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Workshop on hydrofluorocarbon management issues
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Workshop on hydrofluorocarbon management issues

I. Opening of the workshop

1. In accordance with paragraph 2 of decision XXV/5 of the Twenty-Fifth Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer, the Ozone Secretariat convened a workshop to continue discussions on hydrofluorocarbon (HFC) management issues.
2. The workshop was held at the headquarters of the United Nations Educational, Scientific and Cultural Organization (UNESCO), Paris, on 11 and 12 July 2014.
3. The workshop was opened at 10 a.m. on Friday, 11 July 2014, by Ms. Tina Birmpili, Executive Secretary of the Ozone Secretariat.
4. In her opening remarks, Ms. Birmpili said that a fine line existed between substance and process – between objectives and the means to achieve them – and that a sense of urgency could shape a process. While success was dependent on sound processes, such processes could not be achieved without substance. Sustainability rested on robust and engaging relationships between stakeholders and the health and strength of institutions, all of which relied on processes built on trust in order to achieve common objectives. The work of the Montreal Protocol was founded on trust among parties and other stakeholders and on similar commitments for all parties across continents, cultures and time zones. The promise of the Montreal Protocol was a global common good – a healthy ozone layer – for the benefit of present and future generations of humankind. The Protocol was exemplary in providing the best scientific and technical information, through its assessment panels, to enable parties to reach sound decisions in charting the way forward. At the current workshop, representatives of the three assessment panels would give factual presentations, providing the latest information on hydrofluorocarbons (HFCs) and their effects on the biosphere in order to facilitate informed discussions among participants on how to broaden the tools available for managing them and provide different options for the variety of circumstances that countries found themselves in, moving forward in the spirit of cooperation and consensus-building that had characterized the work of the Montreal Protocol.
5. In his keynote statement, the Deputy Executive Director of the United Nations Environment Programme (UNEP), Mr. Ibrahim Thiaw, welcomed participants and congratulated the community of negotiators, scientists and financiers, among others, who had worked together to make the Montreal Protocol one of the most successful examples of global cooperation. Environmental issues were often far removed from the daily concerns of the average person, making behaviour change at the local level problematic. Although they had little understanding of matters such as refrigerant gases that had a negative impact on the atmosphere, African villagers, for example, most of whom were as yet unable to enjoy the

benefits of economic progress, had to recognize that substances produced and consumed in faraway places were contributing to droughts and floods in their localities.

6. He drew attention to the recently convened inaugural session of the United Nations Environment Assembly, in which all 193 States Members of the United Nations had been able to participate owing to the universal membership of the Assembly, which conferred upon it a historic level of representation, legitimacy and authority.

7. The Montreal Protocol – the first treaty to achieve universal ratification – had been extremely successful in terms of institutional strengthening, with national ozone offices located in all parties operating under paragraph 1 of Article 5 (Article 5 parties) thanks to funding provided by the Multilateral Fund for the Implementation of the Montreal Protocol, which enabled developing countries to be full partners in the protection of the ozone layer. In addition to the Protocol's multiple benefits, including in terms of human health, parties to the Protocol had proved that sustainable consumption and production principles could be implemented in trade and industry, and in the economy in general.

8. Turning to HFCs, which had been used to replace ozone-depleting substances owing to their limited immediate effects on the ozone layer, it had been demonstrated in recent years that they could be up to 1,000 times more harmful in terms of global warming than equivalent carbon dioxide. According to UNEP estimates, within 30 to 40 years, the use of HFCs could potentially wipe out all the progress achieved in avoiding carbon dioxide equivalent emissions under the Montreal Protocol and vitiate most of the resulting climate benefits. The management of HFCs was not without challenges; developing countries had been eliminating hydrochlorofluorocarbons (HCFCs) on an accelerated basis, but they required greater support in that endeavour, and technical issues related to alternatives to HCFCs were a clear challenge. HFCs should be phased down where possible and where it made sense; regression in terms of past achievements was not an option. It was important to make haste; the sooner forward-thinking decisions could be made, the cheaper the solutions would be. Consideration must be given to the evolution of the Montreal Protocol, its synergies with the United Nations Framework Convention on Climate Change and funding, notably the evolution of the Multilateral Fund. Dialogue and trust – in one another and in the process – were crucial, as was the political will to move forward. In closing, he expressed the commitment of UNEP to provide the support necessary to enable the parties to meet the objectives of the Montreal Protocol.

9. Following the opening statements, presentations were delivered by Mr. Paul Newman, Co-Chair of the Scientific Assessment Panel; Mr. A. R. Ravishankara, Co-Chair of the Scientific Assessment Panel; Mr. Lambert Kuijpers, Co-Chair of the Technology and Economic Assessment Panel; and Ms. Janet Bornman, Co-Chair of the Environmental Effects Assessment Panel. The opening statements and the presentations are available from the Ozone Secretariat conference portal (<http://conf.montreal-protocol.org/meeting/workshops/presentations-opening/default.aspx>).

10. In his presentation on the Montreal Protocol and HCFCs, Mr. Newman said that emissions of ozone-depleting substances had decreased somewhat after the discovery of the impact of chlorofluorocarbons (CFCs) on the ozone layer, but had then decreased dramatically following the signing of the Montreal Protocol. HCFCs had first appeared in the atmosphere between the 1960s and the 1980s. They had been used as interim substitutes for CFCs – owing to their lower ozone-depletion potential – and were primarily destroyed in the troposphere by reaction with the hydroxide molecules. HCFCs had a lower global-warming potential (GWP) than CFCs, but were nevertheless quite powerful greenhouse gases. Without the Montreal Protocol, HCFCs would probably have continued to increase in the atmosphere such that, by 2065, the ozone layer would have been largely destroyed, with huge increases in ultraviolet rays at the Earth's surface. HCFCs were projected to continue to grow in the atmosphere in the coming years, but were expected to decline by the late-2020s owing to the 2007 agreement to phase them out more aggressively, accelerating the expected return of chlorine to 1980 levels by four or five years. HCFCs made a relatively small contribution to total chlorine in the atmosphere – some 7.5 per cent in 2008 – hence their ozone-depletion potential was low. They were currently dominating banks of ozone-depleting substances and greenhouse gases but, owing to their comparatively short life cycle, would be less significant in the coming decades.

11. In his presentation on HFCs and their potential role in the Earth system, Mr. Ravishankara said that old ozone-depleting substances had also been powerful greenhouse gases. In the process of protecting the ozone layer by decreasing emissions of ozone-depleting substances, therefore, the Montreal Protocol had achieved climate benefits five times greater than those achieved under the first phase of the Kyoto Protocol

to the Framework Convention on Climate Change. The Montreal Protocol had led to the successful phase out of CFCs and adjustments to the Protocol were leading to the phase down of HCFCs. HFCs, which were the main replacements for applications that had formerly used ozone-depleting substances, had a negligible ozone-depletion potential but could be potent greenhouse gases in the future – especially if they continued to increase in use. While in 1990 the consumption of HFCs had been close to zero, it had risen dramatically in recent years, with a concomitant increase in the atmosphere of those substances; projections indicated that they would continue to increase owing to increasing consumption for a variety of uses. Were HFC consumption to continue unchanged, by 2050 they could represent as much as 25 per cent of carbon dioxide-equivalent emissions, offsetting efforts to stabilize carbon dioxide emissions at 450 ppm. On a positive note, alternatives to high-GWP HFCs were already in use. The contribution of HFCs to climate forcing could be maintained at less than one per cent by using alternative substances and alternative technologies.

12. Mr. Kuijpers said that his presentation, on issues related to HFC demand and production, considered demand for HFCs and HCFCs over the period 1994–2014, comparing tonnes and carbon dioxide-equivalent tonnes. He noted that HFCs were considered to be replacements for CFCs and HCFCs and were one of the substances considered when converting away from ozone-depleting substances. Markets for HFCs had developed in Article 5 parties and non-Article 5 parties alike, given that they were used in several sectors, the largest being refrigeration and air-conditioning, leading to a considerable increase in global emissions. Regulations to counter the problem were being considered in many countries. HCFC demand was in the meantime decreasing in developed countries and increasing in developing countries. Demand for HFCs had started in the 1990s in developed countries and around 2005 in developing countries, with a steep increase from 2005 to 2014. In 2014, global HFC demand had been estimated at some 700,000 tonnes. Demand for HFCs had grown by 10–12 per cent per year in non-Article-5 parties over the period 2001–2011, and thereafter growth was estimated to have decreased to 1–3 per cent per year from 2012 to 2014. Demand for HFCs had grown by up to 32 per cent per year in Article 5 parties over the period 2006–2011, dropping to an estimated growth of less than 20 per cent per year thereafter. The main production capacity for HFCs was in China. For the three main HFCs, current production capacity was 750,000 tonnes and less than 150,000 for other HFCs. Noting that the demand data for his presentation had been derived from bottom-up calculations, he said that bottom-up estimates and producer estimates for HFCs differed by around 30 per cent; more reliable estimates for HFC demand in both Article 5 parties and non-Article 5 parties were therefore being sought.

13. In her presentation on the effects of HFCs and HCFCs on the biosphere, Ms. Bornman said that HFCs and HCFCs produced complex effects in the biosphere, including with regard to plants, animals and human health. Their effect on ultraviolet radiation, ozone, climate, health and environment were closely interconnected. Ultraviolet (UV) radiation was one of three key components in forming ground-level ozone and particulate matter, including aerosols, together with nitrogen oxide and volatile organic compounds like HFCs. Global annual premature mortality from particulate matter was around 1.5 million people and around 0.5 million from ozone depletion, while global annual agricultural losses from both were estimated at anywhere between \$12 million and \$24 million. While the effects of decreased ozone and increased UV radiation had been studied extensively, the effects of the opposite scenario – increased ozone and decreased UV radiation – on the biosphere were not well known, nor were the ways in which climate reactions would modify those effects. A decrease in hydroxide radicals, which were important for cleaning the atmosphere, was likely. She drew attention to trifluoroacetic acid (TFA) – a breakdown product of HCFCs, HFCs and some hydrofluoroolefins (HFOs) – which was readily deposited at the Earth's surface through dry and wet deposition. TFA was phytotoxic – causing negative effects for plant growth – but the concentrations measured in various locations around the world were not sufficient to cause an observed effect. Anthropogenic sources of TFA included atmospheric degradation of some HCFCs and HFCs, atmospheric degradation of narcotics, trifluoromethyl-containing pesticides and aluminium production. She provided an overview of approximate concentrations of TFA in different locations and concluded by saying that TFA was not bioaccumulated and that its risk to mammals, including humans and aquatic and terrestrial organisms, was therefore negligible. TFA from the degradation of HCFCs and HFCs was not capable of significant ecosystem damage. TFA sources and cycling through the biosphere should be considered for environmental impacts, and continued monitoring of TFA in the environment might be required if the use of HFOs as alternatives to HFCs increased significantly.

14. Following the presentations, Ms. Birmpili provided an overview of the format of the workshop, which would comprise four sessions, each of which would include speakers, resource panellists, a rapporteur and a facilitator.
15. In each of the first three sessions, the speaker would deliver a brief presentation on a specific topic or issue to set the stage for discussion by the workshop participants. Following the presentations, the session facilitator would open the discussion by inviting the resource panellists to briefly address specific questions and would then facilitate interactive discussion among the speakers and participants. At the end of the workshop, the rapporteurs would summarize the key issues and conclusions with a view to extracting issues for further consideration by the parties at the thirty-fourth meeting of the Open-ended Working Group and the Twenty-Sixth Meeting of the Parties. The fourth session would be organized differently: speakers would report on national or regional policies and a discussion would be held among representatives of industrial associations and one non-governmental organization on ways in which industry responded to policies and measures for HFC management.
16. At the end of the workshop, the rapporteurs would present summaries of the four sessions, together with recommendations and further points for discussion in the near future. The rapporteurs would also report to the Open-ended Working Group at its thirty-fourth meeting on the outcomes of the workshop. Ms. Birmpili encouraged participants to be vocal during the discussions, noting that they could also submit comments and questions electronically to the meeting website during the workshop. An overhead projector would display any questions or comments submitted electronically.
17. All the presentations are available from the ozone secretariat conference portal (<http://conf.montreal-protocol.org/meeting/workshops/presentations-opening/default.aspx>).

II. Session 1

Technical issues

18. The first session of the workshop, on technical issues, was facilitated by Mr. Peter Adler, principal and founder of the ACCORD 3.0 Network, and Ms. Annie Gabriel (Australia) served as rapporteur. In opening the session, Mr. Adler said that its purpose was to identify the key technical issues remaining to be discussed and to generate options for resolving differences.
19. Presentations were made by Mr. Miguel Quintero, independent consultant; Mr. Daniel Colbourne, independent consultant; Mr. Roberto Peixoto, Maua Institute of Technology; Mr. Stephen Yurek, International Council of Air-Conditioning and Refrigeration Manufacturers Associations; and Mr. Mike Thompson, Trane Commercial Systems. Mr. Jianxin Hu (China); Mr. Jacques van Engel, United Nations Development Programme; Mr. Viraj Vithoontien, World Bank; Mr. Yaqoub Almatouq (Kuwait); Mr. Ole Nielsen, United Nations Industrial Development Organization; and Mr. Sukumar Devotta, independent consultant; joined the presenters to answer questions from the floor.
20. Mr. Quintero gave a presentation on alternatives to HFCs and HCFCs for foam production, drawing attention to the flammable and non-flammable options available for polyurethane rigid foam insulation, highlighting their advantages and disadvantages, including in terms of GWP and incremental operating costs, as well as the critical role of global and local system houses in developing foam formulation technologies. Particular points to note with regard to extruded polystyrene foam included significant regional market variations, rapid growth in production in Asia, and the fact that saturated HFCs were regarded in many regions as an alternative in the absence of substances with a proven low GWP.
21. Mr. Colbourne gave a presentation on alternatives to HFCs for refrigeration and air-conditioning, including in high ambient temperatures, which called for a suitability framework for assessing the efficiency, safety and cost of alternatives. Drawing attention to the needs of the main refrigerant-using sectors with regard to alternatives, he said that HFCs could be completely eliminated. To do so, however, would require a change in mindset and, inter alia, the development of better standards and better training for technicians. Ultimately, it would be more cost-effective for manufacturers and engineering companies to switch to any of the hundreds of available alternatives with a low GWP in one fell swoop rather than to do so gradually.
22. Mr. Peixoto spoke about the issues faced by Article 5 parties. He said that the main challenges included the need to avoid replacing HCFCs with HFCs that had a high GWP and the need to achieve a balance between environmental sustainability, performance, safety and cost, which called for assessments

and standard-setting with regard to storage, transportation, service and disposal. Barriers included a dearth of refrigerants for high ambient temperatures; the fact that some countries had to resort to costly short-term solutions in order to comply with energy-efficiency regulations; and the need to assess the climate impact of refrigeration and air-conditioning equipment during its lifetime. The technology needed to leapfrog high-GWP HFCs existed but international support was needed for technology transfer, guidance, demonstration projects, financial incentives and technical training.

23. Mr. Yurek, in his presentation, said that manufacturers had already begun looking into the transition to lower-GWP refrigerants, which would involve making important choices and trade-offs. Drawing attention to a recent study approving 62 alternatives in terms of toxicity, flammability and critical temperature, he stressed that the selection process needed to take into account the need to use the best refrigerant for each application, including the criteria of efficiency, cost and safety. Meanwhile, the timeline for making new equipment commercially available would, he said, depend on how long it took to research the alternatives, to design and test products that could use them, to develop the capacity to manufacture them and to secure regulatory approval. It was a global issue that required a global approach, and education and training would be key.

24. Mr. Thompson, in his presentation, described what he characterized as the dramatic progress that industry had made on new low-GWP alternative refrigerants, foams, solvents and aerosols. That progress had been driven by, among other things, regional and subregional HFC policies that had spurred market conditions and thus technology development; increasing high-level political support for an HFC amendment to the Montreal Protocol; and concerted industry efforts in every sector. With the mobile air-conditioning and foam-blowing sectors having already implemented alternatives, significant additional reductions in HFC use could be achieved through, inter alia, a consistent, flexible, global policy approach; progress on safety codes and standards; training and capacity-building for safe handling; and an understanding that HFCs were useful and that GWP varied by application.

25. Following the presentations, the facilitator and a number of participants posed questions to the panellists, including those who had made presentations. Questions referred to, inter alia, current commercial applications of flammable alternatives to HFCs and how to address risks associated with their use; suitable alternatives to HFCs in high ambient temperatures; strategies for replacing HFCs and HCFCs in installed equipment; key technical issues that had to be resolved to enable the use of low-GWP alternatives; and the most promising technologies in which to invest.

26. On flammable alternatives to high-GWP HFCs, panellists said that such alternatives, including hydrocarbons, were being used in domestic and commercial refrigeration, air-conditioning, dehumidifiers, chillers, large plug-in supermarket applications, cold stores and in the polyurethane foam industry, where HFC alternatives existed for nearly all applications. One said that hydrocarbon use in air-conditioning systems in developing countries was limited due to size restrictions.

27. One panellist said that most alternatives to high-GWP HFCs were flammable blends that presented a significant challenge to developing countries. Several said that it was essential to train technicians to ensure the safe use of flammable alternatives in order to avoid accidents that could deter their use, in particular in developing countries, with one suggesting the use of certification systems to ensure that only trained technicians serviced equipment. Others urged consideration of safety and environmental issues such as the effects of alternatives on air quality, with one calling for research on the environmental effects of TFA, which he said might not have global effects but was a persistent substance that could have significant impacts. One panellist suggested focusing on all risks posed by all refrigerants and not simply on toxicity or flammability, saying that all cooling equipment presented risks and that most incidents and fatalities were associated with HCFC-22.

28. Regarding efforts to train technicians on HFC alternatives, panellists drew attention to work being undertaken under the Montreal Protocol and discussions on the issue by the International Council of Air-Conditioning, Refrigeration and Heating Manufacturers Associations, with one suggesting that UNEP and the Multilateral Fund could design training courses and materials for technicians.

29. Responding to an additional query concerning safety and toxicity standards for refrigerants, one panellist said that different standards existed in different regions and that those prevented the use of certain alternatives might need to be revised. Another said that many developing countries had imported standards from developed regions rather than develop their own, which meant that in some cases standards were either too stringent or difficult to interpret and implement in the importing countries.

30. On high ambient temperatures, two panellists said that it was difficult for countries where such temperatures prevailed to test alternatives to high-GWP substances, with one stating that most technologies were designed for up to 35° Celsius and that a drop in efficiency would result at temperatures higher than that. Another said that a testing programme for low-GWP refrigerants was projected to start in high ambient countries within the following few months and that results were expected in early 2015.

31. On key technical issues, panellists said that it was necessary to focus on safety and flammability; to consider environmental impacts in addition to GWP; to support demonstration projects on, for instance, carbon dioxide refrigeration in supermarkets in tropical Article 5 parties and transport refrigeration; to develop cost-effective solutions for small and medium-sized enterprises and alternatives to HFCs used in the extruded polystyrene industry; to develop a clear picture of risks; and to consider the use of “lower-GWP” rather than “low-GWP” HFCs in developing countries.

32. Concerning strategies for replacing HFCs and HCFCs in installed air-conditioning and refrigeration equipment, panellists said that a starting point could be to require the use of low-GWP alternatives in certain sectors, as a number of countries had done under their HCFC phase-out management plans (HPMPs). Additional steps included consideration of how to design buildings that required less heating and refrigeration and ensuring proper equipment servicing and retirement, including through leak repairs and destruction of refrigerants at the end of equipment life.

33. With respect to investments, two panellists suggested that HFCs currently provided the highest return and that policies were needed to make alternative technologies more attractive to investors, while another said that anticipated regulations on HFCs had already revealed a need for more future-proof alternatives. One panellist called for a global ban on the export of obsolete technologies to developing countries. Another said that safety and flammability were preconditions for good investments in new technologies.

34. In response to a query about how to regain the confidence of industry in developing countries, which were being asked to replace HFCs after those substances had been promoted as alternatives under the Montreal Protocol, panellists suggested phasing out certain chemicals for certain applications to create certainty, clearly defining the term “low-GWP,” finding long-term solutions rather than relying on intermediate steps and adopting a phase-down approach according to which HFCs would be replaced only as alternatives became available. One said that industry was divided with respect to the use of flammable alternatives and that caution was warranted before adopting phase-outs. Another urged supporting small and medium-sized enterprises to enable a transition to hydrocarbons and other low-GWP HFC alternatives in the foam industry.

35. One participant asked whether countries where ambient temperatures rose to 55°C could benefit from HFC and HCFC alternatives. One panellist said that he intended to look into the possibility of using HFC-32 in his region; it was mildly flammable and the cost of transition would not be great. Another said that HFC-32 was better than R-410A, which would incur losses in efficiency and capacity in high ambient temperatures, adding that industry should be encouraged to invest in that and other such alternatives. Another panellist said that the expansion of cities as a result of massive rural-to-urban migration created an opportunity to design new buildings with remote cooling and heating systems that significantly reduced energy consumption and HFC emissions; public-private partnerships would be crucial, however.

III. Session 2

Legal issues, in particular mutually supportive measures between the ozone and climate regimes

36. The second session of the workshop, on legal issues, in particular mutually supportive measures between the ozone and climate regimes, was facilitated by Mr. Maas Goote. Ms. Donnalyn Charles (Saint Lucia) served as rapporteur. Presentations were made by Ms. Arancha Hinojal Oyarbide, United Nations Office of Legal Affairs; Mr. Jose Pons Pons, independent consultant; Mr. Dan Bondi Ogolla, secretariat of the United Nations Framework Convention on Climate Change; and Mr. Jake Werksman, European Commission. The discussion that followed included questions from the floor and responses from a panel comprising Mr. Mark Roberts, Environmental Investigation Agency; Mr. Tony Oposa, Federated States of Micronesia; Ms. Noluzuko Gwayi, South Africa; and Mr. Alistair McGlone, independent consultant, as well as the presenters.

37. Ms. Hinojal Oyarbide explained the provisions of the 1969 Vienna Convention on the Law of Treaties, which codified the rules of customary international law relating to the law of treaties, and the opportunities it offered in enabling the ozone and climate regimes to work in synergy. Concerns about a conflict between the Framework Convention on Climate Change and its Kyoto Protocol, on the one hand, and an amended Montreal Protocol, on the other, could be addressed by the inclusion of a clause in any amendment to the Montreal Protocol clarifying its effect on the climate treaties. In the absence of such a clarifying clause, paragraph 4 of article 30 of the Vienna Convention, governing the application of successive treaties on the same subject, would apply.

38. Mr. Pons Pons drew a series of lessons from the record of the Montreal Protocol, including that a global commitment was necessary; that well-informed parties had proved entirely capable of tackling the problems; that different solutions needed to be developed for different circumstances; that phase-out measures to date had led to the emergence of alternative substances and processes; and that special provisions had enabled developing countries to comply with the Protocol. He called on parties to work together in tackling the linked problems of ozone depletion and climate change.

39. Mr. Bondi Ogolla described the application of the Framework Convention on Climate Change to HFCs, as well as suggestions for how HFCs could be addressed in a mutually supportive manner under the ozone and climate regimes. He concluded that it would not be inconsistent for HFC emissions to be reported, and for HFC mitigation actions to be taken, under the Framework Convention on Climate Change and the Kyoto Protocol while at the same time HFCs were addressed under the Montreal Protocol. He suggested that the new climate treaty to be agreed in 2015 could potentially contain a “carve-out” for HFCs, along the lines of a similar arrangement for aviation and maritime emissions under the Kyoto Protocol.

40. Mr. Werksman argued that law should be used to solve problems, not just to identify them. It was clear, he said, that there was no legal bar to action on HFCs under either the climate change regime or the ozone regime and that there was no legal conflict between the two regimes. Disagreements about which regime should deal with HFCs really had their roots in parties’ different perceptions of the fairness and effectiveness of each regime. Those underlying issues needed to be addressed, but could best be dealt with in negotiations over an amendment to the Montreal Protocol. The language used by the Group of Twenty leaders in their declaration in 2013, which had suggested retaining responsibility for emissions accounting and reporting under the climate regime while addressing production and consumption under the Montreal Protocol, was very helpful.

41. One panellist mentioned the process for promoting synergies between the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade and the Stockholm Convention on Persistent Organic Pollutants as an example of how different regimes could work together in a mutually supportive manner. She also drew attention to decision XIII/29 of the Thirteenth Meeting of the Parties, which included a commitment to support appropriate collaboration and synergies between multilateral environmental agreements, as agreed by the parties to those agreements, and also the 2004 Prague Declaration on Enhancing Cooperation Among Chemicals-Related Multilateral Environmental Agreements, which had called on parties to various multilateral environmental agreements to work together in achieving the sustainable development objectives of the 2002 World Summit on Sustainable Development.

42. Some participants argued that paragraph 2 (b) of article 2 of the Vienna Convention for the Protection of the Ozone Layer gave a mandate to parties to the Montreal Protocol to take action; the growth in HFC use, and its accompanying impact on the climate, was a clear example of the kind of adverse effects from the phase-out of ozone-depleting substances referred to in that paragraph.

43. Other participants drew attention to the work of the Ad Hoc Working Group on the Durban Platform for Enhanced Action under the Framework Convention on Climate Change, and in particular its aim of reducing greenhouse gas emissions before the new climate treaty entered into force; reducing HFC emissions would be a valuable contribution to that aim.

44. One participant queried why, if the Montreal Protocol were to take over HFCs, it should not take over all other greenhouse gases or biodiversity or other issues handled by other multilateral environmental agreements too. In response, it was pointed out that HFCs were a suitable candidate for the Montreal Protocol because they were used in precisely the same sectors as the ozone-depleting substances being

- phased out under the Protocol. Some participants accepted, however, that there could be a case for dealing with other fluorinated gases, such as perfluorocarbons, under the Protocol.
45. In response to the suggestion that the climate regime's approach of applying controls to a basket of greenhouse gases was a flexible and convenient one, allowing parties to choose which ones they limited, some panellists argued that the approach could not send the kind of clear global signal needed by industry to develop and commercialize alternatives to HFCs; the Montreal Protocol's approach of controlling production and consumption was much better suited to that end.
46. Some panellists said that there were precedents for the control of greenhouse gas emissions by institutions outside the climate regime; aviation and maritime emissions, for example, were to be tackled by the International Civil Aviation Organization and the International Maritime Organization, respectively. The climate regime was not a jealous regime; it faced huge challenges and welcomed any assistance from other institutions and agreements. Another panellist argued that the entire life cycle of HFCs should be examined and that the appropriate regime applied at the appropriate point – the ozone regime for production and consumption, and the climate regime for emissions.
47. One participant said that he was hearing little new in the discussion and that key issues, such as the principle of common but differentiated responsibilities, were being ignored. He also said that the Group of Twenty declaration was being misrepresented and that the Group's leaders had never intended HFCs to be controlled under the Montreal Protocol. They were greenhouse gases and belonged under the climate regime.
48. Panellists, however, said that the terms of the Vienna Convention on the Protection of the Ozone Layer gave the Montreal Protocol the legal potential to address HFCs, and one participant added that if there were doubt on that score the Convention itself could be amended.
49. Panellists also argued that the Montreal Protocol was a perfect example of the principle of common but differentiated responsibilities in practice, including as it did delayed phase-out schedules for Article 5 parties, processes for technology transfer and the provision of financial assistance through the Multilateral Fund. If developing countries were worried about taking on commitments to reduce the use of greenhouse gases in advance of any commitments under the climate regime, it should be remembered that they had already achieved substantial reductions in ozone-depleting substances, most of which were powerful greenhouse gases. An amendment to the Montreal Protocol would not change in any way developing countries' commitments under the climate regime.
50. One participant, saying that it would inevitably take several years for any new amendment to the Montreal Protocol to be negotiated and ratified, asked whether it would not be better to focus on providing financial assistance aimed at reducing HFC use immediately without establishing any new legal requirements. In response, panellists said that such an approach was not inconsistent with proposals to amend the Protocol – indeed, both approaches were essential. Unlike voluntary actions, however, an amendment would send a clear signal to industry to support the development of alternatives to HFCs and would also impose a legal obligation on non-Article 5 parties to provide financial assistance, through the Multilateral Fund, for the reduction of HFCs.
51. In conclusion, presenters and panellists reiterated the view that there was no legal obstacle to the climate and ozone regimes working together to address HFCs, including by amending the Montreal Protocol to include HFCs. The climate regime could continue to be responsible for the reporting and accounting of emissions, retaining the overall global duty of managing the reduction of greenhouse gas emissions, while the Montreal Protocol could pursue reductions in the production and consumption of HFCs. Other participants said that controls to limit the use of HFCs could not be implemented because alternatives were not available for certain situations, such as environments with high-ambient temperatures.
52. A legal conflict would arise if compliance with the provisions of one agreement made it impossible for a party to comply with the provisions of the other agreement. There might be a case for dealing with some legal “wrinkles”, such as the text in the Framework Convention on Climate Change and the Kyoto Protocol referring to the Montreal Protocol; such issues could be addressed in the negotiations on the new climate treaty, possibly through a specific “carve-out” for HFCs.
53. Some panellists felt that the key issue was to use the strengths of the climate and ozone regimes in a mutually supportive manner to maximize the effectiveness and fairness of the measures adopted to address

HFCs. It was important to ensure that those objectives were fully reflected in any amendment to the Montreal Protocol in full and appropriate coordination with the climate regime. Some participants expressed the view that the conclusions of the session were those of the panellists and speakers only.

IV. Session 3

Finance and technology transfer

54. Mr. Peter Adler facilitated the session on finance and technology transfer. Ms. Gudi Alkemade (Netherlands) served as rapporteur. Presentations were made by Mr. Erik Pedersen, independent consultant; Mr. John Thompson, Vice Chair, Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol; and Mr. Chandra Bhushan, independent consultant. Mr. Eduardo Ganem, Secretariat of the Multilateral Fund for the Implementation of the Montreal Protocol; Mr. Husamuddin Ahmadzai, Sweden; Ms. Zhou Xiaofang, China; Mr. Philippe Chemouny, Canada; Ms. Katia Simeonova, United Nations Framework Convention on Climate Change; Mr. Jacques van Engel, United Nations Development Programme; and Mr. Anil Sookdeo, Global Environment Facility (GEF), joined the presenters as panellists to respond to questions from the facilitator and the floor following the presentations.

55. In his presentation, Mr. Pedersen discussed the projected costs of a conversion to HFC-free technologies in selected applications in the domestic refrigeration and mobile air-conditioning sectors in Article 5 parties, pointing to the difficulties associated with calculating the costs of a transition away from HFCs given the large number of alternatives being considered for various applications. The preferred alternatives to HFCs in the mobile air-conditioning and domestic refrigeration sectors were, respectively, HFO-1234yf and hydrocarbons. Projections considered only capital costs of conversion to HFC alternatives, which he said would enable countries to calculate conversion costs based on their consumption levels and projected phase-out schedules. Challenges included the limited availability and higher cost of alternative chemicals and costs associated with the servicing of equipment.

56. Mr. Thompson drew attention to the climate impacts of major ozone-depleting substances and their alternatives and said that growing consumption of HFCs presented significant problems for the climate system, warranting action under the Montreal Protocol to reduce their use. Action was already being taken through the accelerated phase-out of HCFCs and under decision XIX/6, which called for the promotion of alternatives to HCFCs that minimized climate and other environmental impacts. Under that decision, the Executive Committee of the Multilateral Fund had developed cost guidelines that provided for a 25 per cent funding increase for climate-friendly alternatives. The Committee had approved around 140 stage-1 HPMPs, which overall had had positive climate impacts, and had adopted a decision on demonstration projects for climate-friendly alternatives. The Multilateral Fund had been remarkably effective in contributing to a transition away from ozone-depleting substances and, by dealing with sectors where HFCs were used, was equipped to address a small but growing part of the climate problem.

57. Mr. Bhushan suggested that tackling HFCs under the Montreal Protocol would require reforming the Multilateral Fund to finance costs associated with energy efficiency technologies and patents, as significant increases in energy use and greenhouse gas emissions were projected in countries such as India. He also suggested that it was necessary to leapfrog HFCs in order to send a clear signal to industry about the need to move to HFC-free alternatives; to adopt a freeze date for developing countries, while enabling the continued use of HFCs and HCFCs for which no alternatives were available; to adopt a stricter HFC phase-down schedule for developed countries; to adopt benchmarks and guidelines for each sector to guide all countries; and to embrace the precautionary approach more fully in order to address the environmental risks of HFC alternatives, in particular those associated with HFOs and TFA. He indicated that consideration could be given to amending the existing control measures to relax the HCFC phase out where alternatives were not available and he highlighted the need to restructure the Multilateral Fund in order to maximize energy efficiency gains to enable leapfrogging of HFCs.

58. Following the presentations, the facilitator and several participants posed questions on, inter alia, the relative advantages and disadvantages of addressing HFC management through the Multilateral Fund and other funding mechanisms; incentives under the Multilateral Fund to encourage a transition to lower-GWP alternatives to HFCs; and barriers to accelerating technology transfer to Article 5 parties.

59. On the question of the relative advantages and disadvantages of the Multilateral Fund and other funding mechanisms, several panellists said that the Multilateral Fund, given its experience and expertise,

was the best mechanism for dealing with the transition to lower-GWP alternatives to HFCs. One said that the Fund was unique insofar as the Montreal Protocol had clear targets that allowed the Fund to tailor its guidelines and programmes to assist countries in meeting them; in addition, it was founded on a principle of fairness in regard to budgetary allocations and meeting the specific needs of Article 5 parties through reasoned analysis and debate. Another drew attention to the fact that the Fund had allowed countries to take the lead in implementing their own projects, while another said that its focus on specific issues and radical action had helped to reduce the use of ozone-depleting substances almost to zero; on the other hand, its scope, she suggested, should be broadened to cover issues such as measures to prevent the replacement of HCFCs with less efficient technologies.

60. Regarding the other funding mechanisms, one panellist said that GEF could consider HFC emission reductions but its focus to date had primarily been on improving energy efficiency and reducing carbon dioxide emissions; another said that those objectives were compatible with those of the Multilateral Fund and that it was important to pursue them all; and another said that the Clean Development Mechanism, the Green Climate Fund and the Climate Technology Centre and Network (CTCN) were all capable of addressing emissions, including HFC emissions, within the climate change context. Lessons learned from the Multilateral Fund could be particularly useful to the Green Climate Fund and CTCN. One panellist, however, cautioned against the risk of duplication of effort.

61. On the question of incentives to encourage HFC phase-down under the Multilateral Fund, one panellist suggested that they should be strengthened to motivate industry to use the most environment-friendly alternatives. Another, however, said that such a move by industry was unlikely to happen until HFCs were covered by the Montreal Protocol. Another cautioned against stronger incentives, as large-scale subsidies tended to distort competition and market prices. One participant expressed concern that poor communities might be required to provide counterpart funding for the conversion of collectively owned manufacturing plants. One panellist replied that the Multilateral Fund did not impose such requirements unless the amounts the parties requested exceeded cost-effectiveness thresholds or were to be used to upgrade capacity. One panellist, asked about the incentives on offer from GEF, said that GEF was more concerned with tackling barriers to investment and resources that prevented local communities from producing their own technologies and infrastructure.

62. On the question of barriers to accelerating technology transfers to Article 5 parties, it was said, inter alia, that the technologies concerned were often incompatible with local standards and conditions, including high ambient temperatures; that companies were unwilling to share patents for fear of losing their competitive edge, although one participant announced that his company was prepared to allow Article 5 parties to manufacture its HCF-32 technology without charging royalties; that transfers were usually negotiated directly between providers and recipients, with the outcome depending on the price; and that a financing model based on unit abatement cost was ill-suited to dealing with HFCs, as it did not take account of energy efficiency. On the latter point, however, two panellists said that the existing approach did not need change, as new equipment should be designed to improve energy efficiency; another suggested that an increase in energy efficiency to be achieved through an HPMP might be interpreted as a capacity upgrade, the cost of which would not be covered by the Multilateral Fund.

63. To surmount such barriers, one participant said that the Multilateral Fund should do more to assist countries that were unable to afford lower-GWP technologies for HFC phase-down, calling for the issue to be addressed before any further discussion of amendments to the Protocol. One panellist, however, replied that donors were unlikely to generate the necessary resources until the Protocol included HFC-specific targets, in the absence of which some countries would switch to higher-GWP technologies. Another panellist said that the solution lay in sound business plans with agreed targets for implementation. Others highlighted the potential benefits of South-South technology transfers and demonstrations of innovative technologies; training; transparent and equitable standard-setting; open and fair procurement procedures; and assisting developing countries in analysing the barriers to and creating an enabling environment for the most appropriate transfers. Several panellists drew attention to existing alternatives for use in countries currently lacking access to non-HFC technologies. One panellist said that those countries should be permitted to continue using HFCs until alternative technologies were available and suggested extending the phase-down deadline. Another noted that the proposed amendments to the Protocol called for gradual phase-down rather than rapid phase-out. Two panellists said that it was crucial to focus on holistic solutions, and another that all negotiations, even on environmental matters, were essentially economic in nature.

V. Session 4

Policies and measures

64. The session on policies and measures was facilitated by Ms. Karin Shepardson, with Ms. Bitul Zulhasni (Indonesia) acting as rapporteur. The session featured two parts: the first part was on policies and measures for the management of HFCs, with several presentations of actions at the country level; in the second part, a panel of experts discussed industry's reaction to signals from the Montreal Protocol, including with regard to CFCs and HCFCs, and future challenges with HFCs.

65. In the first part of the session, presentations were made by Mr. Philip Owen, European Commission; Mr. Masafumi Oki, Japan; Mr. Agustín Sánchez Guevara, Mexico; Ms. Cindy Newberg, United States of America; Mr. Premhans Jhugroo, Mauritius; Ms. Inese Chang-Waye, Seychelles; Mr. Blaise Horisberger, Switzerland; and Ms. Shamila Nair-Bedouelle, UNEP.

66. Mr. Owen delivered a presentation on policies and measures in the European Union that reduced HFC use and promoted alternatives. He first identified HFC-relevant policies that had contributed to the overall phase-down of HFCs in the European Union, including those related to refrigeration, air-conditioning and waste electrical goods. Policy measures that had proved particularly effective included directive 2012/19/EU, on waste electrical and electronic equipment, and directive 2009/15/EC, on ecodesign. Examples of drivers of new policies were the aim to keep global warming within the 2°C limit; the availability of cost-effective, safe, and energy-efficient alternatives; and the control of fluorinated greenhouse gases as part of the aim to achieve an 80–95 per cent reduction in 1990 levels of European Union greenhouse gas emissions by 2050. Challenges to successful implementation of policies included finding optimal ways to support innovation; enhancing industry acceptance; achieving a balance between legislative and voluntary approaches; and ensuring a level playing field globally. In conclusion, he espoused a phase-down of HFCs using a GWP-weighted approach, which would allow choice, facilitate the operation of markets and encourage the use of alternatives that were environmentally friendly, safe to use and economically viable.

67. Mr. Oki gave a presentation on new policy measures in Japan to manage HFCs and promote alternatives. He summarized relevant national legislation, including the country's fluorocarbon recovery and destruction law, and described the status of emissions per sector under voluntary industry action plans, revealing a prospective increase in fluorocarbon emissions in the refrigeration and air-conditioning sector. A new act on the rational use and proper management of fluorocarbons adopted a life-cycle approach to the issue and encouraged the use of low-GWP alternatives in designated products. Manufacturers and importers of fluorocarbon gases would be required to develop action plans to phase down HFCs, and users would have to introduce measures to reduce leakages. In summary, Japan aimed to achieve a phase-down of HFCs through a combination of upstream measures (for example, promoting lower-GWP and non-fluorinated gas products) and downstream measures (for example, reducing in-use leakage from commercial products).

68. Mr. Guevara delivered a presentation on the status of HCFC and HFC consumption in Mexico and the policy and legal instruments in place to control emissions. Data showed a trend towards declining HCFC consumption and increasing HFC consumption in the country. Total consumption was 17,223 tonnes of HFCs in 2012. Related emissions were principally in the refrigeration and air-conditioning sector. The institutional framework for combating climate change was extensive and included elements related to planning, finance, control instruments (including emissions inventories), assessment and law enforcement. The national climate change strategy adopted a number of approaches to adapting to climate change, by building resilience in social groups, production systems and ecosystems, and to mitigating climate change impacts, through energy efficiency, building sustainable cities, promoting clean energy and the adoption of best practices in agriculture and forestry. A key objective of the country's special programme on climate change for 2013–2018 was to reduce emissions of short-lived climate pollutants, promoting co-benefits for health and wellness.

69. The theme of Ms. Newberg's presentation was policy measures in the United States, in particular the proposed "Significant New Alternatives Policy" (SNAP) regulations. The SNAP programme supported the President's climate action plan, under which the United States aimed to reduce emissions of HFCs through international diplomacy and domestic action, including in the area of public procurement. The aim of the programme was to approve climate-friendly chemicals, including lower-GWP refrigerants, and prohibit certain uses of harmful chemical alternatives. The SNAP programme applied a number of criteria

to evaluate alternatives that reduced overall risk to human health and the environment in a range of industrial sectors, including refrigeration and air-conditioning, aerosols, foams, fire suppression and adhesives. HFC emissions were likely to continue to increase, but at a rate much lower than they would in a business-as-usual scenario. The SNAP programme would continue to expand, and commercialization of a full range of alternatives was envisaged.

70. Mr. Jhugroo gave a presentation on the implementation of the Montreal Protocol in Mauritius. The country had completed its phase-out of CFCs in 2005, five years before the target date, and in 2012 it had embarked on an HCFC phase-out programme with a target of 2025 for complete phase-out. He identified the main drivers of policies as political will to achieve environmental protection; institutional frameworks (including setting up a national ozone unit at the Ministry of Environment); legislative frameworks; and public-private partnership. An integrated approach had been adopted, with concurrent implementation of the provisions of the Montreal Protocol and the Kyoto Protocol. Within that approach, the country aimed to leapfrog to natural refrigerants that were both climate-friendly and ozone-friendly. Actions at the national level included the implementation of the HPMP, training in the technical and enforcement areas, sensitization of target groups, demonstration projects for alternatives and a survey of HFC appliances and their use. Remaining challenges included the remoteness of the country as a small island developing State; the external market supply; the availability of technology transfer; financial constraints; and the destruction of stockpiles of ozone-depleting substances.

71. Ms. Inese Chang-Waye gave a presentation on HFC policy in the Seychelles. She said that the national HPMP had been approved for the early phase-out of HCFCs by 2020, but the main stakeholder, the hotel industry, was becoming dependent on HFCs as the phase-out continued, and alternatives were more costly. Four tonnes of HFCs had been imported in 2012, mainly for use in refrigeration and air-conditioning, and 17 tonnes thus far in 2014. The policy on HFCs had been approved and would become effective in 2015. Tax incentives would be deployed to encourage the import of low-GWP alternatives, and all new buildings, including hotels, were required to ensure, as part of their environmental impact assessments, that non-global-warming, non-ozone-depleting alternatives were used. As a small island State, the Seychelles had a responsibility to ensure that alternative formulations did not contribute to global warming, and its climate-friendly policy on HFCs reflected that.

72. Mr. Horisberger delivered a presentation on Swiss policies and measures for the phase-down of HFCs, including the country's federal law on chemicals risk reduction. Policy drivers included reducing fluorinated greenhouse gas emissions at minimal marginal costs; promoting the development and marketing of environmentally friendly technologies; supporting industry in the development of reliable long-term strategies; avoiding potential regulatory loopholes; and promoting life-cycle approaches that were climate friendly. Supportive policy measures included banning the use of fluorinated greenhouse gases where environmentally superior alternatives were available; allowing, when necessary, time-limited essential-use exemptions; requesting emission reduction measures for allowed applications of fluorinated greenhouse gases; and considering voluntary commitments developed by the industrial sector. A number of challenges remained, principally in the refrigeration and air-conditioning sector, including domestic harmonization of safety requirements, training of technicians on alternatives, overcoming prejudice against "natural" refrigerants and the availability and cost of alternatives.

73. Ms. Nair-Bedouelle provided an overview of policies and measures in developing countries. She said that national policy regimes to combat ozone-depleting substances were a critical factor in the success of the Montreal Protocol, and policy setting for the phase-out of CFCs and HCFCs had been highly successful under the Multilateral Fund. Lessons learned from the experience with ozone-depleting substances could help shape future policies on HFCs, and some Article 5 parties had already been proactive in setting initial HFC policies. She said that policies could be both enablers of and barriers to the introduction of low-GWP alternatives, and she cited the UNEP document *Barriers to the Use of Low-GWP Refrigerants in Developing Countries and Opportunities to Overcome These* as a relevant tool. Drivers of change included increasing imports of high-GWP HFCs in many countries; increased availability of low-GWP alternatives in developing-country markets; and encouragement for developing countries to consider policies on HFCs and low-GWP alternatives as part of a broader refrigerant management approach. In addition, policies promoting alternatives in developed countries stimulated policy considerations in developing countries. Ensuring that obligations and incentives were in place to stimulate policy change remained a challenge, as did the coordination of HFC policies with policies on other issues,

including climate, energy, safety and transport. Finally, developing countries would need policy assistance related to HFCs and low-GWP alternatives.

74. In the second part of the session, a panel of industry and non-governmental organization experts led a discussion on industry's reactions to signals from the Montreal Protocol. The following panellists took part: Mr. Samoel Vieira de Souza, Brazilian Association of Manufacturers of Refrigeration, Heating, Air-conditioning and Ventilation Equipment; Mr. Kevin Fay, Alliance for Responsible Atmospheric Policy; Ms. Andrea Voigt, European Partnership for Energy and the Environment; Mr. Durwood Zaelke, Institute for Governance and Sustainable Development; Mr. Ravinder Mehta, Refrigeration and Air-conditioning Manufacturers Association, India; Mr. Greg Picker, Refrigerants Australia; and Ms. Klara Skacanova, Shecco. Ms. Shepardson was again the facilitator, and she prompted the panellists with a series of questions, including some from the meeting participants.

75. On the matter of signals to industry, there was some discussion on whether action by Government or industry should depend on global signals and the potential for action if those signals were weak or lacking. Several panellists spoke of the need for signals to make investment commercially viable on a global basis and in a timely manner. One panellist said that the private sector was very supportive of new technologies and innovation – it was up to policymakers to send clear signals about the long-term objectives that needed to be achieved. Among the global signals identified were ISO standards, including for the air-conditioning and refrigeration sector, which could play an important role in defining the scope of new technologies. One panellist, responding to a question from a participant, said that businesses on all scales, including small and medium-sized enterprises, stood to benefit from a global approach, which gave them the opportunity to move towards innovative technologies with lower GWP. Another panellist agreed, adding that parallel efforts to reap energy-efficiency gains during the phase-down presented a chance for businesses of all sizes to increase profits.

76. The importance to businesses of risk management and upholding corporate reputation was seen as another element that made industry naturally cautious without the support of strong global signals. Product stewardship in the context of a life cycle approach was also becoming increasingly important as businesses tried to find a balance between entrepreneurial risk-taking and regulatory structures. Risk from climate change would continue to grow.

77. There was some discussion of the relative effectiveness of mandatory versus voluntary approaches and regulatory versus market-led approaches. Panellists expressed a range of views, with some citing the ability of the market to solve most demand and supply challenges, while others identified market failures and said that there was a need for strong policy and regulatory guidance. One panellist, citing the example of the European Union, said that a strong regulatory system gave industry a clear framework in which to operate and encouraged innovation and flexibility. Some panellists said that refrigerants themselves accounted for a relatively small part of the cost of refrigeration systems; refrigerant cost, therefore, would not by itself prompt the development of low-GWP alternatives. One panellist said that examples from Europe demonstrated that fiscal measures, in combination with other measures, could send a clear message to industry and deliver significant reductions in ozone-depleting substances and greenhouse gases. Another panellist said that the market was effective for proven, available, mature products, but supportive measures were needed to promote less proven technologies. Another panellist said that the phase-down of HFCs would trigger market forces: high-GWP refrigerants would thus automatically become more expensive in accordance with the law of supply and demand. Another said that, in phasing down HFCs, research to identify the scale of the challenge and the capacity of national economies to deal with it could help engender confidence and encourage proactive decision-making.

78. Several panellists alluded to the success of the Montreal Protocol and the factors behind it. One panellist said that the Protocol had demonstrated the effectiveness of sending out global signals and had shown its flexibility and ability to adapt to changing global circumstances; that approach needed to be continued as the world moved from ozone to climate investment. Another said that the strong regulatory approach of the Protocol was the best way to ensure global action on HFCs and assistance for developing countries, as had been clearly shown by its success in dealing with ozone-depleting substances. Another panellist said that the success of the Protocol was based on collaboration, including the active involvement of the private sector. Another panellist said that, compared to global warming, reducing the emission of ozone-depleting substances was relatively easy to achieve – combating global warming was a multidimensional issue and would involve many changes to people's lifestyles, making it a much more complex challenge.

79. A theme of the discussion was the problem posed by segmentation, whether by industrial sector, scale or geographical location. Some panellists suggested that segmentation militated against economies of scale and reduced economic opportunities, thereby discouraging investment. Consistent global conditions were needed in order for technologies to be scaled up.

80. On the matter of geographical segmentation, one panellist said that regional differences were an important factor in innovation and the introduction of new technologies and needed to be taken into account. In India, for example, the main demand was for small equipment, including room air-conditioners and chillers, but global industry was not well prepared for such region-specific and climate-specific requirements. In addition, many air-conditioners were being manufactured in the country by small manufacturers on a contract basis, making it difficult to pass on new technologies. Regulatory restrictions, he continued, had contributed to an increase in prices, and the industry had stagnated. It was important, therefore, to consider issues through a national lens as well as a global lens.

81. In response to a question from a participant about the lack of alternative technologies for use in high ambient temperatures, one panellist said that the Montreal Protocol had the flexible mechanisms needed to deal with such issues and could cope with them if given the mandate to widen its scope to include the climate impact of ozone-depleting substances and their alternatives. A number of panellists stressed that certain issues had global application, including safety, concern for the environment and the need for education and training.

82. Several panellists raised the issue of downstream considerations, including the competence of service technicians to accommodate technological changes. That was an important safety issue, particularly given the flammability of certain low-GWP alternatives to ozone-depleting substances. Training and strong, clear regulations and guidelines were needed to ensure that safety was not compromised and thus encourage the acceptance of new technologies. One panellist said that the biggest risk was performance – the technology had to function properly before any assessment of its risks.

VI. Session summaries

83. Upon the conclusion of session 4, each rapporteur read a summary of the discussions that took place during her session. The summary by the rapporteurs of the conclusions of the workshop and identification of further discussion points is contained in document UNEP/OzL.Pro.WG.1/34/3.

VII. Closure of the workshop

84. Following the customary exchange of courtesies, the workshop was declared closed at 6 p.m. on Saturday, 12 July 2014.
