TECHNOLOGY AND ECONOMIC ASSESSMENT PANEL

Progress of work and emerging issues

TEAP CO-CHAIRS: BELLA MARANION, MARTA PIZANO, AND ASHLEY WOODCOCK

UN environment
United Nations Environment Programme

MOP38
2-6 NOVEMBER 2026 | KIGALI, RWANDA

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TEAP REPORTS FOR 2026 AND PLANNED FOR 2027

2026: 10 reports and responses to questions on organizational options for TEAP/TOCs

- 2026 TEAP Progress Report (including sector updates, standing decisions on LRM, MDIs, and others)
- Dec XXXVII/6: RTF Replenishment and Supplementary Report for 2027-2029
- Dec XXXVII/2: Emissions of HFC-23 Report
- Quadrennial assessment (TEAP and five TOCs reports)

2027: 4 reports

- 2027 Progress Report (including sector updates, standing decisions on LRM, MDIs, halons and others)
- Synthesis Report
- Dec XXXVIII/2, para. 4: Periodic review of alternatives to HFCs (any updates in Progress Report)
- Dec XXXVII/3: Studies on quantities of and options for used and uncontrolled substances

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2026 TEAP Assessment Key messages

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DECISION XXXV/3: TEAP 2026 ASSESSMENT

a) Technical progress in the production and consumption sectors in the transition to alternatives, taking into account their technical feasibility, economic viability, safety and sustainability, and in the transition to practices that minimize or eliminate the use of controlled substances in all sectors;

b) Process agents and feedstock uses for which the use of controlled substances is no longer required and identification of alternative pathways and technologies that can replace these uses, taking into account costs and other environmental and economic considerations;

c) An assessment of information relating to emissions of controlled substances from feedstock and production processes and other manufacturing processes, and identification of best practices and technologies for minimizing such emissions;

DECISION XXXV/3: TEAP 2026 ASSESSMENT (2)

d) The status of banks and stocks of controlled substances, including rates of recovery, recycling and reuse, their alternatives and other substances of importance to the ozone layer, including those used as feedstocks and those resulting from by-production, and the options available for managing them so as to avoid emissions to the atmosphere;

e) Challenges facing all parties to the Montreal Protocol in implementing obligations under the Protocol and maintaining the phase-outs already achieved, including challenges related to preventing emissions from feedstock uses and by-production, and technically and economically feasible options for addressing those challenges;

f) The impact of the phase-out of controlled ozone-depleting substances and the phasedown of hydrofluorocarbons and associated energy efficiency, and minimum energy performance standards and cold chain management on sustainable development;

DECISION XXXV/3: TEAP 2026 ASSESSMENT (3)

g) Technical advances in developing alternatives to HFCs taking into account, in particular, EE, safety, and suitability for use in high-ambient-temperature countries;

h) Information on uses where HCFCs were not previously used and HFCs have been used and are currently used, such as electronics manufacturing;

i) Assessment of whether production of HFOs is resulting in fugitive emissions of HFCs;

j) Potential impacts of evolving policies and regulations in relation to the management of controlled substances and their alternatives and breakdown products, in particular per-and polyfluoroalkyl substances, on the implementation of the Montreal Protocol and the selection of alternatives in relevant sectors;

k) Information on refrigerant management, with particular attention to leakage prevention and end-of-life management.

TEAP 2026 ASSESSMENT REPORT

- TOC's 2026 Assessment Reports are nearing completion
- Crosscutting issues in the TEAP Assessment Report include:
  - Status of banks and stocks of controlled substances and the options available for managing them so as to avoid emissions to the atmosphere
  - Impact of the phase-out of controlled ODS and the phase-down of HFCs on sustainable development
  - Potential impacts of evolving policies and regulations in relation to the management of controlled substances and their alternatives and breakdown products, in particular per-and polyfluoroalkyl substances, on the implementation of the Montreal Protocol and the selection of alternatives in relevant sectors
- TEAP is coordinating with SAP and EEAP on the development of the Synthesis Report (presentation at MOP 39 in 2027).

TOCs Updates: Sector Highlights and Emerging Issues

Fire Suppression TOC (FSTOC)

FSTOC CO-CHAIRS:
ADAM CHATTAWAY AND
DAN VERDONIK



FSTOC: 2026 ASSESSMENT REPORT

1. Introduction
2. Standards [NEW]
3. Legislation affecting the Fire Suppression
4. Alternatives to Halons, HCFCs and high-GWP HFCs
5. Enduring uses of Halons, HCFCs and high-GWP HFCs
6. Global estimates of Halons, HCFCs and high-GWP HFCs
7. Banking
8. Emission Reduction Strategies
9. Destruction

FSTOC: KEY MESSAGES

- Legislation Challenges:
- The Fire Suppression sector is seeing reduced availability of alternatives, owing to the HFC phasedown, and current and potential future PFAS Regulations.
- Technical Challenges:
  - Some A5 parties lack industrial capabilities to refill the highest pressure (i.e., most space/weight efficient) inert gas systems for data centres, etc.
  - The 2-BTP/CO_2 blend being developed for aviation cargo compartments now needs further testing to ensure its performance is equivalent to halon 1301.
- The expected halon 1301 run-out date is currently 2031-2039, i.e. far before the lifetime of aviation, military, oil and gas, etc. (i.e., enduring uses). Refining this date is still work in progress.
- More halon 1301 is projected to be required at some point. An EUN may be submitted by one or more parties to support aviation, or any of the other enduring uses.

Flexible and Rigid Foams TOC (FTOC)

FTOC CO-CHAIRS:
PAULO ALTOE AND
HELEN WALTER-TERRRINONI



FTOC: 2026 ASSESSMENT REPORT

- Introduction and market overview
- Policies and transition progress
- Technical advancements and alternatives
- Monitoring illegal trade
- Banks
- Safe handling
- End-of-life emissions options

FTOC: KEY MESSAGES

- Low GWP alternative supply chains are maturing
  - Avoiding high-GWP HFCs where possible (A5s)
  - Phase-down is driving transitions.
  - Increased capacity to meet the demand
  - Reduced prices and reduced cost through blending
- HCFC-141b production has reportedly ended
- Flammability and toxicity challenges are emerging
  - Reported adoption of hydrocarbon FBAs without adequate safety measures (non-sparking tools, electrical upgrades etc.)
  - Indoor air quality studies show 1,2-DCE concentrations for years after installation of spray foam, monitored by some parties due to toxicity concerns

Methyl Bromide TOC (MBTOC)









Co-chairs:
Marta Pizano
Ian Porter

MBTOC: 2026 ASSESSMENT REPORT

1. Background
2. Methyl bromide production, consumption and progress in phase-out
3. Quarantine and Pre-shipment – The remaining challenge
4. Methyl bromide emissions and emissions reduction
5. How the phase-out was achieved – a historical perspective
6. Impact of the Methyl bromide phase-out on agricultural sustainability
7. Case studies

MBTOC: KEY MESSAGES

- Of 198 parties, 160 do not report any use of MB for QPS. Fifteen parties use 94% of the total annual reported QPS consumption which is still around 8,000 tonnes.
- Preshipment (PS) uses have many safer and effective alternatives to MB including heat and cold, controlled atmospheres, phosphine and CO2 , SF, ethyl formate, radiation, hydrogen cyanide and ethane dinitrile.
- Over 6,800 tonnes of MB are directly emitted to the atmosphere with no recapture/destruction as required by Decisions (VI/11, VII/5, XI/13, XXI/10).
- Declines in atmospheric concentrations of MB have stalled.
- MB is highly toxic to humans and is increasingly subject to controls to limit occupational exposure. Mandatory decreases to 1ppm in accepted air quality concentration and new regulations in some countries are forcing industries to seek out alternatives for QPS uses.

Medical & Chemicals TOC (MCTOC)

MCTOC CO-CHAIRS:
TAKESHI ERIGUCHI,
HELEN TOPE, AND
JIANJUN ZHANG



MCTOC 2026: ASSESSMENT REPORT

- Production and feedstocks use of controlled substances, including by-products, intermediates, emissions and their mitigation.
- HFC-23, CTC, VSLS, HFCs not listed in Annex F including information on use where available, and whether HFOs production is resulting in fugitive emissions of HFCs.
- Updated information on use and/or alternatives for process agents, solvents (including n-propyl bromide), laboratory and analytical uses, magnesium production, surface coating of chips for semiconductor and other electronics manufacturing.
- Destruction technologies and related end-of-life management.
- Trends in use of controlled substances and the availability and adoption of alternatives for aerosols and pressurised metered dose inhalers (pMDIs)

2026 MCTOC ASSESSMENT PREVIEW

- Total reported ODS production and import for feedstock use was 1.95 million tonnes in 2024 compared to 1.97 million tonnes in 2023 (incl. process agents).
- Since 2020, the increase in ODS production as metric tonnes for feedstock use is mainly due to increased use of HCFC feedstocks, e.g., HCFC-22, with lower ODPs.
- Transition from high- to lower GWP propellants in pMDIs presents many challenges in addition to the key objectives of ensuring safety and efficacy of the new inhalers.
- Two pharmaceutical-grade lower GWP propellants, HFC-152a and HFO-1234ze(E), are in research and development for a range of drugs in pMDIs. Both are needed.

Refrigeration, Air Conditioning and Heat Pumps TOC (RTOC)

RTOC CO-CHAIRS:
OMAR ABDELAZIZ, ROBERTO PEIXOTO, FABIO POLONARA, AND RAJAN RAJENDRAN



RTOC: 2026 ASSESSMENT REPORT

1. Introduction
2. Over-arching Topics (Cross-Cutting)
3. Refrigerants
4. Servicing and Lifecycle Refrigerant Management
5. Modelling RACHP Banks, Consumption and GHG Emissions
6. The Cold Chain (Domestic, Commercial, Transport, and Industrial Refrigeration)
7. Comfort Cooling and Heating (Air-cooled, Water-cooled, Small and Large Applications)
8. Other Applications (Vehicle Thermal Management, Battery Cooling, Data Centers, etc.)
9. Non-Vapour Compression (Not-In-Kind) Cooling and Heating Technologies

RTOC: 2026 AR OVERVIEW

- Global RACHP demand is rising rapidly, increasing both refrigerant use and electricity consumption.
- Energy efficiency, passive measures (e.g. insulation and shading), and heat pumps are key levers for reducing climate impacts.
- The 37 new refrigerant blends introduced since AR2022 highlight the growing complexity of refrigerant transition choices, which require trade-offs among regulation, safety, GWP, cost, energy efficiency, and availability.
- Low-GWP alternatives such as propane (R-290), CO_2 (R-744), ammonia (R-717), and HFOs are gaining ground. However, shortages of skilled technicians and inadequate infrastructure remain major barriers in A5 Parties.
- Scaling up lifecycle refrigerant management and strengthening technician training and safety infrastructure are essential to minimize refrigerant leakage and consumption.

Thank you

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