order to disseminate knowledge about new technologies for the commercial refrigeration segment (i.e., trans-critical CO_2 and/or ammonia low charge systems) for the adoption of the new technology and MLF support would be fundamental in this regard. • Training abroad is cost-effective and permits to evaluate the new technologies in situ. • New HFC-32 split ACs have recently arrived in Grenada so training and activities targeting A2L refrigerants should be developed.
ISSUE: Retrofitting HCFC-based equipment with flammable alternatives	
Country	**Lessons learned**
Chile	• Retrofitting of HCFC-based equipment with flammable alternatives is not a common practice in Chile. • The recently created standard NCh 3301 of 2017 addresses the risks of managing flammable refrigerants, but should be included in the profiles for certification.

Grenada	• Retrofitting of HCFC-based equipment with flammable alternatives is a common practice in Grenada. • The recently created related standard as well as intensive training performed would create a safer environment thus addressing the risks of managing flammable refrigerants.
ISSUE: Demonstration projects for the servicing sector	
Country	**Lessons learned**
Chile	• Demonstration projects promote the adoption of low-GWP technologies by incrementing confidence and removing barriers that are vital for fast HFCs phase out while avoiding the costs of second conversions, thus, approval of demonstration projects should be promoted. • Project design and planning has a direct impact on timely implementation. • Country conditions needs to be taken into account for design and planning. • More realistic schedules for completion are needed, as well as more advanced planning. • Early awareness actions toward end-users is important. • Monetary incentives help projects acceptance by recipient companies. • It is important to increase the creation of technical capacities on new technologies in order to keep its momentum.
Grenada	• Demonstration projects are relevant for the adoption of low-GWP technologies incrementing confidence and removing barriers and are vital for high-GWP HFCs phase out and linkage with energy efficiency concepts. • The SPODS project could offer a regional method to solve issues about destruction of unwanted refrigerants for the Caribbean islands.
ISSUE: Energy efficiency	
Country	**Lessons learned**
Chile	• The Ministry of Energy is in charge of regulations, thus, a close contact and cooperation with the NOU is important. • Realistic baseline for energy consumptions comparison should be clearly stated at the very beginning of the projects if it is an objective of the project. • Most service technicians are not skilled enough to evaluate energy efficiency parameters so future trainings should address this issue.
Grenada	• Demonstration project (energy efficiency comparison between HCFC-22, R-410A and R-290 split AC) still ongoing will be a good instrument in order to educate technicians, importers and end users about energy efficiency issues, while demonstrating the benefits of replacing HCFC-based equipment.
ISSUE: Refrigerant containment (recovery, recycling, reclamation)	
Country	**Lessons learned**
Chile	• It took a long time to decide the best business model for the RRR system, therefore international experience is important in this regard. • Main clients of RRR system are big refrigerants consumers and should thus be the main target of such systems. • Registration of the big installations would contribute to a better control of RRR system in the future. • Long distances and logistic costs are barriers, therefore a well-structured network covering all regions is important. • Refillable recovery tanks are not available in many countries because refrigeration wholesalers are not interested in importing these goods. Hence, at least a limited number of these tanks should be included in any recovery project. • The 2L refrigerants need dedicated recovery units due to flammability. This issue needs to be revisited by the NOU.

Grenada	• When recovery is not mandatory, controlled refrigerants have a low price and not extra taxes are applied, a huge awareness effort is needed in order to make it a common practice. • Final dispositions of stockpiles of used or unwanted controlled substances as well as disposable cylinders are still pending issues in Grenada. There are no refrigerants destruction facilities and disposable tanks are crushed and sent to landfills. Both issues would need to be solved. • The recovery units operated by Grenadian Technicians Association (GRAVA) are shared by its members. Many technicians work at bigger servicing enterprises and or end-users operating recovery units, but it is improbable that independent technicians not associated to GRAVA have access to the recovery centres. This issue should be revisited by the NOU in order to implement a more open access to recovery centres.
ISSUE: Training and sustainability of training results	
Country	**Lessons learned**
Chile	• Both standards already issued by the National Institute of Normalization need to be widespread among the RAC sector, or some specific codes of practice based in these standards need to be prepared for each RAC segment. • An induction to theoretical training should be implemented previous to certification in order to avoid barriers perceived by low schooling technicians. • Alternative cleaning substances like the new HFO solvents should be included in the training because other methods for flushing do not remove crusts when formed inside piping. The use of a cleaning solvent is mandatory under some circumstances. These solvents today are not available in Chile or their prices are high, but this will change in the near future. • Good practices and knowledge about the MP and low-GWP refrigerants are part of the "Good Refrigeration Service Practices" trainings offered by the NOU. These concepts should also be incorporated into the curricula of educational institutions by promoting standards already issued (NCh3241 and NCh3301) by the INN.
Grenada	• Trainers need to be updated with new refrigerants/technologies mainly in commercial refrigeration central systems and good practices; manual need to be updated encompassing new technologies development for this refrigeration segment. These extra costs need to be taken into account. • Although certification is not mandatory, induction trainings implemented previous to certification and strong NOU encouragement for certification are key actions in order to avoid barriers perceived by low schooling technicians.
ISSUE: Awareness-raising and dissemination of information	
Country	**Lessons learned**
Chile	• Changes of behaviour are slow, so awareness-raising as well as training actions should be addressed early.
Grenada	• Awareness raising campaigns are well addressed, but need to be updated regularly in order to incorporate knowledge about new substances/technologies, which requires extra efforts and costs.
ISSUE: Funding	
Country	**Lessons learned**
Chile	• An interesting level of co-funding is able to be leveraged. • Delays in funding disbursement affects project implementation. • The flexibility, granted to Article 5 countries in their Agreements with the Executive Committee, is a good instrument. • The increase in the funding available for the servicing sector under decision 74/50 permits to introduce HCs as alternative.

Grenada	• According to the NOU, some approved funds were less than expected mainly those referred to the procurement of servicing tools. • An interesting level of co-funding was obtained but (according to the NOU) by the sole effort of the NOU, which felt that the IAs should be more proactive in this regard.
ISSUE: Monitoring	
Country	**Lessons learned**
Chile	• Leak reduction in the supermarket sector contributes to refrigerant consumption reduction as well as to the reduction of direct and indirect emissions. Projects within this objective should be welcomed. Registration of big installations would also contribute but the effective control is difficult and implies major costs.
Grenada	• Leak reduction in the supermarket sector contributes to refrigerant consumption reduction as well as to the reduction of direct and indirect emissions. Projects within this objective should be welcomed. Registration of big installations would also contribute but the effective control is difficult and implies major costs.