

**Montreal Protocol
on Substances that
Deplete the Ozone Layer**

Distr.: General
11 September 2026
Original: English

**Thirty-Eighth Meeting of the Parties to
the Montreal Protocol on Substances
that Deplete the Ozone Layer**
Kigali, 2–6 November 2026
Items 5, 7, 8 and 9 of the provisional agenda for the
preparatory segment*

**Issues for discussion by and information for the attention of the
Thirty-Eighth Meeting of the Parties to the Montreal Protocol****Note by the Secretariat****Addendum****I. Introduction**

1. The present addendum to the note by the Ozone Secretariat on issues for discussion by and information for the attention of the Thirty-Eighth Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer presents new and updated information that has become available since the preparation of that note (UNEP/OzL.Pro.38/2), in particular regarding items 5, 7, 8 and 9 of the provisional agenda for the preparatory segment. Section II sets out the following:

- (a) Information on actions that have been taken or are in progress in relation to the operative paragraphs of the draft decisions considered by the Open-ended Working Group of the Parties to the Montreal Protocol at its forty-eighth meeting, under the item on further strengthening Montreal Protocol institutions, as requested by the Working Group at that meeting;
 - (b) A brief summary of the report by the Technology and Economic Assessment Panel on emissions of hydrofluorocarbon-23 (HFC-23), prepared with contributions from the Scientific Assessment Panel, in response to decision XXXVII/2;
 - (c) A report by the Secretariat on progress and any outcomes of activities in connection with the evaluation of the suitability of potential sites for monitoring regional emissions of controlled substances and possible next steps towards establishing monitoring activities at those sites, as requested in paragraph 4 of decision XXXVII/1;
 - (d) Updated information on Technology and Economic Assessment Panel organizational issues, including options for the organization of the Panel and its technical options committees, in response to decision XXXV/20, and nominations by parties of experts to the Panel.
2. The response of the Scientific Assessment Panel and the Technology and Economic Assessment Panel to decision XXXVII/2 on emissions of HFC-23 is set out in volume 3 of the 2026 report of the Technology and Economic Assessment Panel.¹

* UNEP/OzL.Pro.38/1.

¹ Available at <https://ozone.unep.org/meetings/thirty-eighth-meeting-parties/pre-session-documents>.

3. Further information is expected to be provided by the Technology and Economic Assessment Panel replenishment task force in relation to item 4 (a) of the provisional agenda for the preparatory segment of the meeting and will be included in a second addendum to the note by the Secretariat, along with any other issues of relevance for the parties' information.

II. Overview of items on the provisional agenda for the preparatory segment (2–6 November 2026)

4. The issues covered in the present addendum are outlined below in the order in which the respective items are listed on the provisional agenda of the Thirty-Eighth Meeting of the Parties.

A. Further strengthening Montreal Protocol institutions (UNEP/OzL.Pro.37/9, para. 166) (item 5 of the provisional agenda for the preparatory segment)

5. As is mentioned in the note by the Secretariat (UNEP/OzL.Pro.38/2, paras. 35–37), at the forty-eighth meeting of the Open-ended Working Group, during the consideration of agenda item 5, two conference room papers were introduced: a conference room paper setting out a draft decision on strengthening Montreal Protocol operations, submitted by Cameroon on behalf of the Group of African States, and a conference room paper setting out a draft decision on strengthening licensing systems and data reporting to prevent illegal trade, submitted by Canada, also on behalf of Australia, the European Union, Norway and Switzerland. The Open-ended Working Group agreed to forward both proposals for draft decisions for further consideration by the Thirty-Eighth Meeting of the Parties. The draft decisions are set out in section III of document UNEP/OzL.Pro.38/3 as draft decisions XXXVIII/[AA] and XXXVIII/[BB].

6. In addition, the Open-ended Working Group requested the Secretariat to provide information on actions that had been taken or were in progress in relation to the operative paragraphs in both proposals, including information on the experience of parties and good practices in terms of cooperation with customs and other authorities, or, where relevant, to indicate that no such information existed.

7. Information available at the time of the preparation of this note is summarized below. The text of the operative paragraphs is set out in bold, followed by text that summarizes the available information on actions that had been taken or are in progress in relation to those operative paragraphs. As necessary, this information will be supplemented by the Secretariat during the Thirty-Eighth Meeting of the Parties.

8. The Secretariat notes that since the preparation of the two notes on licensing systems at the request of Meetings of the Parties,² seven additional parties have reported to the Secretariat on the establishment and operation of licensing systems covering hydrofluorocarbons (HFCs) pursuant to Article 4B of the Montreal Protocol, indicating that such licensing systems have been established and are in operation. However, these parties have not provided further details on the specific features or operation of their HFC licensing systems.

1. **Information relating to the operative paragraphs of draft decision XXXVIII/[AA]: Strengthening Montreal Protocol operations (submission by Cameroon on behalf of the Group of African States)**

- (a) **To request the Ozone Secretariat to prepare a report on the available tools that could be deployed to enhance tracking and monitoring of controlled substances across the supply chain, including in online marketplaces and on e-commerce platforms, for consideration at the forty-ninth meeting of the Open-ended Working Group of the Parties to the Montreal Protocol (para. 1 of draft decision XXXVIII/[AA])**

9. During the informal meeting on facilitating implementation of the Montreal Protocol that took place on 2 November 2025 immediately prior to the Thirty-Seventh Meeting of the Parties, one of the key takeaways identified in relation to illegal trade was that e-commerce platforms and marketplaces should be regulated, including through improved supply chain tracking.³

² Summary of common features of licensing systems (UNEP/OzL.Pro/Workshop.11/2/Add.2–UNEP/OzL.Pro.WG.1/45/5/Add.2), as updated in a note of the same title (UNEP/OzL.Pro.WG.1/47/4).

³ UNEP/OzL.Pro.37/7, para. 13.

10. There is currently no single tool for enhancing tracking and monitoring of controlled substances across the supply chain, including in online marketplaces and on e-commerce platforms. However, several tools provide different ways to track and monitor controlled substances across the supply chain, including the following:

(a) The United Nations Comtrade database,⁴ which is publicly accessible, aggregates detailed global annual and monthly trade statistics by product and trading partner, including in controlled substances. It covers approximately 200 countries and more than 99% of the world's merchandise trade;

(b) The Container Control Programme, which was established in 2004 by the United Nations Office on Drugs and Crime and the World Customs Organization (WCO) to support the strengthening of international supply chain security by building capacity in countries seeking to improve risk management, supply chain security, and trade facilitation in seaports, airports and land border crossings in order to prevent the cross-border movement of illicit goods.⁵ The programme uses a multisectoral approach that provides continuous monitoring and oversight, offering context-specific training programmes and strengthening cooperation between State agencies and the private sector;

(c) The Supply Chain Integrity Project, a joint initiative of the Australian Border Force and WCO, which is designed to enhance the integrity and resilience of customs-controlled supply chains, while addressing the prolific issue of insider threats and those who seek to subvert routine customs and border controls.⁶ In addition to delivering specialized training to WCO members, the Supply Chain Integrity Project focuses on working proactively and enhancing collaboration with the private sector to promote greater security, transparency and accountability in international trade;

(d) The European Union's EUROSTAT and its statistics on international trade in goods⁷ measure the value and quantity of goods traded between European Union countries (intra-European Union trade) and goods traded by European Union countries with non-European Union countries (extra-European Union trade). The term "goods" refers to all movable property. EUROSTAT is the official, harmonized source of information about exports, imports and trade balances of the European Union, its member States and the euro area;

(e) The International Criminal Police Organization (INTERPOL) operates I-24/7, a secure global police communications system for cross-border police information exchange on criminal activities such as illegal trade, including of ozone-depleting substances, organized networks and falsified documentation;⁸

(f) The European Union Agency for Law Enforcement Cooperation (EUROPOL) has developed the Secure Information Exchange Network Application, a platform for providing secure information on shipments to specialized law enforcement units, such as asset recovery offices, police customs cooperation centres, passenger information units, financial intelligence units, fugitive active search teams, special tactics units and joint cybercrime action task force units.⁹

(b) To also request the Ozone Secretariat to develop standard operating procedures to support a harmonized approach for detection of illegal trade, handling of cases, management of seizures, reporting, and sanctions for consideration by the Thirty-Ninth Meeting of the Parties (para. 2 of draft decision XXXVIII/[AA])

11. In 2025, WCO, with the support of OzonAction and the Ozone Secretariat, developed guidelines for customs administrators on developing standard operating procedures for the enforcement of the Montreal Protocol. The primary objective of the guidelines is to assist customs administrations in ensuring compliance with international and domestic regulations, preventing illegal trade, and facilitating the legitimate movement of controlled substances (and, where applicable, relevant products and equipment). The guidelines, available in English¹⁰ and French,¹¹ provide a

⁴ Available at <https://comtradeplus.un.org/>.

⁵ See www.unodc.org/unodc/en/ccp/index.html.

⁶ See www.wcoomd.org/en/topics/enforcement-and-compliance/activities-and-programmes/abf-wco-supply-chain-integrity-project.aspx.

⁷ See <https://ec.europa.eu/eurostat/web/international-trade-in-goods/information-data>.

⁸ See www.interpol.int/en/How-we-work/Databases.

⁹ See www.europol.europa.eu/how-we-work/services-support/siena.

¹⁰ www.wcoomd.org/en/topics/enforcement-and-compliance/instruments-and-tools/guidelines/developing-sops-for-the-enforcement-of-the-montreal-protocol.aspx.

¹¹ www.wcoomd.org/fr/topics/enforcement-and-compliance/instruments-and-tools/guidelines/developing-sops-for-the-enforcement-of-the-montreal-protocol.aspx.

comprehensive and structured framework designed to assist customs administrations in developing and implementing standard operating procedures for effective control of shipments of substances controlled under the Montreal Protocol and, where applicable, products and equipment containing or relying on those controlled substances.

12. The guidelines cover:

- (a) Import, export, transit, trans-shipment, and free zone operations;
- (b) Verification of permits and documentation;
- (c) Identification of commodities;
- (d) Risk management, facilitation of legal trade, and control measures (sampling, equipment and safety);
- (e) Handling illegal traffic, enforcement operations, and reporting;
- (f) Collaboration with relevant stakeholders.

13. To access the guidelines, customs officers will need access to the WCO members' website (which can be obtained through WCO contact points within their customs administrations). An editable version of the document can be obtained from enforcementpolicyunit@wcoomd.org.

- (c) **To further request the Ozone Secretariat to prepare a checklist that defines core features of effective licensing systems, taking into consideration Article 4B of the Montreal Protocol and relevant decisions and reports, including the summary of common features of licensing systems in response to paragraph 1 of decision XXXVI/9, for consideration by the Thirty-Ninth Meeting of the Parties (para. 3 of draft decision XXXVIII/[AA])**

14. In response to subparagraph 4 (b) of decision XXXIV/8, the Secretariat had prepared a summary of common features of licensing systems,¹² which was made available before the workshop on strengthening the effective implementation and enforcement of the Montreal Protocol, held on 2 July 2023, and the forty-fifth meeting of the Open-ended Working Group. In decision XXXVI/9, paragraph 1, the Thirty-Fifth Meeting of the Parties requested the Secretariat to update its response to decision XXXIV/8 and prepare a compilation of common features of licensing systems, including examples of licensing systems implemented under various circumstances. Document UNEP/OzL.Pro.WG.1/47/4, which was made available before the forty-seventh meeting of the Open-ended Working Group, included a review of the licensing systems of 100 parties against key functions and features derived from Article 4B, relevant decisions,¹³ previous reports and information provided by implementing agencies. The review also identified notable practices and areas for improvement, while recognizing that the specific design and implementation of licensing systems vary according to national circumstances.

15. The common features of licensing systems identified through the reviews included:

- (a) A legal and institutional framework for the establishment and operation of the licensing system, including designation of the authority or authorities responsible for its administration;
- (b) Registration or accreditation of importers and exporters and requirements for the submission of supporting documentation;
- (c) Licensing requirements for imports and exports of controlled substances, including, in a number of cases, re-exports;
- (d) Allocation of quotas or other quantitative restrictions and mechanisms for monitoring the use of allocated quantities;
- (e) Issuance of licenses or permits, including annual, per-shipment or combined licensing arrangements;
- (f) Cooperation and information exchange between licensing authorities, customs and other relevant authorities;
- (g) Labelling and documentation requirements for consignments and containers of controlled substances;

¹² UNEP/OzL.Pro/Workshop.11/2/Add.2–UNEP/OzL.Pro.WG.1/45/5/Add.2.

¹³ Decisions IX/8, IX/9, XIII/12, XIV/7, XVI/32, XVII/16, XIX/12, XXXI/3, XXXIV/8 and XXXVI/9.

- (h) Regular reporting and record-keeping by licence holders, including information on imports, exports and, where applicable, the use or distribution of controlled substances;
- (i) Verification and cross-checking of information from licensing, customs and other relevant sources;
- (j) Measures to prevent and address illegal trade, including inspections, seizure or confiscation, licence revocation, and financial or other penalties.

16. The reviews also identified notable practices adopted by a smaller number of parties, including fully electronic licensing systems integrated with customs portals through a single-window approach; the use of the 2022 Harmonized System codes with national extensions; comprehensive monitoring of transit, trans-shipment and e-commerce; well-defined licence processing time frames, including automated approvals; certification-based access to quotas and licences; measures to promote alternative substances with low global warming potential; public availability of licensing and quota information; institutionalized customs training; and public outreach activities, including enforcement updates and public consultations.

17. The expression “core features” was used in the context of discussions on licensing systems at the informal meeting. The discussions drew on the common features and notable practices identified in the Secretariat’s notes on licensing systems,¹⁴ as well as on country-specific examples presented by parties. The Thirty-Seventh Meeting of the Parties subsequently considered a draft decision that included a request for the preparation of a template for compiling information on licensing systems and a checklist of the core features of licensing systems. During the discussion, some representatives expressed concern regarding the reference to core features, noting that parties had not reached agreement on what those features might be.¹⁵

18. During the discussions on licensing systems at the informal meeting, participants emphasized the role of a clear legislative framework, an electronic system for data management, quota management, institutional coordination, reporting and monitoring, the use of the informal prior informed consent procedure, coverage of reclaimed substances and flexibility for national circumstances. Notable practices identified included licensing of equipment, the strategic use of fees and levies, and incorporation of end-of-life considerations in licensing systems.¹⁶

(d) To request the Ozone Secretariat to explore the feasibility and cost of developing open-source licensing software that can be integrated into customs and single-window systems, for consideration by the Thirty-Ninth Meeting of the Parties (para. 4 of draft decision XXXVIII/[AA])

(i) Open-source licensing software

19. Generic open-source licensing software that can be integrated into the customs system was one of the key takeaways from the breakout groups on import and export licensing systems that met during the informal meeting on facilitating implementation of the Montreal Protocol.¹⁷ The upgrade of the United for Efficiency (U4E) product registry software was provided as an example. U4E has developed software specifications that will help countries to set up their own online product registration systems to capture specific information on products to underpin energy efficiency policies or programmes. These software specifications can be downloaded from the U4E website.¹⁸

(ii) Single-window systems

20. In the context of the Montreal Protocol, a single-window system has been defined as an online facility designed as a single-entry point for meeting import and export requirements that connect the registration and quota system with the licensing system and customs clearance.¹⁹

21. At the time of the preparation of the updated study on common features of licensing systems, of the 100 cases reviewed, only 25 export and import licensing systems were part of single-window systems, i.e., the licensing systems, which were fully electronic, were integrated with customs clearance processes.²⁰

¹⁴ UNEP/OzL.Pro/Workshop.11/2/Add.2–UNEP/OzL.Pro.WG.1/45/5/Add.2; UNEP/OzL.Pro.WG.1/47/4.

¹⁵ UNEP/OzL.Pro.37/9, paras. 161–166.

¹⁶ UNEP/OzL.Pro.37/7, para. 8.

¹⁷ Ibid., para. 10 (d).

¹⁸ See https://united4efficiency.org/wp-content/uploads/2020/10/PRS_specs_draft_final_20191107.pdf.

¹⁹ UNEP/OzL.Pro.WG.1/47/4, para. 22.

²⁰ Ibid., para. 29.

22. Examples of single-window systems that integrate licensing systems presented at the informal meeting include those of the European Union,²¹ Vanuatu²² and Zimbabwe.²³

23. The guidelines accompanying recommendation No. 33 of the United Nations Centre for Trade Facilitation and Electronic Business, a subsidiary body of the Economic Commission for Europe, on establishing a single window²⁴ do not specifically refer to the feasibility and cost of open-source licensing software that can be integrated into customs and single-window systems. However, these guidelines describe what would be involved in conducting a feasibility study for implementing a single window, with key areas to be covered by a feasibility study described in annex C to the guidelines.

(e) To request the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol, in consultation with national ozone officers and the Compliance Assistance Programme and, as appropriate, the World Customs Organization, to assess additional training and capacity needs in parties operating under paragraph 1 of Article 5 of the Montreal Protocol related to illegal trade, licensing systems and data reporting, for consideration by the Open-ended Working Group at its forty-ninth meeting (para. 5 of draft decision XXXVIII/[AA])

24. The Executive Committee of the Multilateral Fund has adopted decisions 87/50 and 95/86 with cost guidelines that identify licensing and quota systems, policy and regulatory development, training for technicians and customs officers, prevention of illegal HFC trade, recovery and recycling, and improved monitoring and reporting as eligible and priority areas under Kigali implementation plans. Recently approved and ongoing HFC phase-out management plans and Kigali implementation plans have accordingly supported the establishment and strengthening of licensing and quota systems, development of e-licensing tools, training of customs and enforcement officers, cross-border knowledge exchange and study visits, workshops on preventing illegal trade, and improvements in data collection and reporting. To date, 91 countries have received stage I Kigali implementation plan funding and all have confirmed operational HFC licensing and quota systems, with annual progress reports and project completion reports documenting training delivered, regulatory measures adopted, system upgrades completed, and lessons learned on enforcement effectiveness.

25. Complementing project-based support, the United Nations Environment Programme (UNEP) Compliance Assistance Programme provides continuous assistance to Article 5 parties on licensing and quota systems, monitoring, reporting and verification, customs and enforcement training, electronic licensing, data reporting and cross-border cooperation, and is increasingly promoting digital enforcement tools, harmonized customs codes, guidance materials on illegal trade, life-cycle refrigerant management, priorities reaffirmed in its proposed work programme for 2027. Building on this, life-cycle refrigerant management activities under Executive Committee decision 91/66 and related discussions of the Executive Committee emphasize improved inventories of refrigerant banks, stronger data systems, recovery, recycling and reclamation schemes, cross-border refrigerant tracking, technician certification, and prevention of illegal trade in reused or reclaimed refrigerants, with inventories and assessments seen as the foundation for evidence-based life-cycle refrigerant management policy and future funding decisions.

26. Looking ahead, decision 98/63 of the Executive Committee, taking into account decision XXXV/13 of the Thirty-Fifth Meeting of the Parties, highlights implementation challenges linked to the import and export of prohibited cooling equipment and the associated needs for customs capacity, enforcement, awareness-raising, and regional coordination to avoid non-compliance, encouraging countries to integrate related activities into Kigali implementation plans and HCFC phase-out management plans and to assess how such measures have been applied. These priorities are reinforced by evaluation work where the Senior Evaluation Officer plans to evaluate the Compliance Assistance Programme's effectiveness on enforcement and illegal trade, including required capacities and implementation constraints, alongside a desk study of policy and regulatory frameworks covering enforcement and sanction mechanisms, procedures for suspicious shipments, and the harmonization of customs codes.

²¹ See <https://ozone.unep.org/system/files/documents/Session%20a-EU%20licensing%20and%20customs%20control.pdf>.

²² See <https://ozone.unep.org/system/files/documents/Session%20c-Licensing%20for%20products%20and%20equipment.pdf>.

²³ See <https://ozone.unep.org/system/files/documents/Session%206a-a%20multifaceted%20approach%20to%20data%20collection%20and%20verification.pdf>.

²⁴ Available at https://unece.org/DAM/cefact/recommendations/rec33/rec33_trd352e.pdf.

27. The Compliance Assistance Programme uses a participatory approach to capacity-building, drawing on the experience of national ozone officers and guidance from international agencies and individual experts. Its strategy for 2024–2026 includes among its outcomes that Article 5 countries report accurate data in a timely manner, that effective legal, regulatory and policy frameworks are in place and enforced, and that imports and exports are controlled and illegal trade is reduced or prevented.²⁵ In support of these outcomes, the 2024, 2025 and 2026 workplans under the 2024–2026 strategy provide for capacity-building for new and existing national ozone officers and support to national ozone units in relation to data monitoring and reporting, licensing and quota systems, and cooperation with customs and enforcement authorities.

28. In 2019, the Compliance Assistance Programme released training packages for its national ozone unit training programme. The packages comprise a series of standardized training materials and tools, including concise booklets, standard agendas for training modules, presentation slides, handouts, checklists for ozone officers, quizzes, evaluation documents, guides for work by ozone officers before and after training sessions, and other supporting materials. The training programme is intended for new national ozone officers, assistants and other staff of national ozone units and provides essential information on the Montreal Protocol, national obligations and the main activities of national ozone units, including on illegal trade, licensing systems and data reporting.²⁶ Training for national ozone officers has continued through OzonAction's regional network activities.

29. The UNEP business plan²⁷ sets out the Programme's planned activities as an implementing agency of the Multilateral Fund for the period 2026–2028. Among other activities, the business plan provides for strengthening government institutions in Article 5 countries responsible for implementing and reporting on national strategies to comply with the Montreal Protocol, as well as activities relating to HCFC phase-out management plans, Kigali implementation plans, institutional strengthening and other technical assistance.

30. Activities conducted by OzonAction in 2026 to date include support in areas relating to licensing and quota systems, data monitoring and reporting, customs and enforcement. For example, regional workshops held in the Pacific in March 2026 brought together national ozone officers, customs officers, energy efficiency officers and other partner agencies to consider licensing and quota systems, data discrepancies, customs training, information-sharing and enforcement procedures.²⁸ In April 2026, OzonAction, in collaboration with the Multilateral Fund secretariat, organized an Africa-focused webinar on the country programme data online reporting system to support national ozone units in preparing accurate and timely country programme data submissions.²⁹ In the same month, OzonAction organized the Montreal Protocol Dialogue on Action against Illegal Trade, in cooperation with the Green Customs Initiative, with participation by international and regional organizations involved in customs, enforcement and related matters.³⁰ In addition to the regional workshops, in July 2026 OzonAction facilitated an interregional network meeting of Caribbean and Pacific Island countries' national ozone officers to exchange experiences and good practices regarding licensing and quota systems, monitoring and verification mechanisms, enforcement practices, and solutions for emerging implementation challenges related to trade control.

2. Information relating to the operative paragraphs of draft decision XXXVIII/[BB]:

Strengthening licensing systems and data reporting to prevent illegal trade (submission by Australia, Canada, the European Union, Norway and Switzerland)

- (a) **To request the Ozone Secretariat to prepare, for information purposes, a list of the core features of licensing systems that is based on Article 4B of the Montreal Protocol and relevant decisions of the Meeting of the Parties related to licensing systems (para. 1 of draft decision XXXVIII/[BB])**

31. See paragraphs 14–18 above.

²⁵ UNEP/OzL.Pro/ExCom/93/94, paras. 7 and 8 and part I.

²⁶ Available at www.unep.org/ozonaction/resources/toolkits-manuals-and-guides/training-programme-national-ozone-officers.

²⁷ UNEP/OzL.Pro/ExCom/97/23.

²⁸ See www.unep.org/ozonaction/news/news/strengthening-trade-control-product-registration-and-energy-efficiency-pacific.

²⁹ See www.unep.org/ozonaction/news/news/unep-ozonaction-and-multilateral-fund-secretariat-organized-africa-focused-webinar-cp.

³⁰ See www.unep.org/ozonaction/news/news/unep-ozonaction-organized-montreal-protocol-dialogue-action-against-illegal-trade.

- (b) **To urge parties that have not yet done so to inform the Ozone Secretariat as soon as possible whether their import and export licensing systems established pursuant to Article 4B of the Montreal Protocol cover used, recycled and reclaimed controlled substances, in addition to new controlled substances (para. 2 of draft decision XXXVIII/[BB])**

32. Article 4B requires each party to establish and implement a system for licensing the import and export of new, used, recycled and reclaimed controlled substances. The requirement for licensing systems to cover new, used, recycled and reclaimed controlled substances has also been reiterated in decisions of the Meetings of the Parties concerning the establishment and status of licensing systems under Article 4B, including for controlled substances listed in Annex F.³¹

33. In the summary of common features of licensing systems prepared by the Secretariat in response to decision XXXIV/8, all 46 licensing systems considered covered new, used, recycled and reclaimed controlled substances.³² In the subsequent note of the same title prepared in response to decision XXXVI/9, only about 15 of the additional 54 parties specifically reported measures regulating recovered, recycled or reclaimed substances, including permitting requirements and other procedural or operational controls.³³ A further 10 parties mentioned measures to encourage recovery, recycling or reclamation, but did not explicitly indicate that such substances were subject to import or export controls. The coverage of used and reclaimed substances in licensing systems was identified as a possible area for improvement, while noting that some of the gaps identified might have stemmed from a lack of specific details in the information provided by parties.³⁴

34. The informal meeting convened on 2 November 2025 also considered challenges of establishing and fully implementing systems for licensing the import and export of new, used, recycled and reclaimed controlled substances and the associated quota system, particularly in the light of the Kigali Amendment. In discussions on core features of licensing systems, participants emphasized coverage of reclaimed substances, while incomplete tracking of reclaimed or recovered substances was identified as one of the challenges facing licensing systems.³⁵

- (c) **To encourage parties to ensure that their import and export licensing systems cover, as applicable, controlled substances that are in trans-shipment or re-exported, taking into account the clarifications on “trans-shipment” and “re-export” in decisions IV/14 and IX/34 (para. 3 of draft decision XXXVIII/[BB])**

35. Decision IV/14 clarified that, in cases of trans-shipment of controlled substances through a third country, the country of origin is regarded as the exporter and the country of final destination as the importer. It distinguished such trans-shipment from import and subsequent re-export, which are treated as two separate transactions. Decision IX/34 reaffirmed this distinction. The importance of addressing transit and re-export through licensing systems has been reflected in subsequent decisions of Meetings of the Parties. Decision XVII/16 urged parties to fully implement their obligations under Article 4B of the Montreal Protocol, and in particular, the licensing systems for the control of imports, exports, re-exports and, if technically and administratively feasible, transit of all controlled ozone-depleting substances, including mixtures containing them. Decision XIX/12 further recommended monitoring transit movements, including trans-shipments through duty-free zones, as a domestic measure that parties could implement on a voluntary basis to improve implementation and enforcement of their licensing systems.

36. The information received prior to the preparation of the note by the Secretariat on common features of licensing systems, prepared in response to decision XXXIV/8, indicated that national licensing systems were rarely used to monitor transit movements, including movements through free trade zones.³⁶ In the subsequent note on the same matter, about one quarter of the licensing systems reviewed explicitly managed transit-related trade flows, either through licensing procedures or customs integration.³⁷ Transit was more commonly mentioned than free trade zones, while trans-shipment was not addressed separately but was mentioned as part of customs handling in some systems. With regard to exports and re-exports, 70 parties explicitly indicated that these required a

³¹ See decisions XX/14, XXIII/31, XXV/15, XXXI/10, XXXIII/8, XXXIV/15, XXXV/19, XXXVI/15 and XXXVII/10.

³² UNEP/OzLPro/Workshop.11/2/Add.2–UNEP/OzL.Pro.WG.1/45/5/Add.2, para. 25.

³³ UNEP/OzL.Pro.WG.1/47/4, para. 18.

³⁴ Ibid., para. 59.

³⁵ UNEP/OzL.Pro.37/7, paras. 8 and 9.

³⁶ UNEP/OzLPro/Workshop.11/2/Add.2–UNEP/OzL.Pro.WG.1/45/5/Add.2, para. 24.

³⁷ UNEP/OzL.Pro.WG.1/47/4, para. 16.

license.³⁸ The absence of specific controls over export and re-export of controlled substances, as well as transit, free trade zone and trans-shipment operations, was identified as a possible area for improvement.³⁹

- (d) **To request parties to ensure that their import and licensing systems control and accurately track the trade of controlled substances in free trade zones, and to report on any such imports and exports as part of their reporting under Article 7 of the Montreal Protocol (para. 4 of draft decision XXXVIII/[BB])**

37. No specific provision in the Montreal Protocol refers to free trade zones.

- (i) **Free trade zones and licensing systems**

38. Beyond reporting the establishment and operation of its HFC licensing system within three months from the date of introducing its licensing system, a party to the Montreal Protocol is not required to provide information on its licensing system, including on whether its import and licensing systems control and accurately track trade of controlled substances in free trade zones. The Secretariat is not aware of any study on how import and licensing systems control and track the trade of controlled substances in free trade zones.

39. On the basis of the analysis of information received from parties in relation to the summary of common features of licensing systems prepared in 2023, it appears that national licensing systems are rarely used to monitor transit of substances controlled under the Montreal Protocol, including movements through free trade zones.⁴⁰ As is indicated in paragraph 36 above, about one quarter of the licensing systems reviewed by the Secretariat for the note prepared for the forty-seventh meeting of the Open-ended Working Group explicitly manage transit movements (trans-shipments) of ozone-depleting substances, including those passing through duty-free zones, either through licensing procedures or customs integration (i.e. controls already available at customs, such as screening at ports and borders and risk profiling), with transit being more commonly mentioned than free trade zones.⁴¹

- (ii) **Free trade zones and data reporting under Article 7**

40. Paragraph 3 of decision XIX/12, on preventing illegal trade in ozone-depleting substances, lists measures that parties wishing to improve implementation and enforcement of their licensing systems in order to combat illegal trade more effectively may wish to consider implementing domestically on a voluntary basis. As is indicated in paragraph 35 above, these measures include monitoring transit movements (trans-shipments) of ozone-depleting substances, including those passing through duty-free zones, for instance by identifying each shipment with a unique consignment reference number.

41. Paragraph 7 of the introduction sheet for the formats for reporting data under the amended Montreal Protocol,⁴² adopted by the Third Meeting of the Parties through decision III/9, provides in part that “countries having free trade zones inside their territories should make a special effort to include in their data reporting production, import and export figures for such zones.” This language was based on the recommendations of the Ad Hoc Group of Experts on the Reporting of Data.⁴³

42. The revised formats for reporting data adopted by the Fifth Meeting of the Parties⁴⁴ through decision V/5 largely retained the language of paragraph 7 of the introduction sheet, indicating that “parties having free trade zones in their territories should make a special effort to include in their data reporting production, import and export figures for such zones.”

43. Subsequent instructions and guidelines accompanying data reporting forms approved by the Ninth, Thirtieth and Thirty-Sixth Meetings of the Parties did not, however, include references to free trade zones.⁴⁵

³⁸ Ibid., para. 14.

³⁹ Ibid., para. 59.

⁴⁰ UNEP/OzL.Pro/Workshop.11/2/Add.2–UNEP/OzL.Pro.WG.1/45/5/Add.2, para. 24.

⁴¹ UNEP/OzL.Pro.WG.1/47/4, para. 16.

⁴² UNEP/OzL.Pro.3/11, annex XI.

⁴³ UNEP/OzL.Pro/WG.2/1/4, para. 14 (f).

⁴⁴ UNEP/OzL.Pro.5/12, annex I.

⁴⁵ See the revised data reporting forms approved by the Ninth Meeting of the Parties through decision IX/28 (annex VII to the report of the Ninth Meeting of the Parties, document UNEP/OzL.Pro.9/12); the revised forms and instructions for reporting data in accordance with the reporting obligations under the Protocol approved by the Thirtieth Meeting of the Parties through decision XXX/10 (annex III to the report of the Thirtieth Meeting of the

44. In the last 20 years, the Secretariat has received Article 7 data reports referring to free trade zones from about five parties.

- (e) **To encourage the parties' national ozone units and customs officers to consider ways of efficiently sharing data in order to better track and monitor imports of controlled substances, including database coordination (para. 5 of draft decision XXXVIII/[BB])**

45. During the final session of the informal meeting on facilitating implementation of the Montreal Protocol, one of the four cross-cutting issues identified was the value of information sharing.⁴⁶ In session 6 of the same informal meeting, the core features of a system of data collection and reporting for the Montreal Protocol and best practices in addressing some of the challenges relating to those systems were surveyed on the basis of the reflections of two parties. Those reflections acknowledged that measures such as creating an interface between the customs and licensing systems and maintaining good relations with importers contribute to the robustness of data collection systems.⁴⁷

46. Examples of data sharing between national ozone units and customs officers presented during the informal workshop include the sharing of information between the National Ozone Unit and the National Customs Agency of Mexico⁴⁸ and the interface of Zimbabwe's licensing system for substances controlled under the Montreal Protocol with the customs system.⁴⁹

47. In the summary of common features of licensing systems prepared by the Secretariat for the forty-seventh meeting of the Open-ended Working Group, the practice of linking Harmonized System codes directly to licensing requirements in application forms and customs electronic systems was identified as potentially helping to improve trade traceability and enforcement.⁵⁰

48. The same summary showed various forms of data coordination with customs authorities, including an automated data-sharing platform provided by customs; two separate but connected online systems for licensing, one operated by a national ozone unit and the other a customs system; and manual coordination (license printouts, email communication and customs notification by the national ozone unit). While formalized cooperation with customs through a memorandum of understanding or standard operating procedures existed in some parties, other parties had operational coordination mechanisms that relied on established working relationships or ad hoc exchanges, with no formal agreements or documented communication procedures.⁵¹

- (f) **To encourage parties to strengthen verification practices for imports and exports of controlled substances, including, where feasible and appropriate, through the establishment of automated systems and standardized procedures that cross-check information reported by industry with customs data (para. 6 of draft decision XXXVIII/[BB])**

49. At the national level, parties have implemented different systems to strengthen verification practices for imports and exports of controlled substances, including through the establishment of automated systems and standardized procedures that cross-check information reported by industry with customs data. During the informal meeting, Zimbabwe presented its system for data collection and verification, which included a licensing system linked to the national customs department through the electronic single window system. In addition, the party's refrigeration and air conditioning sector provides information on type and size of equipment and determines the amount of refrigerant it can take, while the national statistical agency, linked to the customs department, collects data on imports and exports for national trade statistics.⁵²

50. During the same informal meeting, Mexico presented its system for reconciling information required for adequate reporting of controlled substances consumption. This includes requesting import and export reports from the customs authority and companies, verifying company reports against

Parties, document UNEP/OzL.Pro.30/11); and the revised data reporting forms approved by the Thirty-Sixth Meeting of the Parties through decision XXXVI/12 (see the annex to the decision).

⁴⁶ UNEP/OzL.Pro.37/7, para. 14.

⁴⁷ Ibid.

⁴⁸ <https://ozone.unep.org/system/files/documents/Session%206b-Reconciling%20information%20from%20customs%20authorities%20and%20reports%20by%20importing%20enterprises.pdf>.

⁴⁹ See <https://ozone.unep.org/system/files/documents/Session%206a-a%20multifaceted%20approach%20to%20data%20collection%20and%20verification.pdf>.

⁵⁰ UNEP/OzL.Pro.WG.1/47/4, para. 20.

⁵¹ Ibid., paras. 26 and 27.

⁵² See <https://ozone.unep.org/system/files/documents/Session%206a-a%20multifaceted%20approach%20to%20data%20collection%20and%20verification.pdf>.

customs records, requesting additional information from companies in case of discrepancies, calculating national consumption by substance and auditing the consumption of substances.⁵³

- (g) **To remind parties operating under paragraph 1 of Article 5 of the Montreal Protocol that they can seek assistance from the Compliance Assistance Programme of the United Nations Environment Programme on the design and implementation of their national licensing systems (para. 7 of draft decision XXXVIII/[BB])**

51. In paragraph 3 of decision IX/8, the Ninth Meeting of the Parties indicated that the Secretariat and implementing agencies should take steps to assist parties in the design and implementation of appropriate national licensing systems. In paragraph 4 of the same decision, the Ninth Meeting of the Parties decided that Article 5 parties may require assistance in the development, establishment and operation of such a licensing system and, noting that the Multilateral Fund has provided some funding for such activities, decided that the Multilateral Fund should provide appropriate additional funding for this purpose.

52. In paragraph 4 of decision XVIII/18, the Eighteenth Meeting of the Parties encouraged the Compliance Assistance Programme to continue its efforts to train ozone officers and customs officers on best practices and to raise awareness and disseminate examples of best practices for national licensing systems and regional cooperation to combat illegal trade.

53. In paragraph 20 of decision XXVIII/2, the Twenty-Eighth Meeting of the Parties requested the Executive Committee of the Multilateral Fund to include Article 4B licensing among the enabling activities to be funded in relation to the HFC phase-down under the Kigali Amendment. In line with that decision, the Executive Committee, in decision 79/46, approved the review of licensing systems among the enabling activities for Article 5 parties. Decisions 87/50 and 95/86, on cost guidelines for funding, identify licensing and quota systems, among other areas, as eligible and priority areas for support under Kigali implementation plans.

54. Under the Compliance Assistance Programme, UNEP supports Article 5 parties by assessing their current licensing systems and providing suggestions for improving licensing and quota systems. It also provides support to those parties in strengthening monitoring, reporting and verification, customs and enforcement training, electronic licensing tools, the national single window system, and cross-border cooperation, and in promoting the use of digital enforcement tools, harmonized customs codes and illegal trade guidance materials, among other things.

- (h) **To request parties to report, as part of their reporting under Article 7, the sources of imports and controlled substances, and to continue reporting on the destination of exports of such substances, with a view to helping the Ozone Secretariat identify differences between data quantities reported by one party as imports and by another as exports, and vice versa (para. 8 of draft decision XXXVIII/[BB])**

55. Under Article 7 of the Montreal Protocol, each party must report imports and exports of controlled substances on an annual basis. Reporting of source countries for imports under decision XXIV/12 and destination countries for exports under decisions VII/9 and XVII/16 is voluntary.

56. In decision XXX/12, the Thirtieth Meeting of the Parties urged parties exporting controlled substances to report to the Secretariat information on the destinations of their exports, as called for in decision XVII/16, and encouraged parties importing controlled substances to report to the Secretariat information on the sources of their imports, as set out in decision XXIV/12. The Secretariat writes to parties that submit Article 7 data on imports or exports without source or destination information on a regular basis, inviting them to report such information on a voluntary basis.

57. Between July 2015 and October 2024, a number of parties (between 79 and 87 annually), did not report the sources of their imports, and some parties (up to 7 annually) did not report the destination of their exports.⁵⁴ For 2024, as at 28 August 2026, 96 parties included information on source countries, with the source specified for 72% of all imports reported (by weight), whereas 44 of the 52 parties that reported exports in 2024 included either partial or complete information on destination countries, with the destination specified for 99% of all exports reported (by weight).⁵⁵

⁵³ See <https://ozone.unep.org/system/files/documents/Session%206b-Reconciling%20information%20from%20customs%20authorities%20and%20reports%20by%20importing%20enterprises.pdf>.

⁵⁴ UNEP/OzL.Pro/ImpCom/74/6, annex II, table 3.

⁵⁵ UNEP/OzL.Pro.38/6–UNEP/OzL.Pro/ImpCom/77/2, tables 9 and 10.

58. The Secretariat sends letters each year to importing parties informing them of the amounts exported to them as reported by exporting parties, pursuant to paragraph 4 of decision XVII/16. Similarly, the Secretariat provides compiled information on amounts imported from exporting parties, but only to exporting parties that request it, in accordance with paragraph 2 of decision XXIV/12. Such information enables parties to follow up on data anomalies that might indicate illegal trade or incorrect information on sources and destinations, should they wish to do so. In addition, when requested, the Secretariat presents information on differences between quantities reported by one party as an import and another as an export in the same year during network meetings of national ozone officers.

(i) To encourage parties to use the online reporting system for data reported under Article 7 (para. 9 of draft decision XXXVIII/[BB])

59. The reporting of Article 7 data to the Secretariat by means of the online reporting system is voluntary. Every time a party reports Article 7 data, the Secretariat acknowledges by email the data reported. When reporting was not done using the online reporting system, those emails include a paragraph encouraging parties to use it for all their data reporting needs, including to submit or report any data, as well as to view or access all historically reported data.

60. The number of parties reporting data using the online reporting system has increased from 53% in 2019, when the system was introduced, to 65% for 2024 data.⁵⁶

61. In decision XXXVII/8 on data and information provided by the parties in accordance with Article 7 of the Montreal Protocol, the Thirty-Seventh Meeting of the Parties noted the number of parties that had reported their Article 7 data using the online reporting system, marking the first time that that information had been included in the yearly decision on data reporting since the introduction of the system.

(j) To request the Ozone Secretariat to make information available to the parties on those parties that did not report data required under Article 7 by 30 September each year (para. 10 of draft decision XXXVIII/[BB])

62. Under Article 12, subparagraph (c), of the Montreal Protocol, the Secretariat regularly prepares and distributes to parties reports based on information received pursuant to Articles 7 and 9 of the Protocol. Such data reports are normally prepared before each meeting of the Implementation Committee under the Non-Compliance Procedure for the Montreal Protocol as pre-session documents of the Committee. The second report of each year is also distributed as a pre-session document of the Meeting of the Parties.⁵⁷

63. The data reports include a table with the number of parties that have reported Article 7 data for previous years by the deadline.⁵⁸ Apart from an update on which parties have reported outstanding data since the latest decision of a Meeting of the Parties on data and information provided by parties in accordance with Article 7 of the Montreal Protocol, the reports do not specify which parties did not report the required data by the 30 September deadline each year, since both reports are issued prior to 30 September of the relevant year. During meetings of the Implementation Committee, the Secretariat provides the Committee with the names of parties that have not submitted Article 7 data as at the date of the meeting. The number of parties that report Article 7 data by the deadline and the names of those that have not reported by any other cut-off date set out in the decision (e.g. the end of the first day of the meeting of the Implementation Committee that takes place immediately before a Meeting of the Parties) are indicated in the decisions adopted by the Meetings of the Parties on data and information reported by parties (e.g. decision XXXVII/8, paras. 1 and 3).

(k) To also request the Ozone Secretariat to liaise with the secretariat of the Multilateral Fund for the Implementation of the Montreal Protocol on possible options for creating a coordinated approach to data reporting for data submitted under Article 7 and country programme data (para. 11 of draft decision XXXVIII/[BB])

64. The Ozone Secretariat and the secretariat of the Multilateral Fund are looking for a way to link their online reporting systems with a view to facilitating data reporting by Article 5 parties to help

⁵⁶ UNEP/OzL.Pro/ImpCom/74/6, footnote 11; UNEP/OzL.Pro.38/6–UNEP/OzL.Pro/ImpCom/77/2, table 13.

⁵⁷ For example, see the report of the Secretariat on information provided by parties in accordance with Articles 7 and 9 of the Montreal Protocol (UNEP/OzL.Pro/ImpCom/76/2), made available prior to the seventy-sixth meeting of the Implementation Committee and a document of the same title (UNEP/OzL.Pro.38/6–UNEP/OzL.Pro/ImpCom/77/2) made available prior to the seventy-seventh meeting of the Implementation Committee and the Thirty-Eighth Meeting of the Parties.

⁵⁸ For example, see document UNEP/OzL.Pro.38/6–UNEP/OzL.Pro/ImpCom/77/2, table 2.

ensure consistent reporting under Article 7 of the Montreal Protocol and country programme reporting under the Multilateral Fund and reduce duplicative reporting.

65. The goal is to establish, by early 2027, an application programming interface developed on both systems to facilitate connection and exchange of information each time a party reports data on either of the systems.

B. Emissions of hydrofluorocarbon-23 (HFC-23) (decision XXXVII/2) (item 7 of the provisional agenda for the preparatory segment)

66. As is mentioned in the note by the Secretariat (UNEP/OzL.Pro.38/2, paras. 47–49), in decision XXXVII/2, the Scientific Assessment Panel and the Technology and Economic Assessment Panel were requested to provide an update on emissions of HFC-23 to the Thirty-Eighth Meeting of the Parties, taking into account information submitted by parties in response to decision XXXVI/3 and pursuant to paragraph 2 of decision XXXVII/2. The parties' responses to those decisions, provided on a voluntary basis, included information on current methodologies used by those parties for estimating and reporting HFC-23 emissions from HCFC-22 production, as well as best practice technologies to reduce HFC-23 emissions.

67. In addition to the 32 parties that had submitted information in response to decision XXXVI/3 in 2025 (China, the European Union and its 27 member States, India, Japan and the United States of America), in 2026, 31 parties (China, the European Union and its 27 member States, Peru and the Russian Federation) provided further information in response to paragraph 2 of decision XXXVII/2. The two panels reviewed and considered those submissions, along with data on production and emissions of HFC-23 reported by 14 parties.

68. To respond to decision XXXVII/2, the two panels coordinated closely and provided their inputs in one report, the preparation of which was led by the Medical and Chemicals Technical Options Committee of the Technology and Economic Assessment Panel.⁵⁹ The executive summary of the report is set out in the annex to the present addendum, reproduced as received from the panels, without formal editing by the Secretariat. A summary of the report is provided in the following paragraphs.

69. In the report, consistent with the panels' previous reports on the matter, the term "generation" is defined as the total HFC-23 produced as a by-product, without taking into account abatement of emissions. The term "emissions" is defined as the total HFC-23 emitted from a facility that either uses HFC-23 as a feedstock or generates HFC-23 as a by-product, after any abatement, with the dominant emission pathway being direct emissions to the atmosphere.

70. Information on HFC-23 generation is based on voluntary reporting by parties under Article 7 of the Montreal Protocol and data submitted to the Multilateral Fund in project proposals to enable compliance with the HFC-23 by-product control obligations under the Kigali Amendment. Information on HFC-23 emissions is based on mandatory Article 7 reporting by parties, estimates derived from atmospheric observations provided by the Scientific Assessment Panel⁶⁰ and data submitted to the Multilateral Fund, including information for individual production units.

71. Noting that datasets for 2023 and 2024 are considered complete, the Technology and Economic Assessment Panel estimates that the consolidated reported HFC-23 by-product generation from HCFC and HFC production, prior to abatement, was 24,376 tonnes in 2023 and 23,809 tonnes in 2024, while the respective reported emissions were 959 tonnes in 2023 and 1,003 tonnes in 2024.

72. According to the Technology and Economic Assessment Panel, additional industrial and sectoral sources are estimated to contribute approximately 500–2,500 tonnes of HFC-23 emissions annually, including emissions associated with HCFC-22 pyrolysis to produce plastics (trifluoroethylene and hexafluoropropene), other fluorochemical manufacturing, HFC-23 feedstock use, and HFC-23 impurities in chemicals used in emissive applications. Combined with reported emissions from HCFC and HFC production, total annual HFC-23 emissions are estimated at approximately 1,500–3,500 tonnes. These estimates exclude the potential additional source of HFC-23 from the atmospheric degradation of certain fluorinated gases, which the Scientific Assessment Panel estimates at less than 200 tonnes per year in recent years.

⁵⁹ See <https://ozone.unep.org/system/files/documents/TEAP-reponse-to-decision-XXXVII-2.pdf>.

⁶⁰ Including updated information on global summed HFC-23 emissions for 2024 to be published in the 2026 Scientific Assessment of Ozone Depletion.

73. Despite the aforementioned identified sources, a substantial discrepancy remains. Global HFC-23 emissions derived from atmospheric observations are estimated at approximately $14,000 \pm 1,000$ tonnes per year during 2022–2024, compared with estimates of around 1,500–3,500 tonnes per year based on reported production and known emission sources. The resulting gap of roughly 10,000 tonnes per year cannot be explained by the uncertainties in atmospheric estimates or by any additional sources identified. The report therefore points to a potential gap in the completeness of Article 7 reporting and highlights the need to better capture all HFC-23 emission sources. It also identifies substantial variation in facility-level emissions that cannot currently be adequately explained by the information submitted by parties.

74. In a separate section, the report presents a non-exhaustive overview of practices and approaches reported by parties for measuring, estimating, reporting and verifying HFC-23 by-product emissions from HCFC-22 and HFC production facilities. It brings together information submitted in response to decisions XXXVI/3 and XXXVII/2, including updates on methodologies, monitoring practices, verification arrangements and relevant guidance. It also highlights significant differences in reported emissions between facilities, identifies possible reasons for these variations – including differences in monitoring scope and methodologies – and notes examples of independent verification and monitoring practices supported through the Multilateral Fund.

75. To assist the parties' consideration of this issue, in annexes 1 and 2, the report reproduces from previous reports complementary technical information on HFC-23 emissions, describing possible chemical production pathways for HCFCs and HFCs that may generate HFC-23 as a by-product, and a compilation of available best practices for controlling HFC-23 by-product emissions, respectively. Lastly, annex 3 provides estimated locations of current and recently operating HCFC-22 production facilities, based on reports on the clean development mechanism under the Kyoto Protocol to the United Nations Framework Convention on Climate Change, published addresses of manufacturing facilities, and other public sources.

76. During the preparatory segment, parties may wish to consider the information provided and recommend a way forward.

C. Enhancing regional atmospheric monitoring of substances controlled by the Montreal Protocol (decision XXXVII/1) (item 8 of the provisional agenda for the preparatory segment)

77. As mentioned in the note by the Secretariat (UNEP/OzL.Pro.WG.1/38/2, paras. 50–54), in decision XXXVII/1, the Secretariat was requested to report to the Open-ended Working Group at its forty-eighth meeting and to the Thirty-Eighth Meeting of the Parties on progress in and any outcomes of activities relating to the evaluation of the suitability of potential sites for monitoring emissions of controlled substances situated within the regions and locations identified in the information provided by the Advisory Committee of the General Trust Fund for Financing Activities on Research and Systematic Observations Relevant to the Vienna Convention and to prepare possible next steps towards establishing monitoring activities at those sites.

78. The report of the Secretariat and the Advisory Committee to the Open-ended Working Group at its forty-eighth meeting provided information on informal consultations held by a Co-Chair of the Advisory Committee with country representatives and scientists in five countries in the five priority regions identified by the Committee; the subsequent expressions of interest by three of those parties in continuing discussions on the possible establishment of monitoring stations in their territories; the Secretariat's ongoing work to develop an interactive and user-friendly online tool for estimating the costs of establishing and operating a monitoring station; and the establishment, at the ninety-eighth meeting of the Executive Committee of the Multilateral Fund, of a funding window to support pilot projects to enhance regional atmospheric monitoring of controlled substances.⁶¹

79. During and following the forty-eighth meeting of the Open-ended Working Group, three parties (Bangladesh, Ecuador and Mexico) also expressed interest in exploring the possibility of establishing monitoring stations in their territories. The Secretariat provided clarifications in response to questions raised, and a Co-Chair of the Advisory Committee held further consultations with representatives of Mexico and Bangladesh on the margins of the meeting. Scientific-level consultations with the relevant ministries in India and South Africa are also ongoing.

80. Advisory Committee experts are currently starting to work on a charter for the Committee's work on atmospheric monitoring, while also considering the process to be established under the

⁶¹ Executive Committee decision 98/62, reproduced in document [UNEP/OzL.Pro.WG.1/48/INF/5](#), annex.

General Trust Fund for reviewing and supporting projects on atmospheric monitoring of controlled substances submitted to the Ozone Secretariat for consideration. In this regard, the process established under the Multilateral Fund is taken into account, with a view to coordinating the two processes, particularly as the Advisory Committee will be providing scientific advice under both funding mechanisms. Committee members also met on the margins of the Science Assessment Panel's final review meeting in July 2026 in Geneva. In addition, small groups of the Advisory Committee continue to meet informally to discuss details related to the establishment of monitoring stations.

81. The Advisory Committee will hold its twenty-first meeting, to be organized by the Secretariat, in October 2026. As appropriate, the report by the Secretariat and the Advisory Committee to the Thirty-Eighth Meeting of the Parties will include information on the progress made and the outcomes of the meetings of the Committee.

82. At the forty-eighth meeting of the Open-ended Working Group, the Secretariat presented the preliminary version of its online tool for estimating the costs of establishing and operating a monitoring station, created to facilitate the interested parties in understanding the issues and developing relevant project proposals. Following the Secretariat's invitation to test the tool and provide comments and suggestions to inform the preparation of the final version, feedback was received from seven parties (Bhutan, Brazil, Costa Rica, Ecuador, Maldives, South Africa and United States of America), which the Secretariat has taken into consideration. The first version of the tool will be launched at the Thirty-Eighth Meeting of the Parties.

83. The Open-ended Working Group may wish to consider the report and recommend a way forward.

D. Technology and Economic Assessment Panel organizational issues (item 9 of the provisional agenda for the preparatory segment)

1. Options for the organization of the Technology and Economic Assessment Panel and its technical options committees (decision XXXV/20) (item 9 (a) of the provisional agenda for the preparatory segment)

84. As is indicated in the note by the Secretariat (UNEP/OzL.Pro.38/2, paras. 55–59), following consideration by an informal group of interested parties of options for the organization of the Technology and Economic Assessment Panel and its technical options committees, the Open-ended Working Group, at its forty-eighth meeting, noted that the Panel would provide responses, before the Thirty-Eighth Meeting of the Parties, to a number of questions raised by parties in the informal group.

85. The Panel's responses will be made available in an information note through the portal of the Thirty-Eighth Meeting of the Parties for consideration by parties.

86. During the preparatory segment, parties may wish to continue their consideration of the matter, taking into account the additional information to be provided by the Panel, and make recommendations on the way forward.

2. Changes in the membership of the Technology and Economic Assessment Panel (item 9 (b) of the provisional agenda for the preparatory segment)

87. Information about the status of the membership of the Technology and Economic Assessment Panel and its technical options committees, including an outline of the nomination process, is set out in the note by the Secretariat (UNEP/OzL.Pro.38/2, paras. 60–67 and annexes II and III). Pursuant to decision XXXI/8, parties wishing to nominate experts for appointment to the Panel are requested to use the Panel's nomination form, available on the Secretariat's website, and are urged to follow the terms of reference of the Panel, consult the co-chairs of the Panel and refer to the matrix of needed expertise prior to making nominations.

88. At the time of the preparation of the present addendum, the Secretariat had received no additional nominations beyond the one included in the note by the Secretariat. Any nominations subsequently received will be made available on the meeting portal for the Thirty-Fourth Meeting of the Parties, to facilitate the review of and consultations on the proposed nominations by parties, as requested in paragraph 4 of decision XXXI/8.

Annex*

Report by the Technology and Economic Assessment Panel prepared in consultation with the Scientific Assessment Panel

Response to decision XXXVII/2: Emissions of HFC-23

Executive summary

This report includes sections responding to each of the following paragraph and its sub-paragraphs of decision XXXVII/2, relating to emissions of HFC-23:

1. To request the Technology and Economic Assessment Panel and the Scientific Assessment Panel to provide an update on emissions of HFC-23 to the Thirty-Eighth Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer, taking into account the information submitted by parties in response to decision XXXVI/3 and pursuant to paragraph 2 below and including the following:

- (a) Additional analysis of the discrepancy between reported emissions and those derived from atmospheric measurements, including the methodologies applied;
- (b) A description of the information and data sources used, identifying any gaps or limitations;
- (c) Additional information on methodologies adopted by parties for estimating and reporting HFC-23 emissions as well as best practices for improvements to minimize such emissions;

The report includes additional contextual information on other HFC-23 generation and/or emissions, i.e., from chemical pathways used in the production of substances that are not Annex C, Group I substances (hydrochlorofluorocarbons or HCFCs), or Annex F substances (hydrofluorocarbons or HFCs), and from feedstock and consumptive uses. This additional contextual information was considered useful in understanding the relative importance of chemical pathways used in the production of Annex C, Group I, and Annex F substances that may generate HFC-23 as a by-product, which is the focus of this decision.

During the development of this report, TEAP coordinated with the SAP and has included information provided by the SAP from its 2026 Assessment on updated estimates of emissions of HFC-23 derived from atmospheric measurements.¹

ES.1 Compilation of information on the amount of HFC-23 generation and emissions

In 2023, the TEAP response to the previous decision XXXIV/7, paragraph b, provided a compilation of information on the amount of HFC-23 generation and emissions from facilities that manufacture Annex C, Group I, or Annex F substances. It drew on several sources for this information, including United Nations Framework Convention on Climate Change (UNFCCC) submissions by Annex I countries; the Intergovernmental Panel on Climate Change (IPCC); Article 7 data reported under the Montreal Protocol; data reported to the Executive Committee of the Multilateral Fund (ExCom); and the Scientific Assessment Panel (SAP).

In 2024, in its response to decision XXXV/7, TEAP provided updated information on other HFC-23 consumptive and emissive uses, including as a by-product from the production of other Annex C, Group I substances (HCFCs) and Annex F substances (HFCs). In 2025, the 2024 report was updated in response to decision XXXVI/3.

In this 2026 report, responding to the present decision XXXVII/2, these data have been updated as follows:

- Data for both HFC-23 by-product generation (voluntarily) and for HFC-23 emissions (required) from the production of Annex C HCFCs and Annex F HFCs have been reported by parties under Article 7 to the Ozone Secretariat; quantities are reported as annual totals and emissions are available by individual party. These data are incomplete for 2019, 2020, 2021

* The present annex has not been formally edited.

¹ World Meteorological Organization (WMO). *Scientific Assessment of Ozone Depletion: 2026, GAW Report No. xxx*, WMO: Geneva, 2026. (In preparation).

and 2022 due to the timing of reporting obligations consequent upon when parties ratified the Kigali Amendment. However, the datasets for 2023 and 2024 are considered as complete.

- The consolidated data for HFC-23 by-product generation from HCFC and HFC production (without abatement) in 2023 was 24,376 tonnes and in 2024 was 23,809 tonnes.
- The consolidated data for HFC-23 emissions reported as by-product from HCFC-22 and from HFC production was 959 tonnes in 2023 and 1,003 tonnes in 2024.

TEAP estimates of annual HFC-23 emissions from additional other industrial and sector use sources are about 500 to 2,500 tonnes, including the following:

- Pyrolysis of HCFC-22 to produce TFE/HFP (~100–1,000 tonnes, based on estimated associated HFC-23 by-product generation without possible emissions abatement)
- Other fluorochemical manufacturing (e.g., hexafluoroacetone) (~70 tonnes)
- Feedstock use of HFC-23 (~26 tonnes)
- HFC-23 present as an impurity in other chemicals that are used in emissive uses (e.g., ~27 tonnes HFC-23 emissions arising from the HCFC-22 bank)

The combined total of reported HFC-23 emissions as a by-product from the production of Annex C, Group I substances (HCFCs) and Annex F substances (HFCs) for 2024 and the most recent available “bottom up” estimate of annual HFC-23 emissions from other known emissions sources is about 1,500–3,500 tonnes.²

These estimates exclude the potential additional source of HFC-23 from the atmospheric degradation of HFCs, HFOs, and HCFOs of less than around 200 tonnes per year in recent years, as reported by SAP.³ That is, certain HFCs, HFOs, and HCFOs form trifluoroacetaldehyde (CF₃CHO) as a degradation product in the atmosphere. A certain fraction of this gas can photolyze to generate HFC-23. An additional lesser HFC-23 source comes from the direct ozonolysis of HFOs and HCFOs.

While global emissions derived from atmospheric monitoring peaked at 17,000 ± 1,000 tonnes per year in 2018 and 2019, they have since decreased and been relatively constant at 14,000 ± 1,000 tonnes per year in 2022, 2023, and 2024.⁴

This 2026 report continues to identify differences and uncertainties in estimates for global HFC-23 generation and emissions based on currently available data.

SAP has described the uncertainties in the derivation of “top-down” emissions estimates based on atmospheric observations. However, these uncertainties do not bridge the differences between the “top-down” and “bottom-up” estimates.

TEAP has further reviewed the unknowns and uncertainties of its “bottom-up” estimations for HFC-23 emission sources other than from production of HCFC-22, other Annex C, Group 1, and Annex F controlled substances, as requested under decision XXXVII/2. The current review by TEAP continues to conclude that inaccuracies in estimations of these emissions would be relatively small and are unlikely to bridge the difference with atmospheric-derived emissions estimates.

TEAP has identified the major known industrial and use-related sources for which information is currently available. No additional known sources identified through this review appear capable individually or collectively, on available evidence, of bridging the difference.

The difference, of the order of 10,000 tonnes, between the SAP’s “top-down” and the TEAP’s “bottom-up” estimates of global emissions of HFC-23 cannot currently be explained. Given this large difference, a question arises about the completeness of the data reported under Article 7 and whether it includes all sources of HFC-23 emissions.

² Rounded from 1,526–3,526 tonnes. These are contemporaneous annual estimates for the recent years for which data is available or estimated, which is from 2020–2024.

³ World Meteorological Organization (WMO). *Scientific Assessment of Ozone Depletion: 2026, GAW Report No. xxx*, WMO: Geneva, 2026. (In preparation).

⁴ Ibid.

ES.2 Best practices available to measure, estimate, report and verify HFC-23 by product emissions

In response to decision XXXVI/3, paragraph 6, the 2025 TEAP report provided a summary of information on current methodologies to estimate and report HFC-23 emissions from HCFC-22 production) based on information received by the Ozone Secretariat from parties. These best practices to control emissions of HFC-23 are consistent with those used to control other emissions associated with chemical manufacturing. The summarised information from the 2025 TEAP report is included as an Annex to this report and has been updated to include new information received by the Ozone Secretariat from parties in response to decision XXXVII/2, paragraphs 2 and 3. In previous reports, TEAP has cited guidance for facilities in measuring, estimating, and reporting emissions under the UNFCCC Guidelines and from national governments.

MCTOC has carefully reviewed and presented the technical information provided by parties in their submissions in response to decisions XXXVI/3 and XXXVII/2, alongside the data submitted by parties under Article 7, which is included in Table 2.2. These data show some large variations in the average HFC-23 emissions per HCFC-22 plant. MCTOC is unable to fully explain the reason for these variations using the information provided by the parties.