UNITED NATIONS

EP

United Nations Environment Programme

Distr.
GENERAL

UNEP/OzL.Pro/ExCom/80/10
18 October 2017

ORIGINAL: ENGLISH

EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Eightieth Meeting
Montreal, 13-17 November 2017

DESK STUDY FOR THE EVALUATION OF THE HCFC PHASE-OUT IN THE REFRIGERATION SERVICING SECTOR

Background

1. At the 79th meeting, the Executive Committee approved the inclusion of the desk study for an evaluation of the refrigeration servicing sector in the 2017 monitoring and evaluation work programme pursuant to decision 77/7(b), and the terms of reference for such an evaluation (decision 79/6).

Methodology

2. The desk study analyses the progress made in the phase-out of HCFCs in the projects funded by the Multilateral Fund (MLF) in the refrigeration servicing sector. It focuses 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 when relevant, and challenges encountered during project implementation. The evaluation draws lessons from these projects to help future similar activities in the sector. Taking into account the limitations of a desk study, it will attempt to identify potential issues that could be related to the phasing-down of HFCs.

3. The desk study examined selected projects in the refrigeration servicing sector in both low-volume consuming (LVC) and non-LVC countries,[1] in different geographical regions and implemented by bilateral and all implementing agencies (IAs). It addresses the evaluation questions contained in the terms of

[1] The countries included in the study are: Burkina Faso, Djibouti, Ghana, Nigeria and Senegal in the African region; Bahrein, 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 (PIC).

reference, through examination of project related documentation[2] such as project proposals and progress reports, as well as feedback received from the Fund Secretariat and IAs staff.

Scope of the document

4. The present document presents the key conclusions and lessons learnt of the desk study; the results of each of the specific issues and questions identified in the terms of reference of the study, namely: implementation issues, policy, legal and regulatory frameworks; refrigerant containment (recovery, recycling and reclamation); technology-related issues; training; awareness-raising and dissemination of information; funding-related issues; and sustainability; and a recommendation.

5. The document also contains the following annexes:

Annex I	Terms of reference for the desk study for the evaluation of the refrigeration servicing sector
Annex II	HCFC consumption in Article 5 countries considered in the desk study
Annex III	Reasons for delays
Annex IV	Lessons learned
Annex V	Demonstration projects affecting the refrigeration and air-conditioning (RAC) servicing sector (approved after the 74th meeting)

Conclusions and lessons learnt

6. The type of activities being implemented for the refrigeration and air-conditioning (RAC) servicing sector within the HCFC phase-out management plans (HPMPs) are very similar in nature to those implemented within the CFCs terminal phase-out management plans (TPMPs) and the national phase-out plans (NPPs), namely: reducing ODS demand, through training programmes for technicians and other related initiatives; monitoring and reducing ODS supply with import/export licensing and quota systems and customs training, among others; and, assisting both efforts through supporting measures such as additional legislative and regulatory measures and public awareness, among others.

7. Since the first activities for the phase-out of CFCs were approved, such initiatives were organised as a collaborative effort among the numerous stakeholders involved in this issue. Therefore there is now a well-structured network that continues to play a major role in the implementation of the HPMPs. Among these, the technical training schools and refrigeration technicians associations stand out as the most frequently used strategic partners, followed by the chambers of commerce and industry, and NGOs.

8. The results of HPMP implementation have been so far very positive, since the cases of non-compliance with the HCFC consumption control measures was only 2.8 per cent of the countries in the study, and most of the countries reported consumptions well below the limit imposed by the Montreal Protocol, resulting in net savings of 4,342 ODP tonnes of HCFC consumption in 2013 and 4,780 ODP tonnes of HCFC consumption in 2015.

[2] The level of detail provided by the documents consulted, differ greatly, and sometimes the results of the analysis might be affected by this fact. In such cases, an explanation was attempted while keeping in mind the caveat that it might just be a scarcity of detail. In some cases, there was no information to make any analysis whatsoever. One way to solve this would have been contacting the countries themselves, but given the time constrains for this study, this action was out of its possibilities.

9. The reporting record of some of the countries points to the need for a more focused assistance concerning HCFC consumption monitoring and reporting, which is an issue that may also affect future endeavours. The analysis of reporting suggests that there may be an excess of data not necessarily useful. One solution is to streamline the regular reporting requirements and undertake specific data collecting efforts in a database that would allow online consultation. This approach would require a more advanced planning of the information needs in order to produce timely results, but it would certainly constitute the foundation of a more comprehensive and cost-effective reporting system for the future.

10. The process from design to enactment of any new regulation takes anywhere between three to four years. To prevent setbacks in any implementation schedule there must be a realistic lapse of time allowed for such legislation-forming process. This could be coupled with a more advanced planning of regulations. It is also worth considering the value of awareness-raising to promote the political relevance of the regulations under development and thus prioritise the enactment process.

11. The reduction of refrigerant emissions has been at the very core of all the assistance provided to the RAC servicing sector since it is one of the main objectives of the training programmes and of the codes of good practices. The emission reduction activities become more critical for equipment containing greater charges of refrigerant, and that is the rationale behind the thrust for specific initiatives for consuming sectors with greater rates of refrigerant leaks and waste (e.g., supermarkets).

12. The attitude towards safety issues concerning equipment based on flammable refrigerants seems to rest more on the country´s dependence on foreign markets, or the country´s traditions, among others. More assistance seems necessary in countries where the regulatory framework for the use of flammable refrigerants seems to be lagging behind, thus preventing a safer environment for the use of such alternatives.

13. Demonstration projects can take a long time to produce results, and the key factor for reaping the desired multiplicative effects on the rest of the sector would lie in the dissemination efforts of their results, which can happen only at the time of project completion. This calls for a more advanced planning and approval of this type of projects.

14. The causes for delays most frequently reported by the countries seem to suggest that HPMP implementation would benefit from a more independent and stable structure of the national ozone units (NOUs)/project management units (PMUs) from their central governments, and from a more focused assistance to NOUs/PMUs on administrative and operational requirements of projects funded under the MLF. There are indications that these are long-standing issues since the inception of MLF assistance and that, if left unattended will continue to affect HFC phase-out efforts in the future.

15. Key lessons learned related to institutional matters included:

(a) The need on earlier implementation of awareness-raising and training activities since the changes in awareness and behaviour of technicians can take several years;

(b) The need to simplify the complex requirements from public administration for cooperation with external organisations; and the need to address barriers for participation of national regional institutions in bidding and contracting since they had no related experience, and prior authorization of the national agencies was required;

(c) The importance to strengthen the bridges between the NOU/PMU and other authorities in the country for better implementation of the HPMP; and the need to ensure the presence of local technical experts to support the NOU/PMU due to the limited capacities of local government institutions;

(d) The need to empower the PMU with respect to central government authorities, to expedite

implementation in view of the slowness of governmental institutions;

(e) The need to properly tackle each target audience for implementing awareness-raising activities concerning ODS issues, in order to guarantee an impact; and

(f) The effects on implementation of phase-out plans of repeated changes of responsibility in partner institutions.

16. Key lessons learned related to the long-term sustainability of activities included:

(a) The importance of involving the appropriate stakeholders in the design and implementation of training programmes, considering the specific characteristics and needs of the target audience and the country itself;

(b) The sustainability of the training programmes for customs officers by including the training modules in the curricula of the customs training institutions (in some countries the training has been turned into an e-learning module);

(c) The training of customs officers on the implementation of HCFC import/export licensing and quota systems as an incentive to ensure sustainability;

(d) The sustainability of the training programmes for service technicians by ensuring that the curricula of technical training institutions are appropriately modified with such training, and by establishing technician certification schemes which becomes a desirable badge of quality service which any technician and/or workshop desires to have; and

(e) The widespread adoption of formal codes of practice, which become part of the certification process.

17. Key lessons learned related to alternative technologies included:

(a) The key aspect of encouraging domestic innovative solutions to HCFC phase-out;

(b) The need to consider that the commercial refrigeration sub-sector is very different from the domestic sector and the creation of cooperation networks in this sector is much more complex;

(c) The importance to support training for handling of flammable or toxic refrigerants and the corresponding regulations and standards; and innovative approaches for increased safety for users and service technicians; and to ensure adoption of rigorous safety systems for production processes;

(d) The lack of availability of skilled technicians trained on new alternatives;

(e) The higher costs of initial investment; and the challenges in identifying suppliers able to deliver equipment and supplies according to specifications; and

(f) The identification of suitable alternatives for high-ambient temperature countries, particularly for the AC industry.

18. Positive lessons learnt:

(a) Long-term sustainability of the training programme is ensured through the incorporation of the programme in the curricula of the schools;

(b) The legislation in place provides conditions for the successful implementation of R&R scheme;

(c) Besides ODS, recovered and recycled HFC refrigerants are minimizing the climate impact; and

(d) Refrigerant losses are mainly from old equipment and regular servicing and maintenance could reduce and prevent losses of refrigerants from these systems.

19. An eventual field study could concentrate on countries reporting the most frequently cited reasons for institutional and procedural delays in HPMP implementation, in order to better understand the underlying causes and provide a more effective assistance. These countries could be: Bahrain, Bosnia and Herzegovina, Brazil, Burkina Faso, Chile, Ghana, Kuwait, the former Yugoslav Republic of Macedonia, Mexico, Nigeria, Saudi Arabia and Serbia. Another interesting line of investigation for a field study could be obtaining details of more mature demonstration projects, which can also be done for the aforementioned countries.

20. The results of each of the specific issues and questions identified in the terms of reference of the study are presented below.

Implementation issues

21. All the countries in the sample, without exception, implemented the following activities:

(a) Licensing and quotas for the import or export of HCFC-containing equipment;

(b) Fiscal incentives for the import of equipment based on low-GWP refrigerants.

(c) Technical assistance programmes for the refrigeration servicing sector, with training programmes for technicians as the main standard bearer of the assistance to reduce ODS demand;

(d) Technical assistance programmes for the control of ODSs imports/exports, with the import/export licensing and quota systems and customs training as the most important initiatives for the reduction of ODS supply; and

(e) Supporting actions such as additional legislative and regulatory measures and public awareness, among others.

22. Other measures commonly undertaken to control ODS demand included:

(a) Certification of refrigeration technicians after training;

(b) Establishment of codes of good practices for servicing of RAC equipment;

(c) Establishment of refrigerant recovery and recycling (R&R) schemes; and

(d) Establishment of refrigerant reclaiming centres, among others.

23. These initiatives, however, are different for each country according to the degree of development of previous initiatives and to the specific characteristics of the country. Many countries have taken innovative approaches (including demonstration projects) that respond to their very individual needs or those of HCFC-consuming sectors. For instance:

(a) Brazil: “Training and standards for supermarkets and specific type of equipment”;

(b) Fiji: “Retrofit programme for fishing boats”;

(c) Ghana: “End-user incentive programme for the residential, commercial, industrial refrigeration and air-conditioning sectors”;

(d) The Islamic Republic of Iran: “Retrofit programme for fishing boats” in Fiji, the “Programme to promote leak-free supermarket installations”;

(e) Maldives: “Demonstration project for HCFC-free low-GWP alternatives in refrigeration in the fisheries sector”:

(f) Mexico: “HCFC-141b and HCFC-22 cleaning agent phase-out in refrigeration service sector”; Nigeria: “Demonstration project for local production facility of refrigerant-grade hydrocarbons”; and

(g) Uruguay: “Development of a sustainable public procurement programme (SPP) for use of equipment based on low-GWP alternatives”.

24. Several of those efforts have been prompted by decision XXI/9 of the Meeting of the Parties and consequent decision 74/50, but also by the commitment and genuine concerns of countries vis-à-vis global warming and environmental issues in general.

25. The results of these initiatives have been so far positive since within sample of countries for this study, cases of non-compliance with the consumption control measures under the Montreal Protocol were very low (only one or 2.8 per cent), and most countries had reported consumption well below the limit imposed by the Montreal Protocol. The reporting record of the countries in the study also points to the need for a more focused assistance to some of the countries (e.g., Pacific Island Countries (PIC)) concerning HCFC consumption monitoring and reporting.

Contribution to the transition to low-GWP alternatives

26. The main contribution to the transition to low-GWP alternatives within the HPMP has been the emphasis on including low-GWP alternatives in the training programmes for refrigeration technicians. This effort has covered almost 100 per cent of the countries and has greatly contributed to dispel negative attitudes and lack of know-how about these alternatives, in particular about flammable and toxic ones. All the training programmes for technicians have included low-GWP refrigerants as part of the alternatives for HCFCs, except for Armenia and the former Yugoslav Republic of Macedonia (it may be due to an inadvertent omission on the reporting. Likewise, 50 per cent of the countries have started work towards establishing national regulations and standards for the use of flammable and toxic refrigerants.

Contribution to HFC phase-down

27. Every effort to promote low-GWP alternatives to HCFCs carries explicitly a de-promotion of HFCs as future alternatives to HCFCs and as a wise business decision when choosing any new equipment, due to their detrimental environmental effects and to the imminent control measures for these substances. For instance, there is an explicit disincentive for using HFCs as an alternative to HCFCs in Ghana´s “End user incentive programme”. Furthermore, the recycling efforts can include many types of refrigerants including HFCs as reported by the former Yugoslav Republic of Macedonia, and some initiatives have specifically included the retrofit of HFC-based equipment to low-GWP alternatives.

Major stakeholders and their role

28. Currently there is a well-structured network of stakeholders that continues to play a major role in the implementation of the HPMPs. Among these, the technical training schools and refrigeration technicians

associations are key strategic partners, followed by the chambers of commerce, chambers of related industries, chambers of equipment and refrigerant importers, and NGOs.

29. Each of these players has a specific role as per their competences and fields of action. For instance, the most important technical training schools have always been part of the advisory panels or councils that assist the NOU in the design of the training programmes or other type of measures that affect the RAC technicians, but have also been the partners of choice for delivering the training to technicians and sometimes have also been instrumental in the process of technician certification. Likewise, the chambers of commerce, of related industries and of equipment and refrigerant importers have been instrumental to reach the members of their organisations, as main channels of communications with them, and as valuable members within the advisory panels for the design of strategic lines affecting their sectors.

30. Refrigeration associations have also one of the most important strategic partners in the design and implementation of all the activities related to the RAC servicing sector, assisting in the design and implementation of training programmes, certification schemes and legislation or regulations for the exercise of the trade, and have served as a channel of identification and communication with the technicians. They have proven to be useful in the implementation of initiatives for the RAC servicing sector; when they do not exist, their promotion and creation becomes part of the programme objectives, as is the case of the countries in the PIC region and Bosnia and Herzegovina.

Regularity and relevance of reporting

31. The regularity and relevance of reporting depends on its objectives, which vary according to the recipients, such as the country, the IAs, the MLF for evaluation of the overall performance of the Fund, and the Executive Committee to properly inform the policy decisions that will determine the operational and strategic lines of the MLF. Countries report to the Secretariat through progress reports sent with every request for a new tranche of multi-year agreement (MYA) or more often if so decided by the Executive Committee.

32. The most important factor is whether the progress reports provide the necessary and adequate information for the decisions the Executive Committee needs to take. The emphasis of the progress reports, which is the best and almost only source of information concerning the activities in the countries, lies in the completion of pre-defined milestones, and not on the details of the activities and they have a limit imposed on their length and even then, are quite extensive.

Delays in project implementation

33. All of the 35 countries in this study presented delays in at least one of the approved tranches and sometimes in several of them. Thirty five per cent of the reasons provided for delays were of procedural nature, and 34 per cent were of institutional nature.

34. Concerning the delays categorised as “institutional”, 57 per cent were attributed to the delay caused by the actual reorganisation of government institutions or the change of incumbents or the delay in appointing new ones, while 43 per cent were attributed to the slow response of the institutions. With respect to procedural delays, 68 per cent was attributed to the complexity of the activities or complications in their implementation, and 32 per cent due to discussions with stakeholders, either by the complexity of discussions or the increased number of stakeholders. A similar evaluation for TPMPs[3] in 2009 concluded on analogous reasons for delays, namely, administrative arrangements, and discussions with public and private stakeholders, and that “continuity of organizational structures and the NOU staff plays an important role in successful project implementation”.

[3] Final report on the evaluation of TPMPs (UNEP/OzL.Pro/ExCom/58/8).

35. Less frequent reasons for delay were attributable to implementing agencies, such as delay in disbursement of funds (10 per cent); to suppliers, for example delay in delivery of equipment (8 per cent); to market reasons as in the case of the Islamic Republic of Iran with the lack of local availability of pentane, or Saudi Arabia with the market conditions of neighbouring countries where their products are exported (6 per cent); to technology malfunction as in the case of Mexico with the failure of the flushing equipment (3 per cent); and to political reasons or terrorism such as the effect of international sanctions on suppliers for the Islamic Republic of Iran, and the case of Nigeria with the bombing of the UN building on 26 August 2011, respectively (2 per cent). Annex III to the present document lists the main reasons for delays reported by the majority of the countries included in the desk study.

Policy, legal and regulatory frameworks

36. Regarding import/export licensing and quota systems[4], all of the countries have one, although with different scopes depending mainly on the size and complexity of the import/export operations, which is directly related to the size of the economy. One third of all countries have or are aiming to have electronically operated licensing systems, many prompted by the requirements of regional cooperation agreements, such as the three countries in the Middle East region under the Gulf Cooperation Council; two of the three countries in the Eastern European region under the EEU; all the countries in the Latin American region except for Peru; and China. Only five countries (Bosnia and Herzegovina, Burkina Faso, Cambodia, China and Djibouti) reported having included HFCs in their customs coding system. At first sight there does not seem to be any commonality among the countries taking this forward-looking measure.

37. Apart from the import/export licensing and quota system, the countries have included different complementary legislative and regulatory measures, including:

(a) Licensing and quota system for ODS and all HCFC-based equipment, and licensing of all establishments (e.g., importers, distributors, retailers, service workshops) dealing with and handling ODS in the RAC sector;

(b) Mandatory reporting by all importers/exporters of HCFCs, blends and equipment containing them;

(c) Ban on imports or use of refrigerants in non-refillable containers and all used HCFC-based equipment;

(d) Mandatory leak detection, containment of all bigger RAC systems using HCFCs, and R&R of refrigerants; and ban on venting of refrigerant into the atmosphere during servicing;

(e) Maintenance of a logbook to record all leaks, repairs and top ups; mandatory reporting of recovered/recycled and reused refrigerant and stocks of unusable refrigerant; and requirements on labelling for all types of containers of HCFCs, their blends and alternatives as well as equipment and products containing or operating with them; and

(f) Prohibition of any new manufacturing facilities using HCFCs or blends.

[4] "That, for all submissions from the 68th meeting onwards, confirmation has been received from the Government that an enforceable national system of licensing and quotas for HCFC imports and, where applicable, production and exports is in place and that the system is capable of ensuring the country's compliance with the Montreal Protocol HCFC phase-out schedule for the duration of this agreement." (UNEP/OzL.Pro/ExCom/63/60, decision 63/17 paragraph 71).

38. The level of detail of the legislative or regulatory framework does not seem to bear any relation with the size of the country or its consumption level, since LVC countries (e.g., Maldives or PIC) have proposed a comprehensive legislative and regulatory framework in contrast with non-LVC countries.

39. Regional trade organizations favour and promote the adoption of standardised and comprehensive sets of measures among its member countries, as in the cases of the Gulf Cooperation Council (GCC), the Economic Commission of West African States (ECOWAS), the Union Économique et Monétaire Ouest Africaine (UEMOA), and the Eurasian Economic Union (EEU).

40. Concerning the measures for introduction of low-GWP, flammable or toxic refrigerants, the efforts for the establishment of regulations and standards for the safe use of such refrigerants has been undertaken by 54 per cent of the countries (i.e., all the countries in the African, Middle East and Asia Pacific regions; Armenia in the Eastern European region; Brazil, Grenada, Mexico and Uruguay in the Latin American region; and none of the PIC). International standards have been instrumental as references for these countries for establishing their own local standards although no specific mention was found in the documents examined concerning direct contact with international standard organisations.

41. In the case of China, three standards for flammable refrigerants have been established to ensure the safe use of R-290 in the room AC sector. These are technical safety codes for using flammable refrigerants in the household and air-conditioners manufacturing industry, with particular requirements for transportation of room air-conditioners charged with flammable refrigerants, and technical safety codes for servicing. The development of the three standards was initiated in July 2013 and the standard of the safety codes for servicing was approved by the Standard Committee in May 2014 and became effective on 1 January 2016. The draft version of the other two standards has been finished, and distributed to collect comments and suggestions from all the stakeholders. Their adoption is envisaged in 2017. Also in 2015, project to research existing efficiency codes and standards with regard to different refrigerants utilization was initiated, to better connect with the present situations on refrigerant development.

New enforcement procedures and monitoring tools

42. The NOUs have organized several levels of monitoring and enforcement functions besides the ones instituted within the MLF regime (e.g., Secretariat and IAs monitoring visits and verification reports), starting with their own activities monitoring functions within the work plans. These functions are discharged through the staff from the PMUs and/or expert consultants when necessary. In larger countries, the structure of the Ministry of Environment may allow to incorporate environmental inspectors or even replicate the entire monitoring and enforcement structure in each region of the country. Additionally, the consumption of HCFCs is monitored by the department of customs, supported by the ODS import/export licensing and quota system and related regulations, through its customs and other enforcement officers. This structure is very similar to the one adopted for the phase out of CFCs and is the one observed in most of the countries.

43. There is another level of monitoring and enforcement for countries engaged in regional trade agreements (such as the GCC), since such countries must engage in monitoring and exchange of information concerning intra-regional trade regulated within the agreement and be subject to the agreed enforcement procedures. There are also some novel monitoring tools in the RAC servicing sector, such as maintenance logbooks, and labelling for bigger HCFC-based equipment and containers of HCFCs and alternative refrigerants.

Legislation targeting illegal trade of refrigerants

44. This level of detail is not usually available in progress reports but it is assumed, and it is actually the case for the instances known to the consultant, that such provisions concerning illegal trade of refrigerants are included within the legislation and regulations accompanying the ODS import/export

licensing system, and consist of the standard actions taken on the case of illegal trade of any kind, which normally consist of seizure of the shipment, fines, compulsory re-export or even jail. For instance, the regulations on ODS management of China, which entered into force since June 2010, prescribes legal liabilities for illegal activities with ODSs.

Delays in adopting legislation and reasons

45. One country, reported that the standard process for adoption of any regulation normally takes between three to four years (which is longer that the average duration of many projects funded under the MLF or even tranches of a MYA). A good example of this is the adoption of the standard for the safety codes for servicing room R-290-based ACs in China which took two and a half years. At least two other countries have reported that initial discussions with stakeholders for the adoption of regulations have taken longer than expected.

Refrigerant containment (recovery, recycling and reclamation)

46. With respect to the establishment of an R&R network, however small, the only country in the study not reporting this activity was the Islamic Republic of Iran although it does include the subject in the training for RAC technicians (which in this case would rather seem to be a reporting omission). Uruguay has been the only country to report that it has not obtained positive results from the R&R efforts and will prioritise other initiatives during stage II of its HPMP. In the case of the former Yugoslav Republic of Macedonia, the country reported that approximately 26 tonnes of different refrigerants were recovered in 2015 with 96.4 per cent recycled, and 36 tonnes in 2016 with 96.2 per cent recycled. HFCs are among the refrigerants recycled and recovered thus contributing to HFC phase down. The refrigerants not recycled are treated as waste and stored for later disposal.

47. As for the establishment of refrigerant reclaiming facilities, Burkina Faso and Djibouti do not report it within the African region; the Islamic Republic of Iran in the Asian region; Bosnia and Herzegovina and the former Yugoslav Republic of Macedonia in the Eastern European region; Grenada, Peru and Uruguay in the Latin America and the Caribbean region; and all the PIC. No additional details are provided.

Stockpile management

48. Few countries reported actions concerning stockpile management of unwanted HCFCs. For instance, Bahrain is implementing a project for revamping the present system for the management of chemicals and waste and will include a separate section for ODS; Ghana is undertaking a pilot project on ODS waste destruction funded by the MLF; the former Yugoslav Republic of Macedonia reported that the refrigerant not recycled in the R&R system is treated as waste and stored for later disposal; and Peru reported on an ongoing programme for storage of unwanted ODS. Countries members of the GCC abide to specific obligations i.e., prior consent shall be obtained from the concerned authority when disposing of the waste of ODS or appliances, equipment and products containing them.

49. In case of cross-border disposal thereof, the obligations of state parties under Basel Convention with respect to control of transportation of hazardous waste and their cross-border disposal shall be taken into consideration.

Technology-related issues

50. The main challenges encountered to service equipment with alternative technologies have been the lack of a comprehensive regulatory body for the management of flammable or toxic refrigerants, and the lack of the alternatives themselves and related equipment and tools in the local markets. For instance:

(a) In Argentina and Brazil challenges encountered with alternative technologies included: the

cost of conversion due to safety requirements (in the case of hydrocarbons (HCs)); increased capital costs; the need to guarantee the quality and safety of installation, operation and maintenance of equipment; and the need for technicians with better skills, as main challenges, in the case of CO_2;

(b) In Ghana challenges in identifying suppliers capable of delivering equipment were encountered. As the training centres could not be operational, the training programme for customs officers, technicians and students could not be implemented as originally planned;

(c) In Mexico, the capacity-building programme, the incentives for the replacement of old equipment and the availability of consistent data regarding the energy performance of hydrocarbon (HC)-based AC units are expected to increase the market penetration of small HC-based AC units over the next three years; and

(d) In Uruguay, the use of alternative solvents used for servicing RAC equipment appears to be limited as they are not readily available in the country, even though the use of nitrogen and employing filters and other solvents is being demonstrated in the training courses.

Retrofitting HCFC-based equipment with flammable alternatives

51. The attitude of the general public and even the RAC servicing sector towards the risk of using and servicing equipment working on flammable substances is very casual since it is assumed to be negligible. For the more informed stakeholders, it is presumed that the risks are higher for companies manufacturing this equipment due to the higher volumes of flammable substances handled.

52. The attitude towards safety issues concerning equipment based on flammable refrigerants seems to rest more on the country´s dependence on foreign markets, or traditions. More assistance seems necessary in countries where the regulatory framework for the use of flammable refrigerants seems to be lagging behind thus preventing a safer environment for the use of such alternatives.

53. For instance, China has performed extensive tests indicating that the risk of fire or explosion in a wall-mounted R-290 AC unit is one in one hundred million in a year. Ghana has gathered practical experience in retrofitting CFC-based equipment to HC-based refrigerants for 10 years already, without having any related regulatory or standards framework in place. Ghana is also implementing the end-user incentive programme for the residential, commercial, and industrial refrigeration and air conditioning sectors since 2010, which includes a comprehensive programme of training, strengthening of training centres, establishment of related regulatory framework and retrofitting of a number of AC units from HCFC-22 to R-290[5]. As of the 76th meeting, 397 HCFC-based split-AC units have been converted even though the regulatory framework is still being discussed. In Maldives, the criteria used to select R-438A as the alternate refrigerant instead of HC-based refrigerants for fishing vessels was based on the fact that the regulatory and operational safety requirements for the sector did not allow the use of flammable refrigerants.

Effect of demonstration projects for the servicing sector

54. Demonstration projects are expected to serve as proof of the feasibility of technology solutions under local conditions, in order to promote similar undertakings with reduced uncertainty and risk. There are a series of demonstration projects approved after the 74th meeting[6] that have not had the time to produce

[5] Approved on the understanding that Ghana assumed all responsibilities and risks associated with retrofitting HCFC-based RAC equipment to flammable or toxic refrigerants and associated servicing, and that the regulatory environment for the safe use of HC refrigerants would be established prior to the submission of the fourth tranche request.
[6] This includes demonstration projects approved both within and out of the HPMPs.

visible results, but among those approved at previous dates the ones that stand out for the purpose of this study are discussed below.

55. The retrofit programme for fishing boats in Fiji, and the demonstration project for HCFC-free low GWP alternatives in refrigeration in the fisheries sector in Maldives, are both oriented towards the retrofit of HCFC-based RAC equipment for vessels, storage and processing used in the fishing industry. In both cases, very few equipment have been converted and the final and main conclusion has been that there is the need to wait for more mature technology solutions for this sector.

56. The project on emphasis on training and standards for supermarkets and specific type of equipment in Brazil, consists of a technical diagnosis to identify problems causing leakages and efficiency loss in equipment at the supermarket; end-user consulting programme that enhances business decision making in favour of low-GWP HCFC alternatives; and revision, discussion and development of standards for the maintenance sector, with participation of experts from the Brazilian Association of Technical Standards. As of the 76th meeting, four supermarkets had been selected to receive equipment for identification, measurement and performance analysis for refrigeration systems. The project will produce documentation that will be disseminated to the rest of the sector; there is no information of the results of this latter effort.

57. The programme to promote leak-free supermarket installations in the Islamic Republic of Iran, the Government of Germany (as a bilateral cooperation project) had sent two experts to support the technology demonstration at one supermarket (Azadi), with separate condensing units supplying the facility, and leakage annual rates of 400 per cent. For demonstration purposes one of the condensing units was modified to create a sealed system design; a local servicing company was trained on proper management and servicing sealed systems. From ten selected supermarkets, the local servicing company will start to modify at least two condensing unit systems so that data can be collected with regard to leakage rates. As of the 74th meeting extensive record keeping for the assisted supermarkets has been reported but no information has been provided concerning the results of the comparative measurements or the effects on the target audience such as the expected multiplicative effect.

58. Demonstration projects can take long time to produce results, and the key factor for reaping the desired multiplicative effect on the rest of the sector would lie in the dissemination efforts of the results of the demonstration project, which can happen only at the time of project completion. This calls for a more advanced planning and approval of this type of projects.

Energy efficiency

59. No country has reported, so far, definite improvements of energy efficiency through servicing activities but there are numerous initiatives in this respect.

60. In Africa, Ghana is undertaking a project on energy efficiency in the domestic refrigeration and air conditioning sector co-funded by the Global Environment Facility (GEF). In the Middle East region, Saudi Arabia has vowed to ensure that energy efficiency aspects are well considered within the promotion of any new technology to avoid negative climate impact after 2008 due to the promulgation of new building regulations with more stringent energy efficiency requirements.

61. In the Asia and Pacific region, Cambodia is exploring the possibility with the General Department of National Standard and the Ministry of Industry and Handicraft to establish a standard on installation of RAC equipment, as well as product standard (including energy efficiency) to promote the adoption of longer-term alternative technologies to HCFC. China is promoting low-GWP and flammable refrigerants in awareness raising efforts and the room AC industry is making research and development efforts to improve the design and energy efficiency of room AC. Fiji has an on-going cooperation with the European Union Pacific Technical and Vocational Education and Training on a sustainable energy and climate change adaptation project, to enhance national capacity and technical expertise to respond to climate change

adaptation and sustainable energy challenges. Maldives included activities for promotion of ozone climate co-benefit in a GEF funded project on strengthening low-carbon energy island strategies.

62. In the Latin American region, Uruguay, one of the strategic lines guiding the HPMP is the promotion of low-GWP, high energy-efficiency refrigerants as alternatives to HCFC in the RAC sector, consisting of technical assistance for the adoption of low-GWP, high energy-efficiency refrigerants; pilot project for the adoption of low-GWP, high energy-efficiency refrigerants in cold rooms; and promotion of non-ODS, low-GWP, high energy-efficiency technologies in public procurement. In Chile, implementation of activities related to the energy efficiency system include guidelines for the assessment of energy and GHG emissions savings in RAC systems through non-ODS technology; and the use of substances of low climate impact and high energy efficiency in supermarkets, as long as there is one technically and economically feasible.

Training

63. Training programmes for RAC technicians have managed to build their own sustainability after the end of the MLF support by ensuring that the curricula of technical training institutions are appropriately modified to include the main subjects of good servicing practices thus guaranteeing that new graduates are conversant with the issue. All training programmes for technicians have included low-GWP refrigerants as part of the alternatives for HCFCs, with few exceptions that rather seem to be an omission in the progress reports.

64. The establishment of a RAC technician certification scheme contributes to the sustainability of the training, since it creates the need for such training. Most of the countries have included this initiative with different degrees of formalisation, except for Burkina Faso, Djibouti, the former Yugoslav Republic of Macedonia and Maldives, probably due to their lower consumption of ODS among the other countries in their respective regions. This very low consumption entails a smaller economy with fewer resources to undertake different initiatives, and is common that initiative funded by the MLF requires a counterpart contribution from the government. In contrast, the Islamic Republic of Iran has not included this initiative, while having a very large consumption within the Asian region, which may be due to the lack of infrastructure within the country to replicate the efforts at the national level where it is most needed.

65. Certification schemes being implemented range from simple arrangements involving the award of a badge from the NOU with the corresponding awareness campaign that assigns the values of quality and environmental friendliness to the service, to full formal certification systems from an independent body with the corresponding legal rights and obligations.

Awareness-raising and dissemination of information

66. The main source of updated information on technology options for the servicing sector have been the suppliers of refrigerants and equipment and, to a lesser degree, for those technicians already working in the field, the technical training schools. In the first case, the suppliers have been bound by the commercial agreements signed with their own multinational suppliers, and the technical training schools are somewhat compelled by the obligation to respond to the needs of the prevailing market in the country. Therefore, the technical assistance provided by the MLF, be it in the way of training or technical documentation, becomes essential for providing to the countries unbiased information concerning low-GWP alternative technologies for HCFCs. Technical consultants engaged for this purpose under the MLF regime are obliged by pre-defined objectives, subjects and even training material, and not by their personal preferences, thus ensuring that the message is oriented towards the desired goals.

67. The main challenge that faces the efforts to raise the awareness of the population concerning the threatening depletion of the ozone layer and the actions that can be taken against it, is the many different target audiences and messages that must be addressed, thus requiring the split of not only resources but also

efforts in order to properly tackle each target audience. In practice, there should be a different public awareness campaign for each commercial or industrial sector targeted by a specific initiative, as well as for each sub-sector of the general public in order to guarantee certain cost-effectiveness, e.g., for the general public, for school children, for the refrigeration servicing sector, for the importing/exporting sector, for the RAC manufacturing industry.

68. Each awareness-raising initiatives requires and is in effect undertaken with the collaboration of the main stakeholders in the particular area of interest, namely, NGOs for the general public, RAC technicians associations for the RAC servicing sector, the customs department for the customs-related personnel, the chambers of industry, among others. This is the strategy that is being followed by all the countries in the measure allowed by the available resources.

Funding-related issues

69. Projects with necessitating a counterpart contribution from the country tends to increase difficulty for smaller consuming countries. However, only one country failed to meet the freeze obligation in 2013, and seven countries failed their Article 7 reporting obligations in one or more years during the 2011-2015 period (the eight countries were LVCs). Non-compliance could also be due to intrinsic characteristics of small consuming countries related to their government institutions, but even in such cases a re-focused assistance from the MLF could help to overcome this problem. There may be some other indicators that may signal the inadequacy of the level of funding or excessive funding but the limitations of this study prevents any further investigation.

70. Concerning the sources of co-financing, 11 countries reported that they did not identify any source of co-financing, ten countries mentioned the co-financing provided by private enterprises or associations, 15 countries mentioned the counterpart contribution required from the government as the co-financing for the projects and 14 countries mentioned co-financing obtained from other Multilateral Environmental Agreements (MEAs). Some countries mentioned more than one source of co-financing, therefore the numbers do not add up to the total.

71. Some examples of co-financing includes:

(a) Chile undertook two initiatives under its cleaner production programme. An evaluation of the feasibility of implementing clean production agreements, within productive sectors that use ODS, which made proposals of diagnosis studies and potential goals of clean production agreements in servicing and maintenance of RAC equipment, manufacturing, of polyurethane foams, agroindustry and processed food and supermarkets; and proposals of energy efficiency labelling for equipment containing ODS, namely cold cabinets and liquid dispensers containing HFCs (HFC-134a, R-404A or R-507) or HC (R-290) which do not have national energy efficiency labelling, which resulted in a market description for that equipment;

(b) Maldives reported that activities for promotion of ozone climate co-benefits were included in a GEF funded project on strengthening low-carbon energy island strategies; district cooling feasibility study; and an HFC inventory both from the Climate Clean Air Coalition to Reduce Short Lived Climate Pollutants (CCAC); and

(c) For PICs, the RAC sector continues to have the highest energy demand and it is also essential for management of fisheries, which is the largest economic sector. Funding initiatives includes: the Pacific Appliance Labelling and Standards to promote energy efficient equipment, which could be synergised and support HCFC phase out in the RAC sector; the Asia Development Bank Pacific Islands Energy Efficient Project which includes components to finance replacement of existing RAC equipment with non-ODS and more

energy-efficient models in six PICs; and the EC-funded project to maximize climate benefits of the HCFC phase-out in Cook Islands, the Federated States of Micronesia, Samoa, Tonga and Vanuatu.

Sustainability

72. The training programmes for RAC technicians have enjoyed the benefits of their long permanence as the spearhead of assistance to the RAC servicing sector and have thus evolved with time the strategy that ensures their long-term sustainability. Some of the main elements of this strategy are:

(a) The inclusion of the subject of good practices in the curricula of technical training schools, which has become part of the guidelines for the development of this courses;

(b) The certification of technicians which, even in its most basic implementation, becomes a well-respected and sought after badge of quality service which any technician and/or workshop desires to have; and

(c) The widespread adoption of formal codes of practice for the sector, which becomes part of the certification process.

73. All of these elements may eventually evolve towards a formal process of national technician certification scheme including formally adopted standards for RAC servicing, thus contributing to the professionalization of the trade.

74. Similarly, the training programmes for customs officers are being included in the curricula of the customs training institutions, and in some countries, the training has been turned into an e-learning module, thus ensuring the long-term sustainability of such training. The implementation of the HCFC import/export licensing and quota system makes the training of customs officers a necessity for the customs department thus becoming an incentive to ensure its sustainability.

RECOMMENDATION

75. The Executive Committee may wish:

(a) To take note of the desk study for the evaluation of the HCFC phase-out in the refrigeration servicing sector contained in document UNEP/OzL.Pro/ExCom/80/10; and

(b) To invite the bilateral and implementing agencies to apply, when appropriate, the findings and recommendations of the evaluation of the HCFC phase-out in the refrigeration servicing sector in the implementation of projects in stage II of the HPMPs and in the phasing-down of HFCs.

Annex I

TERMS OF REFERENCE FOR THE DESK STUDY FOR THE EVALUATION OF THE REFRIGERATION SERVICING SECTOR

Background

1. The servicing sector, as one of the largest consumer of ODS, is of the utmost importance to all Article 5 countries. For the majority of low-volume consuming (LVC) countries, the servicing sector will be the main source of funding to meet compliance, and will be greatly affected by the HFC phase-down. The importance of the servicing sector was stressed by decision XXVIII/2 of the Meeting of the Parties, which recommends making cost eligible various categories related to this sector[7] and requested the Executive Committee to develop, within two years, guidelines for financing the phase-down of HFCs.

Objective of the desk study

2. The desk study will analyse the progress made in the phase-out of HCFCs in the projects funded by the Multilateral Fund in the refrigeration servicing sector. It will focus on the contribution of specific activities within servicing sector plans to reduce HCFCs, the impact of servicing arising from introduction of low GWP alternatives when relevant, and challenges encountered during project implementation. The evaluation will draw lessons from these projects to help future, similar activities in the sector. Taking into account the limitations of a desk study, it will attempt to identify potential issues that could be related to the phasing-down of HFCs.

Scope and output

3. The desk study will select projects in the refrigeration servicing sector in both LVC and non-LVC countries, in various geographical regions and implemented by various implementing agencies.

4. A report with findings, lessons learned and recommendations will be submitted to the 80th meeting. Following the initial findings, the report may recommend that further data collection and analysis be needed, which will require field visits in a number of selected countries during a second stage of the evaluation.

Desk study evaluation questions

5. A series of evaluation questions follows, describing the main issues to be tackled by the evaluator.

Implementation issues

6. What have been the main activities implemented in the servicing sector under the HPMPs in LVC and non-LVC countries and what has been their impact on HCFC phase-out? What were the main issues and success factors encountered in the project implementation in LVC countries as compared to non-LVC countries?

7. To what extent have activities in the servicing sector contributed to a transition to low GWP alternatives? What were the differences in LVC and non-LVC countries aiming at facilitating acceptance and introduction of low-GWP alternatives to HCFCs? How can HFC-phase down activities in the servicing sector build on this experience?

8. 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

[7] Paragraph 15(c) of document UNEP/OzL.Pro.28/12.

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?

9. Who are the major stakeholders and what was their role in the implementation of the project? Is there a coordination mechanism and, if so, how did it work?

10. What has been the role, if any, of refrigeration associations in the design and implementation of activities in the sector and what were the main limitations encountered, if any?

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

12. Which were the reasons for delays in project implementation?

Policy, legal and regulatory frameworks

13. What have been the policies and legislation or other regulatory measures adopted by the countries in relation to the refrigeration servicing sector? 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? Were there interactions with national, international or regional standards setting bodies related to the safe use of flammable or toxic alternatives?

14. 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?

15. Is there a legislation targeting illegal trade of refrigerants? To what extent illegal trade of refrigerants have been identified in Article 5 countries (e.g., HCFC-22 labelled as HFC-134a)? Have imports of mislabeled refrigerants been identified?

16. 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?

17. Were there delays in adopting this legislation and, if yes, why?

Refrigerant containment (recovery, recycling, reclamation)

18. What activities have been undertaken to promote the recovery of refrigerants and what was their impact? 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?

19. Were stockpiles of used or unwanted controlled substances managed cost-effectively?

Technology-related issues

20. Have challenges been encountered to service equipment with alternative technologies and if so, what were they?

21. Does reducing the refrigerant charge size in the design of systems impacts the amounts of refrigerants emitted during assembly and/or installation?

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

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

24. Have alternatives to HCFCs been promoted, that sustain the operation of HCFC-based equipment until the end of life? If so, which alternatives have been used and what were the results?

25. Have challenges been encountered to service equipment with alternative technologies and if so, what were they?

26. Have demonstration projects contributed to the servicing sector and if so, how and what were the results.

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

28. What were the key lessons learned to deal with low-GWP alternatives.

Training

29. To what extent have training programmes for refrigeration technicians been developed to contribute to address safety in handling low-GWP alternatives? Have they integrated an approach 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?

30. To what extent are training in refrigeration programmes self-sustaining? 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?

31. Are there certification systems for technicians who successfully participate in training programmes? Are these mandatory through regulations? Was there any obstacle in making the certifications mandatory?

32. What types of certification schemes have been established in different Article 5 countries and how effective are they to ensure good practices in refrigeration?

Awareness-raising and dissemination of information

33. Was there updated information on technically and economically feasible alternative technologies to be applied by local refrigeration and air-conditioning manufacturers? What were the capacity building activities implemented by the project?

34. How did technical assistance projects address awareness-related challenges? What awareness-raising strategy was used and what were the results? How did the servicing community change following these activities?

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

Funding-related issues

36. Was there a difference in the adequacy of funding between LVCs and non LVCs countries? Was co-funding in place, either from other funds or otherwise? Were there delays due to obtaining co-funding?

What were the opportunities and challenges related to co-funding and what lessons can be learned from there? How the flexibility that is afforded Article 5 countries through their Agreements with the Executive Committee was used to optimize the allocation upon implementation of the HPMP?

37. 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?

Sustainability

38. What activities have been undertaken to achieve the long-term sustainability of the technicians and customs training programmes funded by the Multilateral Fund? (E.g. adaptation of the curricula of training and vocational schools to address flammable alternatives and low-GWP and zero-GWP alternatives, mandatory training for technicians or any other measure).

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

40. Have there been issues related to availability and affordability of spare parts and refrigerants and how have they been addressed?

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

Methodology

42. A consultant will be recruited based on his or her experience and knowledge of the subject matter and of the functioning of the Montreal Protocol and the Multilateral Fund. The consultant will prepare a desk study that includes an in-depth review of the existing documentation such as project documents, progress reports, verification and project completion reports; minutes from regional ozone officers meetings, ODS alternative surveys, as well as information gathered from interviews and discussions with members of the Secretariat and bilateral and implementing agencies and local stakeholders.

Annex II

HCFC CONSUMPTION IN SELECTED ARTICLE 5 COUNTRIES (ODP TONNES)

Region	Country	2011	2012	2013	2014	2015	2016	Baseline
AFR	Djibouti	0.66	0.64	0.62	0.57	0.56	-	0.70
AFR	Burkina Faso	27.93	26.59	14.88	12.38	11.99	14.41	28.90
AFR	Senegal	36.14	36.14	7.70	20.68	20.63	18.70	36.20
AFR	Ghana	30.71	27.19	25.39	23.34	20.41	-	57.30
AFR	Nigeria	402.32	453.40	334.46	304.11	177.92	-	344.88
ASM	Bahrain	57.32	75.59	49.60	49.14	45.98	45.77	51.90
ASM	Kuwait	397.75	420.15	414.67	336.17	338.98	-	418.60
ASM	Saudi Arabia	1,750.76	1,921.69	1,433.73	1,376.63	1,305.45	-	1,468.70
ASP	Maldives	3.67	3.69	3.19	3.32	2.45	2.40	4.60
ASP	Fiji	14.46	14.37	7.67	6.70	3.87		8.40
ASP	Cambodia	13.71	10.12	9.47	11.19	11.69	4.52	15.00
ASP	Iran (Islamic Republic of)	376.88	376.31	357.44	342.14	309.28	272.98	380.50
ASP	China	20,739.03	21,091.21	15,761.32	16,838.53	13,485.21		19,269.00
EUR	The former Yugoslav Republic of Macedonia	0.90	0.74	0.72	0.57	0.18	0.27	1.80
EUR	Bosnia and Herzegovina	3.35	4.06	5.13*	3.37	2.11	2.34	4.70
EUR	Armenia	7.50	5.67	4.54	3.15	2.34	0.63	7.00
LAC	Grenada	0.18	0.26	0.33	0.36	0.22	0.20	0.80
LAC	Uruguay	17.62	28.05	15.47	17.80	15.78	16.43	23.40
LAC	Peru	32.50	26.98	25.81	22.01	22.82	22.21	26.88
LAC	Chile	109.01	105.78	75.99	74.23	67.63	63.33	87.50
LAC	Argentina	511.56	571.39	246.20	276.09	295.42	228.24	400.70
LAC	Mexico	1,083.40	1,103.98	791.35	733.82	660.37	519.66	1,148.80
LAC	Brazil	1,046.40	1,387.87	1,189.25	1,164.74	1,025.81	875.29	1,327.30
PIC	Nauru	0.01	0.01	-	-	0.02	0.01	-
PIC	Niue	-	-	-	-	-	-	-
PIC	Cook Islands	0.06	0.04	0.02	-	-	-	0.10
PIC	Kiribati	0.01	0.03	0.03	-	0.03	0.02	0.10
PIC	Tonga	0.07	0.05	0.04	0.02	0.02	-	0.10
PIC	Tuvalu	0.01	0.02	-	-	0.02	0.01	0.10
PIC	Marshall Islands	0.24	0.21	0.12	0.08	0.08	-	0.20
PIC	Micronesia (Federated States of)	0.06	0.06	0.03	0.09	-	0.04	0.20
PIC	Palau	0.17	0.17	0.12	0.12	0.11	0.12	0.20
PIC	Samoa	0.29	0.13	0.11	0.08	0.07	0.06	0.30
PIC	Vanuatu	0.08	0.06	0.06	0.04	0.02	-	0.30
PIC	Solomon Islands	2.04	1.62	0.17	0.26	0.18	0.24	2.00

Source: Data reported under Article 7 of the Montreal Protocol, as of 7 September 2017.
* Non-compliance

Annex III

REASONS FOR DELAY

Country	Reasons for delays
Argentina	• The introduction of SAP system at the Implementing Agency resulted in delays in bidding and supply of equipment and tools for the training centres and contracting to trainers (IAs) • This activity was proposed for tranche II financed by the remaining budget of the R-22 AC conversion project with the Government of Italy. Since these funds should be returned to the MLF, the activity was delayed until a later tranche (Procedural)
Armenia	• None provided
Bahrain	• Delayed waiting for the new legislation to be enacted (Institutional) • During 2013 SCE was under restructuring plus ODS Officer of Bahrain was about to retire by end of 2013 (Institutional) • SCE also tried to examine the ability of direct implementation by SCE but it was difficult to take the direct responsibility due to Insufficient staff within SCE to undertake the detailed implementation responsibilities (Institutional) • After change of implementation modality the time needed to agree on joint implementation modality, review legal contracts with UNEP and develop operational work-plan was also substantial which caused further delays (Procedural) • Delays in the start-up of demonstration project due to the challenges related with the selection of the technology since more than 70 per cent of its products are sold under regional brands, including to manufacturers in neighbouring countries (e.g., Kuwait, Saudi Arabia and United Arab Emirates) (Market)
Bosnia	• Major delay in arranging the custom clearance that has to be provided in the form of a letter from the Ministry of Finance. Due to recent changes in the Government and political instability, this process took much longer than expected (Institutional) • Training for technicians was delayed until the establishment of the National Code of Good Practice in Refrigeration and introduction of a certification system for refrigeration service workshops (Procedural)
Brazil	• None provided
Burkina Faso	• Change of the National Ozone team (Institutional) • Delays in fund disbursement from IA (IAs) • Delay in the delivery of equipment (Supplier)
Cambodia	• The implementation of the retrofit incentive programme is postponed until non-HCFC, low GWP and climate-friendly options become commercially available in the domestic market. (Market)
Chile	• The counterparts changed, so the NOU had to present again the agreement concept to the new counterparts which resulted in some delays (Procedural) • The delay in the conversion of the refrigeration equipment of two pilot supermarkets was due to internal administrative IA procedures that caused the cancellation of the contract already issued, therefore requiring a new bidding and proposal preparation (IAs)
China	• As China is a large country with many stakeholders, after the finalization of the overall work plan in September 2012, more time was required to initiate the specific activities on the ground (Procedural) • Delays in signing the amendment to the cooperation agreement with the Foreign Economic Cooperation Office of the Ministry of Environmental Protection (FECO/MEP) of China (Institutional) • Implementation of stage I activities in the refrigeration servicing sector were delayed due to the limited structure and institutional arrangements that were in place, in particular, for the identification and selection of training centres, and the engagement of partners and key stakeholders (Procedural) • The servicing sector HPMP development is only part of the China HPMP stage II development process (Procedural) • The low disbursement is due to receiving delay in obtaining a certified financial statement from the Government (Institutional)
Cook Islands	• None provided
Djibouti	• None provided
Fiji	• Delay in review and administrative process (Institutional) • The project was delayed because of the need for further consultations with the fishing sector (Procedural)
Ghana	• Start-up difficulties (Procedural)

Country	Reasons for delays
	• More time needed to negotiate the agreements with stakeholders for implementation of activities (Procedural) • Delays in procurement processes (Procedural)
Grenada	• None provided
Iran (Islamic Republic of)	• All imports are strongly delayed due to payment requirements and export licence awards (Procedural) • All exports to the Islamic Republic of Iran are subject to award of an export licence which takes considerable time (Procedural) • The supplier faced problems due to the UN sanctions in procuring the necessary parts from international OEM (Political) • Delays are due to the availability of Pentane (Market)
Kiribati	• None provided
Kuwait	• Internal process at EPA where NOU is structured are a bit slow (Institutional) • Delay in concluding the proposal of e-licensing system locally at EPA (Procedural) • Delay due to the movement of EPA to new premise and inability of IT department of EPA to timely respond to NOU needs (Institutional) • Delay in agreeing on the detailed implementation work-plan and costs due to details needed from several authorities involved in the implementation (Institutional) • Changes of the ODS Officer and Head of EPA of Kuwait (Institutional) • Changes in IA contracting instruments and time needed to provide legal clarifications to EPA officials (Procedural)
The former Yugoslav Republic of Macedonia	• Delay in achieving financial closure was caused by financial error in new financial SAP system (IA)
Maldives	• None provided
Marshall Islands	• None provided
Mexico	• Delivery of equipment required for the training was delayed by the supplier (Supplier) • The flushing agent that was delivered was very aggressive and damaged several training flushing units (Technology) • The flushing units got over-heated and automatically switched off (Technology) • The supply of the new motors for the flushing units was delayed by at least one year (Supplier)
Micronesia	• None provided
Nauru	• Loss of NOU since May 2014 (Institutional) • No defined nationally assigned resources (human nor institutional) to allow for continuity (Institutional)
Nigeria	• Delays related to implementation modalities and compliance with international bidding procedures to conform to the guidelines laid out by UNDP Country Office (Procedural) • The bombing of the UN Building on 26 August 2011 was also a major cause of setback to the implementation of the first tranche (Terrorism) • Delays were experienced during the process of supplying the blending tank, as supplier proved to be slow to deliver the equipment (Supplier) • Delays in the managing the collaboration with suppliers (Procedural) • Trials have taken more time than expected, creating delays in the project (Procedural) • Delay was due to the fact that it was not possible in Nigeria to issue Letters of Credit during the presidential election period (Institutional)
Niue	• None provided
Palau	• Delay in signing initial agreement (Institutional)
Peru	• Delay for the initiation of the disbursements (IAs) • The implementation of tranche II suffered additional delays, mainly because of turnover of staff at the General Directorate of Environmental Affairs (Institutional) • In addition, two clerks that had been hired for administrative support quit, which further delayed the execution of activities (Institutional) • The initial Implementation Plan (and associated MYA) needed to be reviewed since the equipment listed under the TPMP was not delivered (Supplier?) • Due to the delays the technical assistance activity for the flushing sub-sector could not be finalized, and therefore the local companies and technicians do not have the tools and knowledge on the use of HCFC-free flushing techniques that would allow the Government to ban such consumption (Procedural)
Samoa	• None provided

Country	Reasons for delays
Saudi Arabia	• Because of the size and complexity of the refrigeration service sector in Saudi Arabia, the preparations of the training took longer than originally expected (Procedural) • The need for harmonization of the activities on preparation of the certification scheme for refrigeration practice and the update of the Code of Good Practice in Refrigeration (Procedural) • Delayed transfer of approved funds to IA (IA) • The delay in implementing the ban on new air-conditioning equipment containing HCFC-22 or HCFC-blends was due to concerns about the limited availability of low global warming potential (GWP) alternatives, particularly for small-size applications, suitable for use in high-ambient temperatures. (Market) • Draft code of practice that was expected to be adopted by the end of 2015 had been delayed due to recent changes of the management of the environment authority; (Institutional)
Senegal	• The delay is linked to various government reorganisations (Institutional) • The approval of the national procedures for HCFC quota allocation encountered difficulties, an interim quota allocation system had to be implemented which resulted in limited recording of HCFC imports in 2013 (Procedural)
Solomon Islands	• None provided
Tonga	• None provided
Tuvalu	• Delay was due to the change in legal advisor as the former legal advisor was undertaking duty travel thus there was a delay from the department (Institutional)
Uruguay	• None provided
Vanuatu	• None provided

Annex IV

LESSONS LEARNED

1. In the African region the main lessons highlighted were: (1) the challenges in identifying suppliers that are capable of delivering the required equipment, (2) the importance to support innovative approaches to ensure increased safety for the users and the service technicians, (3) the key aspect of encouraging domestic innovative solutions to HCFC phase-out, in particular those having a potential for replication in other developing countries, and (4) the need to ensure the adoption of a rigorous safety system for production processes (Ghana and Nigeria).

2. For the Middle East region the main points were: (1) the importance to strengthen the bridges between the HPMP-implementing organization and other authorities in the country for better implementation of the HPMP overarching strategy, (2) the importance to ensure the presence of local technical experts to support in different stages of the projects due to the limited capacities of local government organisations, (3) the issue of suitable alternatives for high-ambient countries, particularly for the AC industry, remains the main concern and challenge, (4) since the internal processes at governmental institutions are slow, the PMU should be empowered with capacity building efforts to expedite implementation efforts (Bahrain and Kuwait).

3. For the Asian region the lessons were: (1) cooperation with the relevant stakeholders is essential for the implementation of the RAC sector plans, (2) coordination between management of HCFC production, consumption and import and export is the key element for compliance with the Montreal Protocol, (3) due to the introduction of new alternative technologies in the RAC sector, modification on the existing standards as well as establishment of new standards will be a key factor for the adoption of alternative technologies, (4) market introduction is essential for the R-290 technology promotion and new policy/financial measures should be considered to help the R-290 air-conditioners' sales in the market, (5) training on the servicing and installation of the RACs with flammable refrigerants is prerequisite for the market introduction and safe use of the R-290 air-conditioners (China).

4. For the Eastern European region the main lessons have been: (1) long-term sustainability of the training programme is ensured through the incorporation of the programme in the curricula of the schools, (2) the legislation in place provides conditions for the successful implementation of R&R scheme, (3) besides ODSs, recovered and recycled HFC refrigerants are minimizing the climate impact, and (4) refrigerant losses are mainly from old equipment and regular servicing and maintenance could reduce and prevent losses of refrigerants from these systems (the former Yugoslav Republic of Macedonia).

5. For the Latin American and Caribbean regions, the main lessons have been: (1) the changes in awareness and behaviour of technicians in their daily work can take several years, therefore, awareness-raising and training activities should be undertaken from the beginning, (2) workshops in the commercial refrigeration sub-sector are very different from those in the domestic sector and the creation of cooperation networks in the supermarket sector is much more complex, (3) the main challenges faced in the implementation of activities in the RAC servicing sector were the interinstitutional arrangements, since the formal requirements for cooperation with industry associations and training institutes were more intense than expected due to the complex requirements established by public administration, (4) between the planning and the implementation of the HPMP there were several changes of responsibility in partner institutions (Brazil).

6. As for the regional training approach, a regional training approach was chosen to meet the specific needs of each of the five regions of the country, as well as to improve the expansion of activities for stage II. However, the participation of national regional institutions in bidding and contracting complicated the process. Most regional partners had no experience with this type of contract, and prior authorization of the

national agencies was required to participate in a tender and enter into an individual contract. Concerning technical aspects: the mobile training units include a demonstration refrigeration system to simulate actual operating conditions of a supermarket refrigeration system, as well as to demonstrate best practices and design properties of a sealed system. Finding the adequate components for a demonstration unit to work as a model for supermarket refrigeration systems was more difficult than expected with respect to pressure, temperature, settings and system performance. It was also quite difficult to find suppliers willing to offer supplies in accordance with specifications (Brazil).

7. With regard to alternative technologies: in a first stage, priority was given to containment, best practice, leak control in supermarket installations and their respective standards. As a second step, technical information was also compiled on alternative technologies on the market, such as CO_2, HC, and NH_3. Particularly for CO_2, an increasing number of installations were observed, as well as increased interest on the part of the commercial sector. However, the following challenges must be overcome in the application of such alternatives: higher costs of initial investment; availability of skilled technicians trained on new alternatives; and (c) guaranteeing the quality and safety of installation, operation and maintenance (Brazil).

8. Other lessons are: administrative delays because of employee turnover in government organisations has greatly affected implementation efforts; support from national consultants has been critical for the implementation of the HPMP; there is the strong need to involve all potential stakeholders and sectors from the beginning, and assure that all agree on the common goals of the national strategy; and the considerable increase in the cost of training in new technologies, given the complexity of the novel mixtures, the flammability of some of the alternatives and the electronic complexity of new cooling equipment and air conditioning (Uruguay).

Annex V

DEMONSTRATION PROJECTS AFFECTING THE RAC SERVICING SECTOR (APPROVED AFTER THE 74TH MEETING)

Country	Project title
China	Demonstration project for ammonia semi-hermetic frequency convertible screw refrigeration compression unit in the industrial and commercial refrigeration industry at Fujian Snowman Co. Ltd.
Colombia	Demonstration of HC-290 (propane) as an alternative refrigerant in commercial air-conditioning manufacturing at Industrias Thermotar ltda.
Costa Rica	Preparation of a demonstration project for the transition of HCFC-22-based refrigerant unit to NH_3 system in cold chambers.
Costa Rica	Demonstration of the application of an ammonia/carbon dioxide refrigeration system in replacement of HCFC-22 for the medium-sized producer and retail store of Premezclas Industriales S.A.
Kuwait	Preparation of a demonstration project for low-global warming potential alternatives in high ambient temperature conditions in air-conditioning applications.
Kuwait	Demonstration project for HCFC-free low-global warming potential technology performance in air-conditioning applications (capacity above 8 TR).
Maldives	Preparation of a demonstration project for low-global warming potential alternatives for HCFC phase-out in refrigeration applications in fishing industry.
Maldives	Demonstration project for HCFC-free low-global warming potential alternatives in refrigeration in fisheries sector.
Mauritius	Demonstration and user incentive programme for conversion to technologies with low global-warming potential.
Mexico	HCFC phase-out management plan (stage II, second tranche) (HC demonstration and training).
Saudi Arabia	a) Preparation of a demonstration project for the phase-out of HCFCs by using HFO as foam blowing agent in the spray foam applicants in high ambient temperatures. b) Preparation of a demonstration project for promoting HFO based low-global warming potential refrigerants for air conditioning sector in high ambient temperatures.
Saudi Arabia	a) Demonstration project for the phase-out of HCFCs by using HFO as foam blowing agent in the spray foam applications in high ambient temperatures. b) Demonstration project on promoting HFO-based low-global warming potential refrigerants for air-conditioning sector in high ambient temperatures. c) Demonstration project at air-conditioning manufacturers to develop window and packaged air-conditioners using low global warming potential refrigerants.
Europe	Preparation of a regional centre of excellence for demonstration and training of low-global warming potential ozone-safe alternative technologies.
Europe	Development of a regional centre of excellence for training and certification and demonstration of low-global warming potential alternative refrigerants.
Global	a) Preparation of a demonstration project on refrigerant containment and introduction of low-global warming potential refrigerants at the country level. b) Preparation of a demonstration project in the refrigeration assembly sector (Argentina and Tunisia).
Global	Demonstration project on refrigerant quality, containment and introduction of low-global warming potential alternatives (Eastern Africa and Caribbean regions). b) Demonstration project for the introduction of trans-critical CO_2 refrigeration technology for supermarkets (Argentina and Tunisia).