



UNEP

UNITED NATIONS ENVIRONMENT PROGRAMME
INDUSTRY AND ENVIRONMENT OZONACTION PROGRAMME

Saving the Ozone Layer: Guidelines for United Nations Offices



**Practical steps to phase out
the use of ozone-depleting
substances on UN premises**

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Saving the Ozone Layer: Guidelines for United Nations Offices



Practical steps to phase out the use of ozone-depleting substances on UN premises



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Preface

The protection of the Earth's stratospheric ozone layer is a significant achievement of international environmental diplomacy and of the United Nations.

The ozone layer is vital to human, animal, and plant life on the Earth's surface. Yet in the 1980s it was discovered that the layer was vulnerable to damage by emissions into the atmosphere of particular industrial chemicals, of which the most important was the family of chlorofluorocarbons. The negotiation of the international treaty—the Montreal Protocol—designed to limit, and ultimately end, the production and use of these chemicals took place under the aegis of the United Nations Environment Programme.

The regime established by the Montreal Protocol has proved highly effective in limiting damage to the ozone layer. Ozone depletion has reached record levels as a result of the last seventy years of production and use of ozone-damaging chemicals. However, the damage is now nearing its peak and it is predicted that the ozone layer will start to recover in the next few years; it should be restored to full health by the middle of the next century.

This process of recovery can be accelerated by actions taken by organizations and individuals. Many offices throughout the world contain equipment, including refrigerators, air-conditioning units and fire extinguishers, which contain ozone-depleting substances. Ensuring that these appliances do not leak, and are adequately serviced or replaced with units that do not contain such substances, will speed up the recovery of the ozone layer. Since substitutes now exist for virtually all uses of CFCs and most other ozone-depleting substances, this is a relatively easily achievable goal. Indeed, in many instances new units containing

CFC substitutes are more efficient (for example in energy use) than the old units they replace, resulting in additional benefits.

Individual UN offices can participate in this way in the process of ozone layer protection initiated by UNEP. Although it is international agencies and national governments which agree and monitor ozone protection policies, it is firms, offices and employees—including those of the United Nations—which put them into effect. And, as at the global level, local UN offices should be setting an example and giving the lead to other organisations in the countries in which they are based.



*Elizabeth Dowdeswell,
Executive Director,
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How to use these guidelines

These guidelines are written for UN office managers. They are designed to guide you through a series of steps that will help you reduce and eventually eliminate the damage your office equipment does, or may do, to the Earth's protective ozone layer.

In particular, these guidelines will assist you to:

- identify equipment that contains CFCs and other ozone-depleting substances (ODS);
- decide how best to phase out ODS;
- minimize the loss of ODS during phase out; and
- ensure that new equipment purchased is ODS-free.

Throughout this document, text printed with a shaded background summarises the environmental and political information which underpins the decisions you will be taking. Reading it is not essential to follow the steps outlined in the main text, but you may find it helps you understand the reasoning behind them. Sources of further information are listed in Appendix 2.

Applicability of the guidelines

Although these guidelines are written with UN offices in mind and use as examples steps that have already been taken in the UN office complex in Gigiri in Nairobi (see box on page 17), in practice, however, they are applicable to any office-type building or organization (industrial plant may require rather different procedures). We therefore also encourage their use in office complexes within and outside of the UN System.

Background: saving the ozone layer

What is the ozone layer?

The thin layer of ozone high in the Earth's atmosphere plays a crucial role in protecting life on the planet's surface from harmful ultraviolet radiation emanating from the sun. In the 1980s it was discovered that this ozone layer was vulnerable to damage from chlorofluorocarbons (CFCs) and other industrial chemicals. Stable, non-toxic and highly versatile, CFCs have been employed for a wide variety of uses, including aerosol propellants, refrigerants and air-conditioning fluids, solvents and foam-blowing agents. Halons, i.e. related compounds containing bromine rather than chlorine, have been used as fire extinguishants.

What are ozone treaties

The United Nations, through UNEP, was instrumental in negotiating the 1985 Vienna Convention for the Protection of the Ozone Layer, and the subsequent 1987 Montreal Protocol on Substances that Deplete the Ozone Layer. These international treaties, which have now achieved almost universal adherence, applied quantitative controls to the production and consumption of ozone-depleting substances (ODS).

What progress is being made on the implementation of these treaties

These controls have been made steadily stricter as the scientific evidence for ozone depletion has strengthened, and as industry has succeeded in developing non-ozone depleting substitutes. **In the industrialized world, total phase out of most categories of ODS was achieved by the end of 1995.** Other ODS, including the CFC substitutes hydrochlorofluorocarbons (HCFCs), are due to be phased out at future dates.

Developing countries enjoy rather longer control schedules, with most ODS due for phase out by 2010. The Montreal Protocol contains a mechanism (the Multilateral Fund) for providing financial support to developing countries to assist them in drawing up and implementing ODS phase-out programmes. The Fund operates through four implementing agencies: UNEP, UNDP, UNIDO and the World Bank. Funding is also available through the Global Environment Facility for phase-out projects in countries with economies in transition in central and eastern Europe and the former Soviet Union.

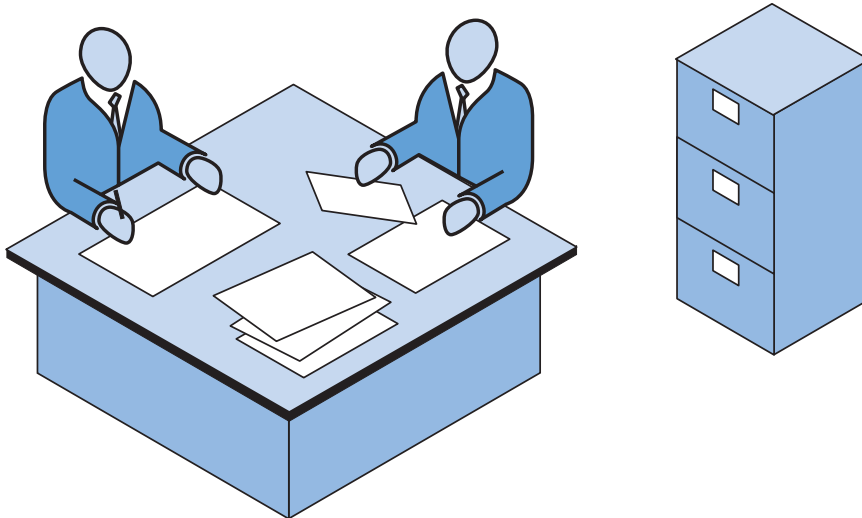
How UN offices can contribute to protecting the ozone layer

Substitutes now exist for virtually all uses of CFCs and halons, and in some areas—aerosol propellants and solvents, for example—ODS are now almost never used. Refrigeration and air-conditioning equipment, and fire extinguishers, on the other hand, have fairly long lifetimes. Many UN offices will therefore still contain products that do use ODS. These include equipment:

- produced before the phase-out dates;
- produced in developing countries;
- containing recycled ODS;
- containing HCFCs, which still damage the ozone layer, though at much lower rates than CFCs.

There are many steps that can be taken to remove this equipment or replace the ODS it contains, and many countries are carrying out programmes to do just this. Indeed, equipment which needs regular servicing with refrigerants has to be retrofitted to take alternatives, as the original substances are becoming more difficult and more costly to obtain.

Drawing up an action plan



The first step is to draw up an action plan for ODS phase out. This should have four stages:

Step 1: establish the framework: staff, budget and timetable;

Step 2: identify ODS-using equipment and ODS in use;

Step 3: choose the appropriate replacement option; and

Step 4: review progress.

Even when the ODS phase-out programme is completed, there is one continuing requirement:

Step 5: when new equipment is purchased (for example in a new office), ensure, as far as possible, that it does not contain ODS.

This should, of course, become gradually easier with time, as ODS consumption is progressively phased out worldwide.

The following pages provide guidelines for completing each of these steps, including checklists. Examples of how they might be filled in are also included, drawn from the action plan carried out in the UN Nairobi Gigiri complex in 1996.

Two general points should be borne in mind:

Replacement options: HCFCs

Although total phase out of ODS is the ultimate aim of the ozone regime, the use of HCFCs (CFC replacements which deplete the ozone layer but at much lower rates) is still permitted until 2030 (2020 for new equipment). In some cases, equipment containing HCFCs is still preferred to non-ozone-depleting replacements—where the latter are not widely available, for instance, or where they have other drawbacks, such as low efficiency of energy use or doubts over safety.

National legislation

Clearly, each office has a duty to conform with the environmental, and health and safety, regulations of the country in which it is situated. Sometimes, these will supersede the information contained in these guidelines. Some governments, for example, place restrictions on the use of HCFC-containing equipment over and above those mandated by the Montreal Protocol. If not already known, appropriate advice should be sought from the relevant government agency.

Step 1: Establish the framework

This step includes four separate stages:

1 Establish the commitment

Obtain a firm commitment from the Director(s) responsible for administration and services including refrigeration, air-conditioning and fire protection equipment and vehicles, that the site will minimize and, where possible eliminate, the use of ODS.

This commitment, and the reason for it, should be made known and, where appropriate, discussed throughout the organization so that all staff come to understand and share the objective of protecting the ozone layer. (UNEP IE can provide information leaflets, posters, etc.—see Appendix 3). UN staff should be encouraged to follow the guidelines in their own homes and vehicles. Ozone protection should be included in the facility's environmental management systems (covering the use of recycled paper, for example, or minimizing energy use), where they exist.

2 Allocate responsibility

Ensure that a senior manager, with appropriate technical and organizational skills, takes responsibility for the project.

3 Set up the team

The manager should create a team of representatives from all the relevant departments, such as purchasing and site maintenance. You may wish to add representatives from local supplying companies, and for larger sites it may be necessary to include a technical refrigeration expert and fire engineer.

4 Prepare a preliminary budget

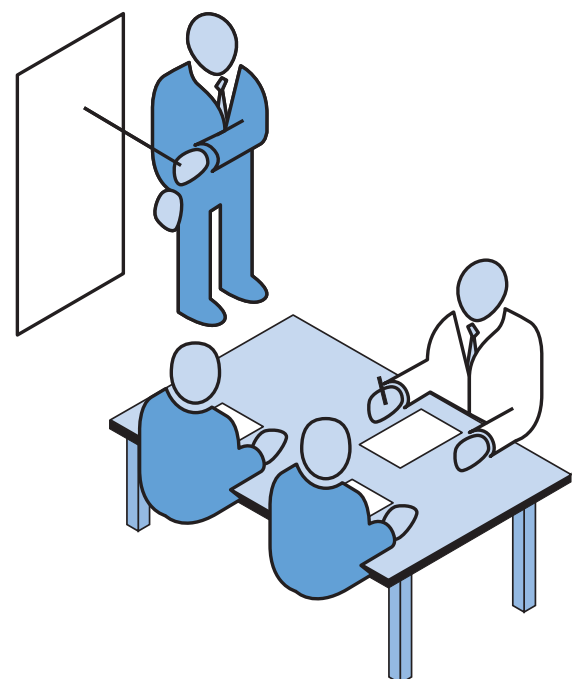
Costs will include: time of management personnel; labour costs; purchase of additional processing equipment; costs of in-house service

personnel or contract maintenance; possibly higher costs of replacement equipment.

Savings may often be achieved, however, through lower running costs; new ODS-free systems are usually more energy-efficient than those they replace, particularly for refrigeration equipment. Many new systems also have lower emissions.

At this stage many of the figures will be interim ones only; the final budget will have to wait until the survey of ODS-using equipment has been completed (see step 4).

The speed of replacement of ODS-using equipment will obviously depend on individual circumstances, including the office's range and age of equipment, and overall budget. It will probably not be possible to achieve total phase out of ODS use immediately; but the priority should always be to phase out high ODS-using equipment first.





Checklist Step 1: establish the framework

STEP:	ACTION:
<p>1. Establish the commitment</p> <p>Relevant Director:</p>	<p><i>P. ASHDOWN (OFFICE MANAGEMENT)</i></p>
<p>2. Allocate responsibility</p> <p>Senior manager:</p>	<p><i>A. MUTHAIQA (DEPUTY OFFICE MANAGER)</i></p>
<p>3. Set up the team</p> <p>Site maintenance:</p> <p>Purchasing:</p> <p>Local supplying companies:</p> <p>Technical refrigeration expert:</p> <p>Fire engineer:</p>	<p><i>M. AGGARWAL (SENIOR MAINTENANCE ENGINEER)</i></p> <p><i>E. AHMED (FINANCE OFFICER)</i></p> <p><i>E. FERNANDEZ (COOL REFRIGERATION LTD)</i></p> <p><i>D. K. LEE (CONSULTANT, GLOBAL COOLANTS INC)</i></p> <p><i>B. BOYD (CHIEF OF SAFETY)</i></p>
<p>4. Prepare a preliminary budget</p> <p>Costs</p> <p>Management personnel time: US\$..... 1,000</p> <p>Labour: US\$..... 2,500</p> <p>Additional processing equipment: US\$..... 10,000</p> <p>Service/maintenance personnel: US\$..... 2,500</p> <p>Replacement equipment: US\$..... 40,000</p> <p>Savings</p> <p>Reduced running costs (per year): US\$..... 2,000</p>	<p><i>J. ZHAO (FINANCE OFFICER)</i></p> <p><i>C. CHISHOLME (SENIOR MAINTENANCE ENGINEER)</i></p>
<p>5. Prepare preliminary action plan</p>	<p><i>P. AKINTADE (SENIOR MANAGER)</i></p>

Step 2: Identify ODS-using equipment and ODS in use

This stage involves identification of equipment that may potentially contain ODS, and the particular ODS the units use. Newer equipment may not even contain ODS at all, and therefore will need no action. The box on page 10 lists categories of ODS-using equipment, and the most common ODS, and their alternatives, likely to be in use today.

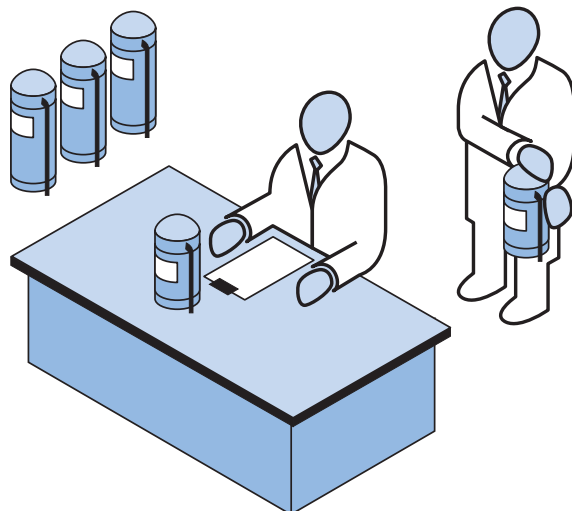
This identification stage involves the following:

1 Survey the equipment on site

Conduct a survey of the entire facility to locate every possible source of ODS, i.e.:

- refrigerating and freezing units;
- fixed air-conditioning systems;
- mobile air-conditioning systems; and
- fire-fighting equipment.

Assign a unique number to each item (see the checklist).



2 Obtain details of ODS used: equipment which is not regularly serviced:

For each item of equipment, the type of ODS (or alternative) it uses must be identified, together with the quantity. Where these details are not indicated on the piece of equipment itself, or in its manual, they should be obtained from the supplier or manufacturer.

3 Obtain details of ODS used: equipment which is regularly serviced

If the equipment is serviced by its supplier, which is usually the case for larger systems, the details need not be obtained by UN personnel; the easiest option is to contact the supplier. They can advise on alternatives, and should be shown these guidelines so that they fully understand the need for reducing ODS use. If the supplier does not possess the necessary information, they can obtain it from the manufacturer.

The information gathered on the amount of refrigerant charge added can help to indicate problems with leakage. With sealed systems, refrigerant loss should be zero. With larger systems, refrigerant leakage almost inevitably occurs during servicing, but loss of much more than 5 per cent per year (on average) is excessive, and action should be taken to identify and stop leakage.



Checklist Step 2: identify the equipment and ODS use

Equipment containing ODS

Item no.	05	24	31
Type	CHILL ROOM	PACKAGED AIR-CONDITIONER	FIRE EXTINGUISHER
Location	CAFETERIA	CONFERENCE ROOM	CENTRAL LOBBY
Refrigerant/extinguishant type (e.g. hand-held units and flood systems); and approx. charge (g)	R12 4500 g	R22 2000 g	HALON-1301 77 kg
Quantity of refrigerants/ extinguishants added and when	50 g 1/10/95	SEALED UNIT — NO SERVICING	TOTAL RECHARGE 1/3/95
Age of equipment (date of purchase)	1985	1990	1987

ODS and ODS-using equipment most likely to be in use today

A typical UN facility will include four major categories of equipment which may potentially contain ODS:

Refrigeration systems

Canteen and refreshment facilities use several domestic-type refrigerators. Larger UN complexes also have retail outlets which require refrigerators and freezers. They may also sometimes have cold rooms and walk-in coolers, which, being site-assembled, are usually more prone to leakage than the fully sealed smaller systems, posing a greater danger to the ozone layer.

Air-conditioning systems

On many sites, air-conditioning can be reduced to the minimum required for essential cooling, for example for computer equipment. On other sites, however, climatic conditions are such that air-conditioning for human comfort is desirable.

Vehicles

Motor vehicles hired or owned by the offices, and by individual UN staff, may contain mobile air-conditioning systems using ODS as refrigerants. Their use almost invariably involves leakage.

Fire-fighting equipment

Health and safety regulations always require the presence of fire-fighting equipment. Particular facilities, such as computer centres, need to be protected against fire by fire extinguishants which will not themselves damage the computers. Halons have so far proved the best substances for this particular use. However, they are powerful ozone depleters, and their production in developed countries has been halted from the end of 1994.

Other ODS uses

Other possible sources of ODS include solvents (used in, for example, print shops or dry cleaners) and insulation panels (containing foams blown with ODS). Compared with the four sources listed above, these are less important, and there is little UN office managers can do to reduce their use, although disposal should always be carried out in ways that ensure ODS do not leak into the atmosphere (contact the relevant authorities). These uses will in due course be phased out by industry. These guidelines therefore refer only to the four categories listed above.

This equipment will contain the ODS, or their alternatives, listed below. They are usually known by their ASHRAE designations, e.g. R12, but can also appear under different product names; an information paper listing trade names of common ODS is available from the UNEP IE OzonAction Programme.

CFCs (chlorofluorocarbons)

CFCs are the most widespread family of ODS, and the most common refrigerants. Production and consumption of CFCs has now ceased in the developed world, so any equipment which contains them cannot be serviced with the same substances (in developed countries) unless they are stockpiled or recycled.

Common CFCs: R11, R12, R13, R113, R114, R115

Common CFC blends: R500, R502, R503

HCFCs (hydrochlorofluorocarbons)

HCFCs were important transitional substances in the early years of the ozone regime, helping in the speedy phase out of CFCs, and are still used in some refrigerating and many air-conditioning applications. They are still, however, ozone-depleters, and are due to be phased out in developed countries by 2030 (for new equipment, 2020).

Common HCFCs: R22, R123, R141, R142b

HFCs (hydrofluorocarbons)

HFCs are now replacing both CFCs and HCFCs as refrigerants and air-conditioning fluids. They are not ozone-depleters at all, and are therefore not subject to control under the Montreal Protocol. They are, however, greenhouse gases, contributing to global warming.

Common HFCs: R134a, R404a

Halons

Halons have been used as effective fire extinguishants. They contain bromine instead of chlorine, and are powerful ozone-depleters; they were the first family of substances to be banned under the Montreal Protocol (in 1994). Substitutes are available, but those for essential uses (i.e. military installations) have been slow to develop and many countries operate collection and banking facilities for recycling and reusing halons; it may, therefore, be possible to service existing equipment containing halons. (Information on halon banks will be available from the national industry or environment agency or department.)

Common halons: halon-1301 (also used as a refrigerant under the name R13B1)

Non-halocarbon alternatives

As the control schedules of the Montreal Protocol have taken effect, non-halocarbon alternatives have become more widespread and are now available for many CFC and halon uses. For refrigeration and air-conditioning, these include hydrocarbons (such as propane or butane) and ammonia; for fire-fighting they include carbon dioxide and dry powder. None of these pose any threat to the ozone layer, though some are greenhouse gases, and some are toxic and/or flammable.



Step 3: Choose the appropriate option and prepare a plan for phase out

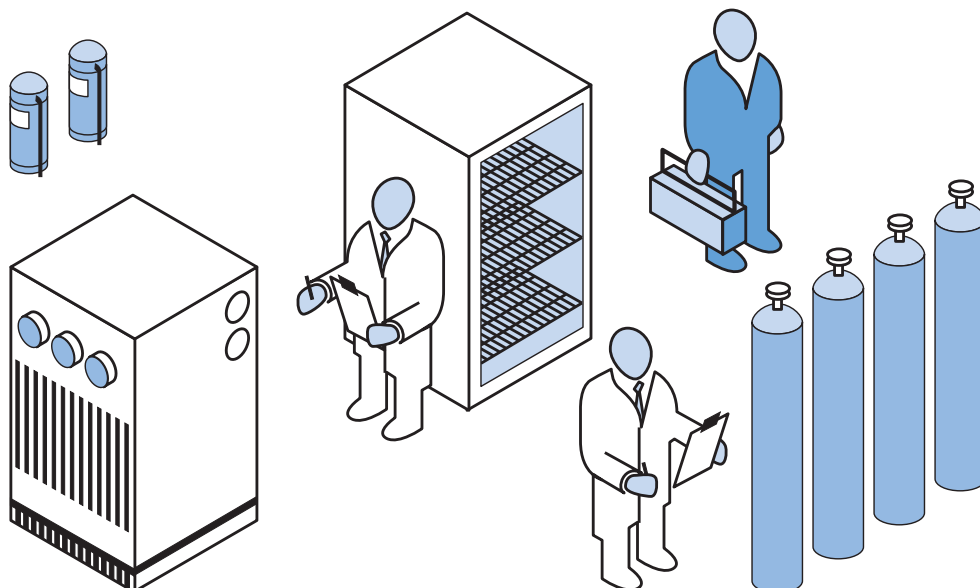
In this stage, you decide whether or not to replace the unit or the ODS it contains, and if so, with what alternatives. The choice of replacement will depend on two factors:

- the type of equipment; and
- the type of ODS it uses.

ODS with a high ozone-depleting potential (ODP), such as CFCs, should always (ultimately) be replaced, but whether the substitute is a low ODP replacement (HCFCs) or zero ODP replacement (HFCs or non-halocarbon alternatives) will depend on the equipment in question. The precise timing of choices, and speed of replacement, will of course depend on the age of the existing equipment, budgetary constraints and other factors (remember that newer equipment, which is usually more efficient, may well have lower running costs).

The overall inventory of refrigeration, including technical and financial considerations and the finalized plan for containment, equipment conversions and substitution, is commonly known as a refrigerant management plan. The refrigeration expert within the work team should be able to provide you with such a plan.

This section offers general recommendations, with the overall aim of reducing ODS use in a cost-effective manner. The ultimate aim is always to end up with equipment which uses no ODS at all, but in terms of cost-effectiveness, it may often make sense to keep existing equipment running, replacing high ODP refrigerants with low ODP alternatives as the opportunity arises, until full replacement is necessary. The one option that is *not* available, however, is to ignore the issue.



1 Small sealed refrigerating and air-conditioning systems

If these are operating satisfactorily, there is no need or justification for replacing them. The ODS they contain does no harm to the ozone layer as long as it remains within the cooling system. The choice of alternatives comes when the equipment fails and needs repairing or replacing.

- If the unit is replaced as a whole, a zero ODP system should be purchased.
- If replacement would be too expensive, or if the failure is due to particular components that can be repaired or replaced:

If the failure is loss of refrigerants through a single identifiable leak which can be repaired, the opportunity should be taken to replace the refrigerant with a zero ODP or low ODP drop-in replacement (zero ODP is preferable).

If the compressor has failed, the system should be cleaned out and the compressor replaced by one suitable for use with a zero ODP refrigerant.

2 Larger and partly site-assembled refrigerating and air-conditioning systems

Unlike the smaller factory-sealed systems, these are produced with accessible components, which give rise to a greater possibility of leakage—especially if there is excessive vibration. Since leakage of ODS will damage the ozone layer, these systems need to be thoroughly leak-tested by a responsible maintenance engineer on a regular basis, and leaking parts repaired. In these cases, the refrigerating or air-conditioning fluids can be replaced before the unit reaches the end of its operating life.

If no leaks are detected, no action need be taken (except ensuring that tests are carried out regularly); the ODS is safely contained within the system. The regular service provides an opportunity to replace the refrigerant with a zero ODP or low ODP drop-in replacement (zero ODP is preferable).

In some cases, no drop-in replacements are available. In these cases, servicing with recycled CFCs may be possible, but it is

Alternatives to ODS commonly used as refrigerants (new systems)

ODS

Alternatives

Small domestic units

R12 (CFC-12)

HFCs: R134a
Hydrocarbons: R600a

Larger commercial units

R12 (CFC-12)

HCFCs: R22
HFCs: R134a, blends
Hydrocarbons: R600a, R290

R502 (CFC-115/HCFC-22 blend)

HFCs: R404a
Hydrocarbons: R290

R22 (HCFC-22)

HFCs: R407C, R507
Hydrocarbons: R290

Alternatives are continuously being developed. The latest information on the possible alternatives is available from the UNEP IE OzonAction Programme (see Appendix 2); you may wish to direct your supplier to this.



Checklist Step 3: choose the appropriate action

Equipment containing ODS

1. Small sealed refrigerating and air-conditioning systems

- No action to be taken until the equipment fails:
- Replacement recommended and scheduled for:
- Equipment failed and repaired (with refrigerant replacement) on:
- Equipment failed and replaced on:
- Item number:

✓ 1/6/96
24

2. Larger and partly site-assembled refrigerating and air-conditioning systems

- Leak test undertaken on:
- No action to be taken until the equipment fails/leaks:
- Equipment recommended for continued servicing with recycled CFCs:
- Refrigerant scheduled for replacement by zero ODP/low ODP alternative on:
- Refrigerant replaced by zero ODP/low ODP alternative on:
- Equipment scheduled for retrofit/replacement on:
- Equipment retrofitted/replaced on:
- Item number:

✓ 1/6/96 (R134A)
05

3. Mobile air-conditioning systems

- System recommended for continued servicing with recycled CFCs:
- System scheduled for retrofit on:
- System retrofitted on:
- Item number:

4. Fire-fighting equipment

- Equipment recommended for continued servicing with recycled halons:
- Equipment scheduled for replacement on:
- Equipment replaced on:
- Item number:

✓
37

preferable to replace the system entirely, or retrofit it with a compressor that can operate with zero or low ODP refrigerants. This is usually expensive, but may result in an increase in efficiency.

If leaks are detected, the system should be either repaired or replaced. The choice depends on the age of the equipment and its likely remaining lifetime:

If the unit is relatively old, it should be replaced completely with a zero ODP system (which is also likely to be significantly more efficient).

If the unit is relatively new, the leak should be repaired and the opportunity taken to replace the refrigerant with a zero ODP or low ODP drop-in replacement (zero ODP is preferable).

3 Mobile air-conditioning systems (MACs)

These require regular servicing with refrigerants. Where the system uses CFCs, it is sometimes possible for it to be maintained with recycled CFCs, where these are available. It is preferable, however, to retrofit the system with one using

HFCs (i.e. zero ODP refrigerants). At present, retrofits for MACs are based on HFC-134a

The vehicle user should ensure that the garage which services the car has the appropriate knowledge and equipment to recover and reuse the used CFCs and carry out the retrofit; UNEP IE can provide relevant information material.

4 Fire-fighting equipment

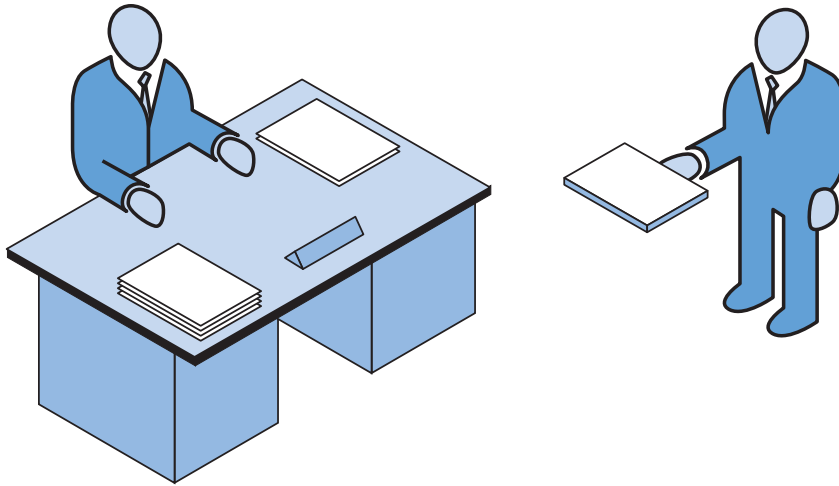
Substitutes for portable extinguishers using Halon 1211 are available. For essential uses where Halon 1311 is needed, the requirement can be met through 'banked' halons.

When the units have to be replaced, zero ODP alternatives should always be chosen; there is a wide variety available. It should be borne in mind that different quantities will probably be required to achieve the same effect as the halon systems the new units replace.

You may thus proceed to prepare an action plan for phase out. Such a plan could be prepared by a team and finalized in consultation with senior managers, suppliers and service technicians concerned.



Step 4: Review progress



The senior manager identified in Step 1 needs to conduct a periodic review of phase-out progress, with a report to the Director with overall responsibility.

Each of the units of equipment identified under Step 2 should be listed, together with the options chosen, which are summarized below. The refrigerant or extinguishant used (which should generally be a low or zero ODP replacement for the former CFCs and halons) should also be listed (see the checklist for Step 3.)

1 Small sealed refrigerating systems

- No action to be taken until the equipment fails; or
- Replacement recommended and scheduled for [date] (if the equipment is near the end of its expected life); or
- Equipment failed and repaired (with refrigerant replacement) on [date]; or
- Equipment failed and replaced on [date]

2 Larger and partly site-assembled refrigerating and air-conditioning systems

- Leak test undertaken on [date]; and
- No action to be taken until the equipment fails / leaks; or

- Equipment recommended for continued servicing with recycled CFCs; or
- Refrigerant scheduled for replacement by zero ODP/low ODP alternative on [date]; or
- Refrigerant replaced by zero ODP/low ODP alternative on [date]; or
- Equipment scheduled for retrofit/replacement on [date]; or
- Equipment retrofitted/replaced on [date]

3 Mobile air-conditioning systems

- System recommended for continued servicing with recycled CFCs; or
- System scheduled for retrofit on [date]; or
- System retrofitted on [date]

4 Fire-fighting equipment

- Equipment recommended for continued servicing with recycled halons; or
- Equipment scheduled for replacement on [date]; or
- Equipment replaced on [date]

As these reviews progress, the preliminary budget drawn up in Step 1 should be gradually replaced by a final budget, as costs (and savings) become clear.

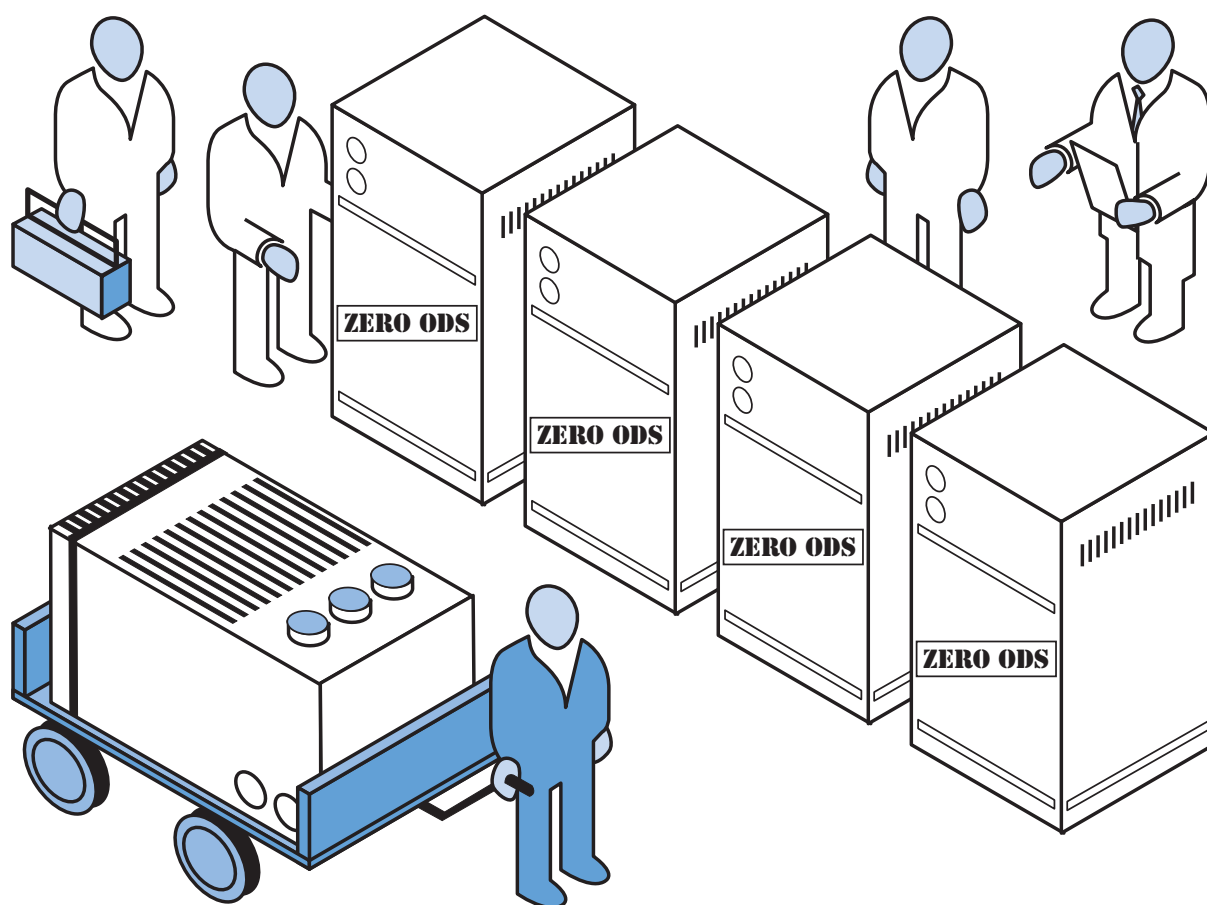
Step 5: Keep new equipment ODS-free

As new equipment is purchased, zero-ODP refrigerants, air-conditioning fluids and fire extinguishants should always be chosen where they are available (see box on page 12). The Director with overall responsibility needs to make sure that the individuals responsible for purchasing and procurement are aware of this requirement. This may require appropriate modification in the purchasing policy of the office.

Where possible, 'not-in-kind' (non-halocarbon) alternatives should be preferred: hydrocarbons,

ammonia or water. Where these are not possible, zero-ODP halocarbons (i.e. HFCs) should be chosen.

The supplier will usually be able to supply the appropriate equipment. If more information is needed, the UNEP IE documents listed in Appendix 2 are useful, and the relevant government departments and agencies in the host country should also be able to offer advice.



Case history: the Gigiri complex at Nairobi

An equipment review has already been carried out for the United Nations buildings at Gigiri, Nairobi, Kenya. The complex includes about 40 systems operating on R12, 37 systems operating on R22 and two systems operating on R502. The R12 systems range in size from those containing about 85 g of refrigerant to those containing up to 12 kg. The R22 systems range from 600 g to about 3 kg. The two R502 systems each contain about 400 g.

There could be more than one conversion option; however, those recommended by the consultants were as follows:

Equipment	Location/use	ODS in use	Recommended conversion
High temperature refrigerators (12 systems)	Commissary, catering	R12	Refrigerant change to R134a
Medium temperature freezers (1 system)	Catering	R12	Refrigerant change to R134a
Low temperature freezers (2 systems)	Commissary, catering	R12	Refrigerant change to R134a
Display counters (3 systems)	Commissary	R22	No action until leaks detected; then change to R404a
Domestic/commercial freezers (2 systems)	Commissary	R502	No action until leaks detected; then change to R404a
Domestic/commercial chest freezers (3 systems)	Commissary, cafeteria	R12	No action until leakage/failure; then change to R134a (with new compressor) or (if in poor condition) new unit
Domestic refrigerators/freezers (18 systems)	Offices, stores	R12	No action until leakage/failure; then change to R134a (with new compressor) or (if in poor condition) new unit with hydrocarbons or R-134a
Icemakers (3 systems)	Wash area, lounges	R12	No action until leakage/failure; then change to R134a with new compressor
Window box air-conditioners (11 systems)	Offices	R22	No action until leakage/failure; then refrigerant change to R404a
Split system air-conditioners (15 systems)	Offices	R22	No action until leakage/failure; then refrigerant change to R404a
Packaged air-conditioners (15 systems)	Conference rooms	R22	No action until leakage/failure; then refrigerant change to R404a
Fire extinguisher systems (3 systems)	Offices	halon-1301	Recycled halon-1301 or R227

Conclusions

These guidelines have been designed to assist UN office managers through the various steps necessary to first reduce, and then eliminate, the damage their office equipment causes to the Earth's protective ozone layer. Although they are specifically aimed at UN facilities, they are relevant to any set of offices in the private, public or voluntary sectors, and UN staff should encourage their use as widely as possible.

The information contained here relates to the situation in mid 1996. Developments in the field of refrigeration are continuous and rapid, as industry responds to the spur to innovation provided by the Montreal Protocol. Up-to-date information about possible replacements and alternatives should always be obtained whenever

decisions about the use of new systems or replacement refrigerants are made.

UNEP IE, through its OzonAction Programme, is able to provide the latest information on containment of ODS, retrofitting and conversion. We can also direct you to the appropriate suppliers for advice.

We would also be grateful to receive reports of progress your office has made in following these guidelines and phasing out the use of ozone-depleting substances.



Appendix 1: Abbreviations

ASHRAE	American Society of Heating, Refrigeration and Air-conditioning Engineers
CFCs	chlorofluorocarbons
HCFCs	hydrochlorofluorocarbons
HFCs	hydrofluorocarbons
ODP	ozone-depleting potential
ODS	ozone-depleting substances
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNEP IE	United Nations Environment Programme, Industry and Environment centre
UNIDO	United Nations Industrial Development Organization

Appendix 2: Sources of further information

UNEP IE Publications

All publications available from:
 UNEP Industry and Environment,
 Tour Mirabeau,
 39–43 quai André Citroën,
 75739 Paris Cedex 15, France

Tel: (33-1) 4437 1459

Fax: (33-1) 4437 1474

E-mail: ozonaction@unep.fr

WWW: <http://www.unepie.org/ozonaction.html>

Publications are free of charge unless marked otherwise; all publications are free of charge for individuals and organizations from developing countries)

General information/awareness material

Flyer on the OzonAction Programme

The *OzonAction Newsletter*, quarterly publication, 8pp. Available in Arabic, Chinese, English, French, Spanish, Portuguese

Halons Special Supplement No. 1 of the *OzonAction Newsletter*, September 1993, 4pp. Available in English, French and Spanish

Refrigeration Special Supplement No. 2 of the *OzonAction Newsletter*, September 1994, 8pp. Available in English, French and Spanish

Vienna Plus Ten, 1995. Special Supplement No. 3 of the OzonAction Newsletter.

List of Ozone Layer Protection Videos, June 1995, 11pp.

OzonAction Posters, 1994. Available in English, French and Spanish (150FF/US\$30 per set)

The OzonAction Information Clearinghouse Diskette Version 5.0 (OAIC-DV), 1997

Stratospheric Ozone Protection Flyer: Questions and Answers. Query response service available from UNEP IE, 1995

Technical options: sectoral

Technical Brochures. Available in English, French and Spanish:

Protecting the Ozone Layer Volume 1: Refrigerants, 1992, 40pp. (150FF/US\$30)

Protecting the Ozone Layer Volume 2: Solvents, Coatings and Adhesives, 1992, 40pp. (150FF/US\$30)

Protecting the Ozone Layer Volume 3: Fire Extinguishing Substances, 1992, 40pp. (150FF/US\$30)

Protecting the Ozone Layer Volume 4: Foams, 1992, 32pp. (150FF/US\$30)

Protecting the Ozone Layer Volume 5: Aerosols, Sterilants, Carbon Tetrachloride and Miscellaneous Uses, 1992, 28pp. (150FF/US\$30)

Training manuals in the refrigeration sector

Training Manual on Chillers and Refrigerant Management, 1994 (425FF/US\$85)

Training Manual on Good Practices in Refrigeration, 1994 (400FF/US\$80)

Sourcebooks for protecting the ozone layer

Flyer on Technologies for Protecting the Ozone Layer: Sourcebook Series

Sourcebook of Technologies for Protecting the Ozone Layer: Refrigeration, Air-Conditioning and Heat Pumps, 1994 (550FF/US\$100)

Sourcebook of Technologies for Protecting the Ozone Layer: Specialized Solvents Uses, 1996 (US\$85)

Sourcebook of Technologies for Protecting the Ozone Layer: Aerosols, Miscellaneous Uses and Carbon Tetrachloride, 1996 (US\$85)

Sourcebook of Technologies for Protecting the Ozone Layer: Flexible and Rigid Foams, 1996 (US\$85)

Case studies: refrigeration sector

Conversion of CFC-based Refrigeration Systems to Non-CFC Alternative Refrigerants—the New Zealand Experience, August 1995

Refrigerant Recovery and Recycling, 1995

Blends as Refrigerants to replace CFCs and HCFCs, 1995

Sector specific information: halons sector

Halon Management: Banking for the future information kit, 1993. Available in English, French and Spanish

Guidelines for government and industry

Practical Guide to Policy Guidelines for Industry on the Management of Phase-Out of ODS, 1994 (225FF/US\$45)

Elements for Establishing Policies Strategies and Institutional framework for ozone layer protection (275FF/US\$55)



Appendix 3: The OzonAction Programme

UNEP IE's OzonAction Programme under the Multilateral Fund of the Montreal Protocol on Substances that Deplete the Ozone Layer

Do you need answers to any of these questions?

- What are CFCs, halons & other ozone-depleting substances (ODS)?
- Why are they being phased out globally?
- When will they be phased out?
- Will I still be able to buy them?
- Can they be replaced?
- What are the alternative technologies, equipment and substitutes?
- How do I contact the experts?
- Do 'not-in-kind' alternatives exist?
- How do I obtain them?
- What are governments doing?
- What can industry do?
- What can my company do?
- What can I do?
- What kind of assistance is available to me in order to facilitate the switch-over?
- How/where can I get information?
- How can I get training?
- What is happening in my country and in my region?
- Who is responsible for ODS phase-out issues in my country?

The OzonAction Programme can provide answers to these questions and many others relating to ozone depletion. You have the right to benefit from the research and experience that has been gathered over the past few years. All it takes to make a start is a letter, a fax or a phone call.

The OzonAction Information Clearinghouse

The OzonAction Information Clearinghouse (OAIC) is an integrated information exchange service designed to meet the needs of developing countries through various communication media. The OAIC provides technical, policy and scientific information on a wide range of ODS phase-out issues including:

- descriptions of alternative technologies and product listings for each industrial use sector;
- an international directory of experts and consultants;
- technical literature abstracts, and information for ordering documents;
- descriptions of national and corporate policies and programmes to phase out ODS;
- listings of workshops, conferences and meetings concerning ozone depletion issues; and
- bulletins containing news on phase-out initiatives.

There is no charge for using the OAIC query response service; simply phone, fax, e-mail or write to us with your question.

Why do we need the OzonAction Programme?

Scientists agree that emissions of man-made chlorofluorocarbons (CFCs), halons, carbon tetrachloride, methyl chloroform, methyl bromide and other substances are responsible for depletion of the ozone layer.

Millions of ozone molecules are being destroyed every minute and this is increasing the amount of harmful ultraviolet radiation that reaches the

Earth's surface. People, animals and plants are being exposed to this radiation, which threatens to cause skin cancer and eye cataracts, reduce agricultural productivity and severely damage the marine food chain.

The world community has understood the gravity and urgency of this situation, and has acted decisively.

Nations throughout the world have committed themselves to phasing out the use and production of these ODS through an international treaty: the Montreal Protocol. They recently decided that the threat is now so acute that the phaseout should be accelerated.

The Multilateral Fund was established by Parties to the Protocol in January 1991 to provide financial and technical assistance to developing countries that are Party to the Protocol to enable them to phase out ODS. Four organizations serve as the Fund's implementing agencies: the UN Development Programme (UNDP), the UN Environment Programme (UNEP), the UN Industrial Development Organization (UNIDO) and the World Bank.

UNEP was given responsibility for gathering information, holding workshops and training courses, networking, conducting country programmes and acting as an information clearinghouse.

The OzonAction Programme is UNEP's response to this mandate.

The Programme also receives the support of the Finnish International Development Agency (FINNIDA) and the Swedish International Development Authority (SIDA).

How can the Ozonaction Programme help?

The OzonAction Programme is designed to ease developing countries' transition to the use of

chemicals that do not deplete the ozone layer.

We can help by providing information, organizing training and assisting countries in the preparation of their national programmes for phasing out ODS.

Information exchange

Information about technical and policy issues is available through our OzonAction Information Clearinghouse (OAIC). The information exchange on how to reduce ODS use takes place through mail, fax and 'phone, as well as through electronic media (i.e. World Wide Web, Internet, e-mail and diskette databases), the OzonAction newsletter and technical publications prepared in close liaison with the UNEP Assessment Panels and their Technical and Economic Options Committees as well as in partnership with government, industry and NGOs.

Training and networking

The OzonAction Programme helps by:

- organizing training and networking workshops to provide government and industry decision makers with information on ODS control policies, strategies, and replacement technologies and products;
- organizing regional and national 'train the trainer' courses which include information and skills on servicing, maintenance, and recovery and recycling; and
- advising on national information campaigns to raise public awareness on the importance of ozone protection, and publishing documents and training; and
- networking with the ODS officials nominated by their governments who are in charge of their National Ozone Units to provide them with guidance and to share information and experience.

Country programmes

The OzonAction Programme helps developing countries that consume small quantities of ODS to assess their current production and



consumption and to develop their own national phase out action plans. The cost of developing these programmes is met by the Multilateral Fund. Other implementing agencies can also collaborate to assist with country programmes and identify investment projects.

Institutional strengthening

The OzonAction Programme provides administrative and technical assistance to eligible Article 5 countries through Institutional Strengthening projects. These projects support institutional infrastructure at the national level to facilitate ODS phase out activities and implement the Country Programme. It also assists National Ozone Units to monitor the government and industry action plans to fulfill the national obligations under the Montreal Protocol.

Helping you to help our planet

Our goal is to help you obtain the information you need to make the right decisions. Become a partner in the global OzonAction network and join the thousands of people who have decided to act in order to preserve the fragile ozone shield.

Contact us now:

- to get the OzonAction Newsletter;
- to get Technical Brochures/Sourcebooks;
- to get answers to your technical and policy questions;
- to get the contact data of your National Ozone Unit.

Write, phone, fax or e-mail us now to:

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39-43, Quai André Citroën

75739 Paris Cedex 15

France

E-mail: ozonaction@unep.fr

Tel: (33 1) 44 37 14 50

Fax: (33 1) 44 37 14 74

WWW: <http://www.unepie.org/ozonaction.html>

Telex: 204 997 F

Cable: UNITERRA PARIS

or: in Asia and the Pacific:

UNEP Regional Office for Asia and the Pacific (ROAP)

UN Building, Radjamnern Avenue

10200 Bangkok, Thailand

Tel: (66 2) 280 60 88

Fax: (66 2) 280 38 29

or: in Latin America and the Caribbean:

UNEP Regional Office for Latin America and the Caribbean (ROLAC)

155, Boulevard de los Virreyes Col Lomas

Virreyes - 11000 Mexico DF

Tel: (52 5) 202 4841 Fax: (52 5) 202 0950

or: in Africa:

UNEP Regional Office for Africa (ROA)

P.O. Box 30552, Nairobi, Kenya

Tel: (254 2) 624 281 Fax: (254 2) 623 928

or: in West Asia:

UNEP Regional Office for West Asia (ROWA)

P.O. Box 10880, Manama, Bahrain

Tel: (973) 266072 Fax: (973) 266075

About UNEP Industry and Environment

It is now widely accepted that sustainable development and a sound environment go hand-in-hand. UNEP recognized this as early as 1975 when it established its Industry and Environment centre (IE), located in Paris. UNEP IE functions as a catalyst to bring industry, government and non-governmental organizations together to work towards environmentally sound forms of industrial development. UNEP IE seeks to:

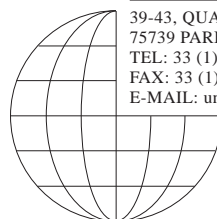
- define and encourage the incorporation of environmental criteria in industrial development;
- help formulate policies, strategies and management tools for sustainable industrial development and build the capacity for their implementation;
- promote preventive environmental protection through cleaner, safer production as well as other proactive approaches; and
- stimulate the exchange of information on environmentally sound technologies and forms of industrial development.

To promote the transfer of information and the sharing of knowledge and experience, UNEP IE has developed three complementary tools: a *Technical Report Series*; the quarterly *Industry and Environment review*; and a *Query-Response Service*.



UNEP

UNITED NATIONS ENVIRONMENT PROGRAMME
INDUSTRY AND ENVIRONMENT



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