A treaty needs a working transition

Montreal's ozone bargain: controls, finance and review, 1987-2022

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The decision

Governments had to reduce chemicals that damaged the ozone layer while firms and households still depended on the services those chemicals supplied. A signature could set a direction, but replacement technologies, money, reporting and periodic revision would determine whether that direction became workable. Montreal's useful diplomatic lesson lies in the connection between these tasks, not in a claim that agreement instantly repaired the atmosphere. [S1-S6]

Abstract

The Montreal Protocol joined international controls on ozone depleting chemicals to a process for scientific review, differentiated implementation and support. Its original agreement was not the complete phaseout system that developed later. Subsequent decisions strengthened controls, while a financial mechanism helped eligible developing countries meet agreed incremental costs. Reporting and atmospheric observation provided different ways to test progress, including evidence of unexpected emissions. The scientific assessment published in 2022 reported declining chlorine and bromine entering the stratosphere and signs of ozone recovery, but also uncertainty and regional differences. Projected returns to 1980 ozone levels remain conditional forecasts, not completed outcomes. Technology choices can introduce new climate, safety and maintenance problems, so substitution needs evaluation rather than a simple label. For Sri Lanka, the conditional lesson is to connect diplomatic commitments with data, finance, technical capacity and review. Montreal offers a design discipline, not proof that every environmental bargain transfers unchanged.

Reader's question

When Sri Lanka signs an environmental agreement, who pays for firms and technicians to make the change? This is a question about implementation design, not a finding that a named local program is unfunded. The case separates the promise, the transition, reported activity and the environmental outcome.

1. The first agreement was not the final system

The Ozone Secretariat records the Montreal Protocol as signed in 1987 and entering into force in 1989. The original text set controls for specified chemicals and included rules for reporting, review and cooperation. It was a legal framework with a continuing process, not the fully developed set of controls and financial arrangements visible decades later. [S1, S2]

One example shows why chronology matters. The original Article 2 set a control for Group I Annex A substances at 50% of the 1986 calculated consumption level for the period beginning July 1998, with associated production rules and qualifications. That is a historical commitment in the original text, not today's schedule or a statement that every substance was to disappear immediately in 1987. [S2]

The original Article 5 allowed qualifying developing-country parties a ten-year delay for specified controls, subject to stated consumption conditions. It also called for help with access to alternative substances and technology. This was differentiated implementation with eligibility and limits, not a blanket exemption for every developing country from every future obligation. [S2]

The choice was more than ambition or delay

A strict promise without an achievable transition could fail in practice. An indefinitely postponed promise would fail to address the environmental problem. The treaty's evolving approach combined controls with different timetables, repeated assessment and later financial support. This is an analytical description of the bargain, not proof that every negotiation choice was optimal. [S1-S4]

Judgment: differentiation can make cooperation possible when capabilities differ. Its credibility depends on defining who qualifies, what they must eventually do, what support is available and how progress will be checked. "Different circumstances" should not become a permanent excuse for obligations nobody can inspect.

Read the version, not only the title

The consolidated 2019 text lists successive adjustments and amendments, including London in 1990 and Kigali in 2016. A researcher must distinguish provisions present at adoption from those added later. This case uses the original text for the initial bargain and the later Article 10 for the financial mechanism, rather than silently putting that later mechanism into the 1987 signature. [S2, S3]

2. Build a way to learn before the first promise expires

The original Article 6 required assessment of controls beginning in 1990 and at least every four years thereafter, using scientific, environmental, technical and economic information. It provided for expert panels to report their conclusions through the secretariat. The agreement therefore built review into its operating design rather than waiting for a separate crisis to make revision possible. [S2]

The later consolidated text provides an adjustment route based on assessments, including changes to control levels and timing under specified decision rules. Adjustment and amendment are not interchangeable labels for every treaty change. The significance here is narrower: the framework could develop as evidence and feasible alternatives changed. [S3]

Evidence had more than one job

Define the problem. Scientific assessment examines atmospheric chemicals, ozone and environmental effects. It helps identify whether the policy is addressing the right threat.

Test the transition. Technical and economic assessment examines options for replacing or reducing controlled substances. A technically possible substitute is not automatically affordable, safe or suitable everywhere.

Check performance. Reporting and observation examine whether production, trade and atmospheric behavior match expectations. They can reveal different kinds of gaps.

These are analytical distinctions supported by the treaty's assessment provisions and the scientific and technical panels' reports. They are not a claim that the panels enforce domestic law or make every political decision for governments. [S2, S5, S6]

A reporting duty is not an environmental measurement

The original Article 7 required production, import and export data and provided for estimates where baseline data were unavailable. The treaty definition of consumption is production plus imports minus exports. This is a policy accounting concept, not the quantity of chemical released into the atmosphere in the same year. [S2]

Judgment: define the measured variable before praising a number. A lower calculated consumption level, a lower emission estimate and a recovering ozone layer are related evidence, but they are not the same observation. A successful reporting system should preserve that distinction rather than merge administrative and physical outcomes into one headline.

3. Finance turned a timetable into a more credible offer

The Multilateral Fund's history records the 1990 London agreement on a financial mechanism and the establishment of an interim fund on 1 January 1991. This sequence matters: financial support developed after the original protocol. The fund's existence should not be backdated to 1987. [S4]

The later Article 10 provides financial and technical cooperation for parties operating under Article 5 paragraph 1. It says the mechanism shall meet their agreed incremental costs to enable compliance, with categories determined by the parties. It includes a Multilateral Fund and allows other forms of cooperation. "Agreed incremental costs" is not an unlimited promise to pay every cost that any enterprise attributes to environmental policy. [S3]

The article includes grant or concessional support, clearing-house functions, country studies and technical cooperation. The fund's current institutional account describes investments, technical guidance and capacity building as its operating work. These are mechanisms and mandates, not proof that every individual project achieved its intended result. [S3, S4]

The budget is a decision, not a receipt

The fund's published replenishment table records an adopted budget of US$540 million for 2021-23 and US$965 million for 2024-26. The increase is US$425 million, or 78.7%, calculated from those nominal dollar budgets. It is not a real-terms comparison, annual spending, cash received or verified project delivery. [S4]

Judgment: displaying an approved funding envelope can clarify ambition, but it cannot establish that recipients received resources on time or that equipment and training worked. A serious implementation account follows the sequence from approval to commitment, disbursement, installation, use and measured performance.

Who carries the transition risk?

Firms may need new equipment and skills before a replacement market is mature. Technicians may need training before they can safely service new systems. Governments need administrative capacity to identify substances and record trade. These are implementation questions prompted by the technical and financial framework, not estimates of costs for Sri Lanka.

Conditional lesson: a deadline is more credible when the assistance is specific enough to use. But support also needs eligibility, safeguards and monitoring. Finance without a clear transition plan can spend money without securing compliance; a transition plan without finance can become a promise firms cannot carry out.

4. What the physical evidence actually says

The Scientific Assessment of Ozone Depletion: 2022 reports that total chlorine entering the stratosphere from controlled and uncontrolled ozone-depleting substances declined from a 1993 peak of 3,660 parts per trillion to 3,240 in 2020. The reported decrease is 420 ± 20 parts per trillion, or 11.5%. This is a dated atmospheric-composition measure, not a 2026 observation or a percentage of treaty obligations completed. [S5]

The same assessment reports total bromine entering the stratosphere declining from 22.1 parts per trillion in 1999 to 18.9 in 2020: 3.2 ± 1.2 parts per trillion, or 14.5%. The starting years and chemical quantities differ. Neither change should be relabeled as the percentage shrinkage of the Antarctic ozone hole. [S5]

Recovery was not uniform

The assessment finds continuing recovery in the upper stratosphere and recovery of Antarctic total column ozone, with substantial variation from year to year. It also reports low confidence in the limited evidence for total-column recovery outside the Antarctic since 1996, and notes unresolved differences between models and lower-stratosphere observations. A single favorable headline loses these distinctions. [S5]

Its expected returns to 1980 total-column ozone values are around 2040 for the near-global average from 60 degrees north to 60 degrees south, 2045 for the Arctic and 2066 for the Antarctic. The January 2023 UN account explains that these expectations depend on current policies remaining in place. They are dated assessment projections, not promises that the ozone layer is already fully repaired or fresh forecasts made in 2026. [S5, S7]

Observation can challenge the administrative story

The scientific assessment describes unexpected CFC-11 emissions, investigations and subsequent reductions. It also says uncertainty about releases from existing stocks and gaps in observing networks prevents a conclusion that all unexpected emissions have ceased. The case does not attribute misconduct to a country or enterprise from this summary. Its point is that independent physical evidence can reveal a gap that reported controls alone may miss. [S5]

Judgment: monitoring should be capable of producing inconvenient findings. A system that only confirms success cannot reliably distinguish compliance from incomplete data or hidden activity.

5. A replacement can solve one problem and create another

The Secretariat's account distinguishes ozone-depleting substances from hydrofluorocarbons, or HFCs. Some HFCs were used as replacements and do not deplete ozone, but are powerful greenhouse gases. The 2016 Kigali Amendment added a phase-down of HFCs. That later climate step is not evidence that every replacement was originally free of environmental costs. [S1, S3]

The Technology and Economic Assessment Panel's 2022 assessment examines options across sectors and warns that discussion of a technical option is not endorsement of its safety or environmental acceptability. It stresses worker safety, disposal and continuing evaluation. This case uses that caution to reject an automatic inference from "alternative" to "safe and suitable." [S6]

Keep the service, change the harmful input

Judgment: a transition succeeds when users retain the service they need while environmental harm falls. Replacing a chemical in a cooling system may require attention to equipment, servicing, safety, efficiency and disposal. Policy design should evaluate the whole operating change, not merely the name on a cylinder.

That is also why technical assistance matters alongside finance. A purchased replacement can fail if maintenance systems, training or safe handling are missing. These are proposed evaluation questions, not findings that a particular country's technicians or firms are unprepared.

Three forms of success should stay separate

Diplomatic success. Parties adopt and revise commitments and agree operating institutions.

Implementation success. Countries and firms change production, trade, equipment and practice within the agreed rules.

Environmental success. Atmospheric measurements and scientific analysis show reduced harm and recovery, with appropriate uncertainty and time lags.

The treaty and institutional records establish the first category's milestones. Scientific and technical reports help evaluate the others. None of these categories should be inferred solely from an anniversary, a budget announcement or a new signature. [S1-S6]

The counterfactual remains a different kind of evidence

Scientific assessments also use models to compare controlled and uncontrolled futures. Such models can inform decisions, but their estimates are not directly observed parallel worlds. This case does not supply a new estimate of avoided illness, warming or economic loss, nor does it attribute the outcome to finance alone. Its central claim is about the observed architecture connecting obligations, learning, resources and scrutiny.

6. Conditional lessons for Sri Lanka

Attach a transition plan to the diplomatic promise. Judgment: identify affected users, equipment, supply chains and technicians. State what must change, when, and how essential services will continue. An international commitment is not an inventory of domestic readiness.

Define the data before choosing the headline. Judgment: distinguish treaty consumption accounting, emissions, chemical stocks and environmental outcomes. Report units, periods, uncertainty and revision rules. Lower imports alone do not prove every old stock has been safely recovered or destroyed.

Link assistance to usable tasks. Judgment: identify which incremental costs qualify, which institutions deliver help and how approval becomes actual implementation. Do not equate an adopted funding envelope with disbursement or successful delivery. Verify current eligibility and application rules rather than copying historical terms.

Build review into the first bargain. Judgment: name the evidence, review date and route for changing obligations as science and technology evolve. Protect the distinction between an expert assessment and the political decision it informs. Review should produce a decision or a clear explanation, not merely another meeting.

Test substitutes across more than one risk. Judgment: examine climate effects, worker safety, energy use, maintenance, affordability and disposal. A solution to ozone depletion can create other costs. Procurement and training should reflect the actual equipment and local operating conditions.

Let monitoring find failure. Judgment: compare administrative reports with independent evidence where feasible, investigate gaps and explain corrections. A credible regime must be able to detect unexpected activity without presuming that every anomaly proves misconduct.

Transfer limits

This case does not audit Sri Lanka's current ozone or cooling programs, verify its present treaty compliance, calculate a transition budget or recommend a particular refrigerant. Those choices require current local records, applicable law, technical standards and funding terms. Ozone diplomacy also differs from agreements where substitutes, costs and distributional conflicts are harder to resolve.

Decision. Prefer commitments connected to credible transition work: controls that can be understood, assistance that can be used, evidence that can challenge claims and a revision route that responds to learning. Montreal is a discipline for implementation, not proof that every environmental negotiation can reproduce its outcome.

Sources, calculations and limits

Evidence inspected 15 October 2026 for the 16 October case. The environmental outcome window is the 2022 scientific assessment, not a claim to the newest atmospheric measurement. Independent MacroLens desk research; not affiliated with Harvard Business School; not peer reviewed.

S1. Ozone Secretariat, treaty overview. Adoption/entry chronology and the distinction between ODS and the later HFC phase-down. Institutional account, not an independent causal test.
https://ozone.unep.org/treaties/montreal-protocol

S2. Original Montreal Protocol text, EUR-Lex. Original provisions on controls, qualifying developing countries, assessment, reporting and technical assistance. Used for the initial agreement, not later amended schedules.
https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX%3A21988A1031%2802%29

S3. Ozone Secretariat, consolidated 2019 text and Article 10. Later adjustments/amendments and financial-mechanism terms. These provisions are not all backdated to 1987.
https://ozone.unep.org/sites/default/files/2019-04/MP-consolidated-English-2019.pdf
https://ozone.unep.org/treaties/montreal-protocol/articles/article-10-financial-mechanism

S4. Multilateral Fund, history and institutional account. London financial-mechanism decision, interim fund from January 1991 and published adopted replenishment budgets. Institutional promotion is not used as proof of every project's success; budget is not cash received.
https://www.multilateralfund.org/about/history
https://www.multilateralfund.org/about

S5. WMO/UNEP Scientific Assessment of Ozone Depletion: 2022. Published 2022, posted February 2023. Chlorine/bromine changes, ozone recovery evidence and uncertainty, unexpected emissions and conditional future paths. Assessed physical evidence and models, not a 2026 measurement.
https://ozone.unep.org/sites/default/files/2023-02/Scientific-Assessment-of-Ozone-Depletion-2022.pdf

S6. Technology and Economic Assessment Panel, 2022 assessment. April 2023 report. Sectoral transition options and explicit safety/environmental-acceptability caveats. No product endorsement or local engineering specification is inferred.
https://ozone.unep.org/system/files/documents/TEAP-Assessment-Report-2022-April23.pdf

S7. UN News, 9 January 2023. Dated explanation of the scientific assessment and the policy condition attached to recovery projections. Used with S5, not as an independent scientific replication.
https://news.un.org/en/story/2023/01/1132277

Calculation. US$965m - US$540m = US$425m; 425 / 540 x 100 = 78.7%, nominal adopted triennial-budget increase. No claim of corresponding spending growth or attribution of physical recovery to this later budget. Parts per trillion, calculated consumption, emissions and ozone levels remain distinct. Sri Lankan lessons are conditional judgments, not a current compliance verdict.